A Monetary Analysis of Argentina’s Inflationary Recovery: Comparisons with Large Devaluations in Asia

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Abstract
Although monetary models of inflation have been popular with many economists, few attempts have been made to apply them to economies after major shocks to the exchange rate. These models assume that prices are free to adjust, which has been shown to be an invalid assumption in short and medium terms. However, by using a panel data set of countries affected by the large devaluations which characterized the East Asian Financial Crisis, I offer an argument that the monetary model can still be used to explain movements in price levels. I then apply a more detailed version of the monetary model to Argentina’s recent bout of inflation and find that an ever increasing money supply is a major culprit behind its ongoing inflation problem.

Acknowledgements: I would like to thank my thesis advisor, Professor Ronald McKinnon, for his support, patience, and the ideas that inspired this project. Without him, this paper would have never been possible. I am also grateful to Mark Tendall for his support, friendship, and advice over the years, as well as running the Summer Research Program. I would also like to thank Assistant Professor Esteban Rossi-Hansberg for introducing me to the research process, and Professor Geoffrey Rothwell for his guidance during Honors College. Finally, thanks to my fellow honors students for their encouragement during this project. Any remaining mistakes are mine.
Introduction

When a country’s exchange rate fluctuates against its major trading partners or against an anchor currency, that country suffers real consequences. Historically, much attention has been paid to exchange rate movements and the regimes which govern these movements. In the interwar period, countries freely floated their exchange rates. However, the global economic downturn of the 1930s pushed countries to competitively devalue their currencies in an effort to stimulate their economies. The Bretton Woods system established near the end of the war was an attempt to prevent similar harmful manipulations of the exchange rate by establishing a system in which countries were pegged to official dollar parities. However, since the collapse of the Bretton Woods system in 1973, most currencies have floated or been “softly” pegged.

The price of a floating exchange rate is the high volatility. As a result, many countries have chosen an exchange rate regime that is somewhere in between fixed and floating with some currency controls.

In mid-1997, the so-called East Asian Tigers were enjoying spectacular economic success. Countries such as South Korea, Thailand, Malaysia, Indonesia, the Philippines, and Singapore enjoyed consistent GDP growth at around 10% per year. These countries were seen as models of economic growth that others tried to emulate, praised even by the IMF. The Asian Tigers also were the recipients of large inflows of foreign capital, which could be used to invest to further boost their economies.

While many of the Asian countries experienced rapid economic growth before 1997, their collapse was even faster in 1997-98. In May 1997 the Thai baht, which had been pegged to the dollar, was fiercely attacked by speculators, causing massive financial
outflows from the country and resulting in a currency which lost half its value. By July, the crisis had spread to the Philippines, where the central bank tried to raise interest rates to defend its currency before the effort eventually failed, resulting in a heavily devalued peso. Malaysia was also affected as early as July. The overnight loan rate increased from less than 8% to more than 40%. There was also a major downturn in investment and in 1998 Malaysia entered into a recession. When its rupiah came under attack in August, Indonesia was forced into a floating exchange rate regime, where it continued to fall. Indonesia’s GDP fell by 13.5% during the course of 1997. South Korea, the largest economy which will be studied in this paper, was plagued by a shaky banking system that was characterized by many non-performing loans. In November of 1997 its economy took a sharp downturn, including a sharp depreciation of its currency.

A few years later, Argentina went through a similar experience as the Asian countries. After a loss of investor confidence, money began flowing out of the country beginning in 2001. The next year, the peso was allowed to float, which resulted a in free fall for the currency. The peso, which was originally fixed at a 1-to-1 peso-dollar parity, fell to nearly 4 pesos per dollar.

Due to the large devaluations and the open nature of the economies hit by the crisis, there was inflationary pressure in these economies. Since they depended on goods from abroad, which became more expensive when the currencies crashed, price indices in each country reveal a persistent upward movement following the crisis. This paper will focus on these price levels in the period following the devaluations.

The countries hardest hit by the Asian Financial Crisis will be the focus of this paper: Indonesia, South Korea, Thailand, Malaysia, and the Philippines. Since Argentina
went through a similar experience, we will also examine data from its crisis. Due to the slow adjustment of the in the price of nontradable goods and services (Burstein, Eichenbaum, and Rebelo, 2005), real exchange rates fall after a nominal devaluation, but that adjustment back to equilibrium in the real exchange rate is a slow process. Although many of the East Asian crisis countries have seen a return to nominal exchange rate and price level stability, Argentina has recently witnessed a return to rising price levels.

The monetary view of an economy is the belief that the price level is determined by an equilibrium in the money market – the equalization of demand and supply. Thus the both the supply of money and factors which affect the demand for money, such as the interest rate and income, affect the price level. The key assumption which the monetary models rests on is price level flexibility – that is, the price level adjusts quickly to changes in the variables which affect it.

In the aftermath of large devaluations, Burstein, Eichenbaum, and Rebelo show that prices of nontradable goods, which are included in measurements of price levels, are slow to adjust. This evidence seems to indicate that the monetary view of exchange rate determination should not hold after a deep devaluation. I will use a panel data set consisting of the five crisis countries and Argentina to see if there is any evidence of the relationship predicted by the monetary view. If not, this would add more support for Burstein et al’s findings. I also test the monetary model using both Consumer and Wholesale Price Indices (CPI and WPI, respectively) to see which measure of the price level is better described by the independent variables in the model.

Finally, I will turn to the more specific question of Argentina’s continuing inflation. Why has Argentina had problems in the aftermath of its devaluation when most
of the Asian countries have experienced low rates of inflation? In addressing this question I will adopt a modified version of the monetary model to empirically test the determinants of Argentina’s inflation.

**Modeling the Exchange Rate and Price Level**

The literature on the behavior of economies following deep devaluations is not very well developed. We will examine different models which deal with both price levels and the exchange rate and incorporate parts of different ones.

*Purchasing Power Parity*

Any discussion of international economics begins with purchasing power parity (PPP). The theory of (absolute) purchasing power parity is that the nominal exchange rate between two currencies equals the ratio of domestic price levels. That is,

\[ S = \frac{P}{P^*} \]

Where \( S \) is the nominal exchange rate, \( P \) is the domestic price level, and \( P^* \) is the foreign price level.

The Economist’s Big Mac Index, an attempt to measure how over- or undervalued a currency is based on the price of a Big Mac, is based on absolute PPP. An extensive empirical body of research exists which comes to mixed results regarding the theory. After an extensive survey of the literature, Edwards and Savastano (1999) conclude that at best, there is only evidence of “ultra-long-run” support for PPP – that is, in the long run, changes in the equilibrium exchange rate are driven by changes in economic fundamentals which affect the real exchange rate (RER). As a result, they argue that PPP-based models of the exchange rate are usually misleading in short- and medium-term studies.
Purchasing Power Parity-based models require many strong assumptions to hold. To satisfy the PPP condition, there must be no transport costs or other barriers to trade such as tariffs, and foreign and domestic goods must be exactly alike. For a more in-depth discussion, see McKinnon (1979). Furthermore, the PPP model requires that the real equilibrium exchange rate be stationary (Edwards and Savastano, 1999). A base year is chosen where an exchange rate is deemed to be “in equilibrium,” and the degree of misalignment is calculated based on that for all subsequent years. Thus when using a PPP-based model, the choice of the base year is extremely important.

Relative PPP is a more relaxed version of the theory. Rather than focusing on an equalization of price levels, the basis for relative PPP is the rates of change of the price levels (inflation) and change in exchange rate (depreciation or appreciation).

\[ \Delta S = \Delta P - \Delta P^* \]

This condition has been found to hold empirically more often than absolute PPP. Relative PPP can be used to show when a country has reached an “equilibrium” position with a constant exchange rate. For example, an absolute PPP analysis of China suggests that its currency is undervalued. However, its inflation rate has converged to the rate of the United States, so relative PPP predicts little change in the nominal exchange rate, and a look at the data shows this relationship has held.

Behavioral Equilibrium Exchange Rate

An alternative way of thinking about movements in the exchange rate is the notion of a so-called “real equilibrium exchange rate” (REER) – a view which sees the real exchange rate as based on underlying fundamentals. The resulting framework has been called a lot of names, including NATREX (for natural real exchange rate, as in
Stein, 1994 and 1996; and Stein and Paladino, 1998), Behavioral Equilibrium Exchange Rate (BEER, discussed in Clark MacDonald, 1998), and many others. These approaches can be identified by their common features (Williamson 1994). The first is the belief that equilibrium real rates can be calculated; that is, there is a benefit in the attempt. The second is the rejection of the view that the best estimates of the REERs are derived from PPP models. These economists believe that REERs can change over time as a result of changes in the fundamentals.

BEER-based models use attempt to assess the real equilibrium exchange rate by using a reduced-form equation that explains the behavior of the exchange rate over the sample period. However, by focusing on real variables, these models fail to take into account the reality that the policy variables which affect the exchange rate are in nominal terms (thank you to Ronald McKinnon for pointing this out). Thus it seems like the BEER models are a poor description of how exchange rates (and price levels) are actually determined. A major shortcoming of the REER models is that they completely ignore monetary variables, since they only focus on real variables. Since we are focusing on changes in price levels, we need an open economy model which incorporates the money supply and price level into determinations of the exchange rate. and we will not utilize this model.

The Monetary View of the Exchange Rate

The monetary model of exchange rate behavior is an extension of absolute PPP. Following Hallwood and MacDonald (2000) and Husted and MacDonald (1998), we start with the PPP condition holding:

\[ S_t = P_t - P_t^* \]  \hspace{1cm} (1)
Taking logs we are left with

\[ s_t = p_t - p_t^* \]  \hspace{1cm} (2)

where lower case letters (with the exception of \( i \)) from here forward correspond to logarithmic values of each variable and an asterisk denotes the foreign country. Absolute PPP may be a shaky assumption, which will be tested later. The key to the monetary view of the exchange rate is the money market. The money demand function is given by

\[ m_t^D - p_t = \alpha_1 y_t - \alpha_2 i_t \quad \alpha_1, \alpha_2 > 0 \]  \hspace{1cm} (3)

\[ m_t^{D*} - p_t^* = \alpha_1 y_t^* - \alpha_2 i_t^* \]  \hspace{1cm} (4)

where \( i \) is the interest rate, \( m^D \) is the demand for money, and \( y \) is the level of real national income. The money markets are continuously in equilibrium such that money demand is always equal to money supply, which is exogenously determined. Thus

\[ m_t^D = m_t^S = m_t \]  \hspace{1cm} (5)

\[ m_t^{D*} = m_t^{S*} = m_t^* \]  \hspace{1cm} (6)

By substituting the money supply equation into the money demand function and combining the domestic and foreign equations, we can solve for the relative price level, obtaining

\[ p_t - p_t^* = m_t - m_t^* - \alpha_1 (y - y^*) + \alpha_2 (i - i^*) \]  \hspace{1cm} (7)

Since we have (reluctantly) assumed absolute PPP holds, our reduced form equation is

\[ S = m_t - m_t^* - \alpha_1 (y - y^*) + \alpha_2 (i - i^*) \]  \hspace{1cm} (8)

This final equation has been estimated by several different authors; see Husted and MacDonald (1998), Hodrick (1978), Bilson (1978), and Putnam and Woodbuy (1980), among others.
Mark and Sul (1998) emphasize the importance of using panel data due to the insufficient number of observations which make obtaining reliable results difficult. Using quarterly data from 17 countries, they are able to reject the null hypothesis of no cointegration between the nominal exchange rate and the right hand side of equation (8).

Husted and MacDonald (1998) use a panel data set from nine Asian countries from 1974 to 1996 in an attempt to determine whether the Asian currencies were significantly misaligned prior to the crisis. They test the reduced form equation (defined with respect to the Japanese yen) above using several different techniques: OLS with fixed effects and three different types of Maximum Likelihood estimates with fixed effects. The calculations yield the correct sign on most of the coefficients, and the authors argue that the currencies were not significantly misaligned. Husted and MacDonald conclude that the monetary view of the exchange rate is a plausible one.

Rather than test the final equation (8), we will test the money demand equation (3). This has the advantage of not requiring PPP to hold, since we are not incorporating the exchange rate into the model. Although we ignore the question of exchange rates, this still allows us to test whether the monetary view has explanatory power over an economy in the immediate aftermath of a currency crisis where the economy is adjusting to a large change in the exchange rate.

*The behavior of price levels following deep devaluations*

There exists a large body of literature about various topics regarding the Asian Financial Crisis. However, the body of work regarding the post-crisis speed of price level adjustment is very thin as the work that does exist tends to focus on the path of real exchange rates following devaluations. One paper which does examine a post-crisis
economy is by Siregar and Rajaguru (2005). They apply the monetary model to Indonesia both before and after its 1997 crisis and find that the monetary model has more explanatory power for the post-crisis period. They conclude that the growth rate of base money was a key monetary determinant of Indonesia’s post-crisis inflation. This paper will be discussed more when analyzing Argentina’s experience.

Burstein, Eichenbaum, and Rebelo (2005) use a detailed empirical analysis of the aftermath of Argentina’s 2001 devaluation to support their theory that the slow adjustment in the price of nontradable goods and services is the driving force behind the large drop in real exchange rates that occurs after large devaluations. An important contribution is recognizing that included in the retail price of tradable goods are distribution costs and local goods, which are nontradable. With the real exchange rate defined as

$$RER_t = P_t / (S_t P^*_t)$$

they find that changes in the price of the tradable component of goods represent a very small part of movements in the real exchange rate. Thus they conclude that movements in the price of nontradables dominate movements in the real exchange rate. Note that “nontradables” as used in their paper are nontradables in the “pure” sense, without including distribution costs and local goods. Burstein et al also show that prices of nontradables adjust more slowly to changes in the exchange rate than tradable goods. Keeping this in mind, we must remember that prices may not be as free to adjust as assumed in the monetary view. Also important to note is that their data set only goes through 2002. Thus at that point Argentina had not diverged as sharply from the Asian
experience as has happened in recent years. However, my data set includes data through the end of 2005.

**Data**

Unless otherwise noted, all data used for our analysis is from the IMF’s International Financial Statistics (IFS) website and compact disc. All exchange rates are measured in national currency per United States Dollar. Although there is some debate about the best measure of the money supply, we assume that the M1 money supply—currency plus demand deposits—is a good indicator of level of money in an economy. It is measured in the domestic currency. Both price indices (the CPI and WPI) use 2000 as the base year. Imports, exports, and GDP are all measured in domestic currency to avoid measurement issues associated with fluctuations in the exchange rate. All data spans from the beginning of the crisis until the end of 2005 (or in some cases a couple months into 2006).

**East Asia and Argentina**

The countries used in our analysis were chosen somewhat arbitrarily. We first looked at the five countries hardest hit by the crisis and later added Argentina as its experience was similar until eventually it became the focus of this work. There will be two graphs for each country – one with key variables of the monetary model, and one with the exchange rate and national account data.

*Note: All variables except interest rate are measured on left axis as percent cumulative change. Interest rate is displayed on the right axis. On second graph, GDP, imports, exports on left axis. Exchange rate on right axis.*
Korea

After an initial large depreciation, the exchange rate has been restored to its pre-crisis level. Despite a large expansion in the money supply, inflation as measured by the CPI and WPI has stayed low. From 1998 through 2005 (eight years), the WPI increased by about 10%, and the CPI by about 22%. In 2005 CPI inflation was 2.5% and WPI inflation was 1.5%. Interest rates have stayed at a steady level since the end of 2001. Imports and exports have risen at a gradual pace along with output.
**Indonesia**

One of the countries hardest hit by the crisis, Indonesia’s exchange rate remains the most depreciated compared to its previous level. Its price level measures show an elevated price level, with the WPI higher than the CPI. Over the eight year time horizon, the WPI increased by 141% and the CPI by 171%. Inflation in 2005 was 22% and 18% when measured by WPI and CPI, respectively. In 1999 interest rates skyrocketed but have stayed at reasonable levels recently. Indonesia has a moderate current account surplus.

**Malaysia**

Malaysia’s price indices have increased very slowly after the crisis. After its devaluation, the exchange rate and other economic indicators have remained relatively stable. The exchange rate
remained fixed for the duration of the sample period. Malaysia’s inflation has been moderate, with the WPI increasing by 24% since the crisis and the CPI by 17%. 2005 inflation was 6% with WPI and 3.5% with CPI. At the macroeconomic level, Malaysia’s imports, exports, and GDP have all risen steadily and at about the same rate for the past few years.

The Philippines

The Philippines was less affected by the crisis than many of the other Asian countries. In the wake of the crisis, the WPI has increased at a much more rapid rate than the CPI – the WPI has increased by 93% since the crisis compared to 47% for the CPI. In 2005, WPI inflation was 9%, while CPI inflation was 7%. The exchange rate has undergone a moderate but sustained depreciation – its initial
depreciation was less dramatic than the other countries, but it has continued to depreciate. GDP growth has been somewhat sluggish but has been consistently positive, as with imports and exports.

**Thailand**

After the initial depreciation, Thailand’s currency has maintained a steady value about 50% above its pre-crisis level. Despite a large increase in money supply, the CPI and WPI have increased very slowly and are not very far above where they were in 1997. The WPI has increased by

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¹ Note that since the exchange rate is measured as baht/dollar, an increase in the exchange rate means that the currency has devalued.
just 26% since the crisis, and the CPI has only increased by 19%. WPI and CPI inflation in 2005 were 8% and 6%, respectively. Interest rates, while very high during 1998 and 1999 have fallen to low levels since then.

Argentina

Argentina’s devaluation was more drastic than the other countries – at one point the peso/dollar exchange rate increased by about 280%, compared to about 80% for Korea, the Philippines, and Thailand at their peaks. Despite a stable exchange rate during the past couple years, Argentina has experienced inflation that has not been seen in the Asian countries. Also, its WPI has increased much more rapidly than its CPI. The WPI has increased by 160% since 2001, while the CPI has increased by 70%. The 2005 inflation rates were especially high, totaling 12% with both indices. The money supply has increased at a consistently high rate. Interest rates, while at one point very high, have been held down by Argentinean authorities.
Model Testing

The monetary model of the price level behavior was tested with linear ordinary least squares fitting. To test the model in a period not following a deep devaluation, we used the United States from 1996 quarter 1 – 2005 quarter 3. The model used, obtained from rearranging equation (3) above, is

\[ p_t = m_t - \alpha_1 y + \alpha_2 i \]

Thus we expect the coefficient of GDP to be negatively signed and for the interest rate coefficient to be positively signed. The coefficient for the money supply should be positive and close to unity. Since there are two measures of price levels, we will run two sets of regressions – one using CPI as the dependent variable, and one using WPI as the dependent variable.

Results for United States (dependent variable = WPI)

\[ wpi_t = C_0 + m_t - \alpha_1 y + \alpha_2 i, \] where \(C_0\) is the intercept.

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Model} & R & R^2 & \text{Std. Error of the Estimate} \\
\hline
1 & .916 & .840 & .02770 \\
\hline
\end{array}
\]

Model Summary

\[
\begin{array}{|c|c|c|c|}
\hline
\text{Model} & \text{B} & \text{Std. Error} & \text{Beta} & \text{t} & \text{Sig.} \\
\hline
1 (Constant) & 1.187 & .472 & 2.517 & .017 \\
1 m & .717 & .155 & 4.611 & .000 \\
1 y & -.204 & .151 & -1.350 & .186 \\
1 i & .018 & .004 & 4.119 & .000 \\
\hline
\end{array}
\]

Coefficients

\(a\) Predictors: (Constant), i, y, m

\(a\) Dependent Variable: wpi
As predicted by the model, the coefficients of $m$ and $i$ are positive, while $y$ is negative. The monetary view of the price level seems like a “good” one here.

Results for United States (dependent variable = CPI)

$$cpi_t = C_0 + m_t - \alpha_1y_t + \alpha_2i_t$$

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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*a. Predictors: (Constant), i, y, m*

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<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
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<tr>
<td>m</td>
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<td>.051</td>
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<td>y</td>
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<tr>
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<td>.001</td>
<td>-.066</td>
<td>-2.168</td>
<td>.037</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: cpi*

Here the signs for $y$ and $i$ are switched, yielding signs not predicted by the model. The sign of the interest rate coefficient is ambiguous because in a stable economy such as the United States there is little or no threat of sustained movements in inflation or the dollar’s exchange rate.

We now consider the case following a deep devaluation. How well will the monetary model fit countries which are adjusting to a large, rapid change in the exchange rate? To fit the data to the model, we look at the first 17 quarters after devaluation (constrained by availability of data from Argentina, since its devaluation occurred more recently) with a panel set consisting of the six countries. We allow for different
intercepts for each country, although statistically significant results can be obtained without using different intercepts (see Appendix A).

Results for Emerging Markets (dependent variable = CPI, country effects included)

\[ cpi_t = C_{0,i} + m_t - \alpha_1 y_t + \alpha_2 i_t \]

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
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<th>Adjusted R Square</th>
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a. Predictors: (Constant), thai, m, philip, i, kor, arg, mala, y

<table>
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<th>Model</th>
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<td></td>
<td>i</td>
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<tr>
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<td>philip</td>
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<td></td>
<td>thai</td>
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<td>.366</td>
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a. Dependent Variable: cpi

While a R-squared value shows that the independent variables explain most of the movement in price levels, only the money supply coefficient is significant. The positive sign on the GDP coefficient does not conform to the model. Let us now turn our attention to the same test, but with WPI as the dependent variable.
Results for Emerging Markets (*dependent variable = WPI, country effects included*)

\[ wpi_i = C_{0,i} + m_i - a_1 y_i + a_2 i_i \]

### Model Summary

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<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
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*a. Predictors: (Constant), thai, m, philip, i, kor, arg, mala, y*

### Coefficients

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<td>Beta</td>
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<tr>
<td>thai</td>
<td>1.822</td>
<td>.050</td>
<td>.299</td>
<td>36.609</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: wpi*

This regression output suggests that the monetary model does a very good job of explaining movements in price levels as measured by WPI. The sign on the GDP coefficient is negative and the interest rate coefficient is positive. The sign on the money supply coefficient is positive and very close to unity. All variables are significant at the 99% level and the R-square value is extremely high – even higher than the CPI results. This lends support for the use of the WPI when using the monetary model. The better results for the WPI than CPI probably reflect the fact that the CPI is less responsive to external shocks since it has a larger component of non-traded goods, which adjust less quickly than traded goods. That is, the prices of non-traded goods are not very sensitive.
to changes in the economy. For a discussion and test of the open economy monetary model, see Appendix A.

*Purchasing Power Parity*

The starting point for the monetary view of exchange rate determination is the assumption that purchasing power parity holds. That is,

\[ s_t = p_t - p_t^* \]

Is this a realistic assumption? To test this, we again allow for country-specific intercepts. We also normalize every exchange rate so that the value of the domestic currency in terms of US dollars at the beginning of each period is 1, so that every currency has equal weight. Again, all variables used are natural logs and the measure of the price level is WPI, as we saw that it better fits the models used after a large devaluation.

\[ s_t = C_0 + (p_t - p_t^*) \]

One problem with this estimation is that the price level is assumed to be exogenous. This is probably not a valid assumption since the two variables are cointegrated – the left and right hand sides of the equals sign could be switched without any loss of meaning – but we will proceed anyway.

**PPP Estimation Results**

<table>
<thead>
<tr>
<th>Model Summary</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Model</strong></td>
</tr>
<tr>
<td>1</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), thailand, pricediff, korea, malaysia, philippines, arg
Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>B</th>
<th>Std. Error</th>
<th>Beta</th>
<th>t</th>
<th>Sig.</th>
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</thead>
<tbody>
<tr>
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<td>1.386</td>
<td>.046</td>
<td></td>
<td>30.421</td>
<td>.000</td>
</tr>
<tr>
<td></td>
<td>pricediff</td>
<td>1.302</td>
<td>.081</td>
<td>.941</td>
<td>16.067</td>
</tr>
<tr>
<td></td>
<td>arg</td>
<td>-1.176</td>
<td>.083</td>
<td>-1.033</td>
<td>-14.085</td>
</tr>
<tr>
<td></td>
<td>korea</td>
<td>-1.113</td>
<td>.061</td>
<td>-.978</td>
<td>-18.223</td>
</tr>
<tr>
<td></td>
<td>malaysia</td>
<td>-1.017</td>
<td>.061</td>
<td>-.894</td>
<td>-16.663</td>
</tr>
<tr>
<td></td>
<td>philippines</td>
<td>-.863</td>
<td>.059</td>
<td>-.758</td>
<td>-14.675</td>
</tr>
<tr>
<td></td>
<td>thailand</td>
<td>-1.012</td>
<td>.061</td>
<td>-.889</td>
<td>-16.568</td>
</tr>
</tbody>
</table>

a. Dependent Variable: exrate

The intercepts for each country (combining the constant term and each country-specific intercept) are close to zero. Furthermore, the coefficient on the relative price term (pricediff) is close to unity (although it should be noted that it is statistically significantly different from unity). The high R-square value indicates that most of the movement in the relative price level is explained by changes in the exchange rate. Even with the cointegration problem, these results show that at the very least, the relative price level and exchange rate track each other’s movements. Therefore it does not seem unreasonable to assume that purchasing power parity holds.

**Interpretation**

The results of the regression lend support to the studies conducted by Mark and Sul (1998) and Husted and MacDonald (1998) which argued that the monetary view of the exchange rate is a good one. The fact that the data in this study comes from immediately following deep devaluations, when price levels are known to be slow to adjust, suggests that the monetary model is more versatile than perhaps some think. Thus when evaluating the cause of Argentina’s continuing inflation – increases in the price
level – the monetary model should be able to help. Recall the results listed in the table above:

\[ wpi_t = 2.13 + 1.02m_t - .57y_t + .007i_t \]

\[ (.293)*** (.069)*** (.097)*** (.001)*** \]

Note: ( ) is standard error; ***Significant at 1%

The results from the panel data set suggest that the money supply is the dominant determinant of the price level. Although the interest rate is scaled differently than the other variables – recall that the money supply and income data are scaled such that they are defined to have values such that 100 is the base year, while the interest rate data is the country’s actual interest rate – the coefficient is still surprisingly low. Interest rates, according to this model, are not a major factor price level movements. Additionally, the high R-square suggests that this is a plausible model of the behavior of an economy.

According to Burstein, Eichenbaum, and Rebelo (2005), the WPI has non-traded components – distribution costs and local goods. This should serve to slow the adjustment of the price level such that it is not free to adjust – violating the assumptions made in the derivation of the monetary model. However, since an analysis of the data suggests that the monetary view can explain movements in price levels, we will proceed by using the monetary view of exchange rate determination.

**Comparing Argentina to Korea**

Argentina and Korea are two of the more well-known economies which underwent financial turmoil – Argentina because of its very large depreciation and the past history of inflation in Latin America, and Korea because, as the largest of the East Asian Tigers, its struggle was strongest indictment of the “East Asian Miracle.”
An important question is whether there is any real negative impact of a high inflation rate. On a smaller scale, the effects of inflation on an economy are well established. Uncertainty is introduced into the wage bargaining process as the future value of money is not known. Furthermore, lenders are cautious to lend funds at low interest rates since the money they receive in the future is less valuable. There are also costs associated with continued contract renegotiations and changing prices for vendors. Do these effects combine to reduce the total income of a country with a high inflation rate?

The answer to this question remains unknown. Although many studies have attempted to answer this question, they have not come to a consensus. McCandless and Weber (1995) use a data set consisting of 109 countries to examine the relationship between inflation (measured by change in CPI) and real GDP growth, and find a coefficient that is negative but not statistically different from zero. They then include a table of other similar studies and conclude that “the difference between our results and those of the studies listed in [the table] and the difference between our results for the full sample and the Latin American subsample and those for the OECD subsample suggest that the true relationship between inflation and real output growth is still uncertain” (McCandless and Weber 95).

While inflation, especially rates of inflation below 20%, may not slow down the economy as a whole, there are still reasons to avoid it. The obvious reasons are the costs to people mentioned above. Another reason that understanding inflation is important is that avoiding inflation is a goal of politicians. They run the risk of not being reelected if
their constituents demand a reduction in the inflation level and they cannot manage to do it.

While on the surface Argentina and Korea had similar experiences, especially in the beginning, their recoveries from the devaluations were markedly different. In the years following the depreciations, Korea allowed its exchange rate to appreciate, and at present the value of its currency in dollars is close to the pre-crisis level. At the same time, Korea has had low levels of inflation. On the other hand, Argentina’s exchange rate has remained quite stable in the years following its initial devaluation, not changing very far from triple its original value – a very large devaluation. On the other hand, Korea’s exchange rate at the end of March 2006 was 972 won/dollar, compared to 965 won/dollar in October 1997, before the crisis. Not only was Argentina’s devaluation deeper, but it has no recovered with an appreciation as Korea has.

Since its crisis in 2002, Argentina has experienced a steady increase in its price level. This problem has worsened recently as the inflation rate doubled over the year of 2005 to reach 12.3 percent (Mander 2006). While inflation is more apparent in tradable goods, as evidenced by the higher rate of WPI increase, services have also felt the effects. A continuing tendency of rising prices puts pressure on everyone in the economy – workers whose salaries cannot maintain their purchasing power as the cost of living rises, business owners who face uncertainty about the future value of their products, and consumers who are discouraged from saving as the future value of money will likely continue to fall.

Many have attempted to diagnose Argentina’s problem and prescribe a policy which would counteract its rising prices. One commonly cited potential culprit is loose
monetary policy. The Central Bank has been the target of much criticism, especially since its president is relatively new in office. In the 18 months since the new president has been in office, the inflation rate has tripled. According to the monetary model, an increase in the money supply would translate to a rise in price level, and continuous increases in the money supply would result in inflation. The Central Bank president, Martin Redrado, has countered by blaming other factors, such as expansionary fiscal policy, rising wages, and an economy that is still adjusting to the heavy devaluation in the exchange rate which occurred in 2002 (Casey 2005).

“If you blame monetary policy for what is happening you have to blame monetary policy from 2003 and 2004 because of the lag effect it has on the economy” (Casey 2005), he argues.

Many economists blame Argentina’s unwillingness to let the peso appreciate for the continuing inflation. To see why, recall the PPP condition:

\[ S = \frac{P}{P^*} \]

If the peso-dollar exchange rate depreciates to a level that is three times its original value and is not allowed to appreciate afterwards, eventually the price level must also triple, according to the model. In other words, Argentina will undergo inflation until this new level is reached. One theory is that Argentina’s inflation is a natural reaction to the “stable” exchange rate – although the exchange rate has remained constant for some time, the cost of this has been a rising price level. According to this view, the inflationary pressure in a country whose exchange rate was allowed to rise back towards its original level – let’s use Korea as an example – should be less because the appreciation lessons the pressure for price adjustment.
Argentina and Korea – Changes in Exchange Rate, Price Levels, and Inflation (note: from before crisis to 17 periods later, %change is from beginning to end of period)

<table>
<thead>
<tr>
<th>S (Cur$/)</th>
<th>WPI</th>
<th>CPI</th>
<th>CPI Infl Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>ARG (2001Q3)</td>
<td>1.000</td>
<td>98.267</td>
<td>98.751</td>
</tr>
<tr>
<td>ARG highest value reached</td>
<td>3.75 (+275%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ARG (2005Q4)</td>
<td>3.012</td>
<td>256.344</td>
<td>168.291</td>
</tr>
<tr>
<td>% Change</td>
<td><strong>+201.2</strong></td>
<td><strong>+160.87</strong></td>
<td><strong>+70.42</strong></td>
</tr>
<tr>
<td>KOR (1997Q2)</td>
<td>888.100</td>
<td>88.500</td>
<td>91.875</td>
</tr>
<tr>
<td>KOR highest value reached</td>
<td>1695 (+91%)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>KOR (2001Q3)</td>
<td>1309.600</td>
<td>99.400</td>
<td>104.700</td>
</tr>
<tr>
<td>% Change</td>
<td><strong>+47.46</strong></td>
<td><strong>+12.3</strong></td>
<td><strong>+13.96</strong></td>
</tr>
</tbody>
</table>

Korean data through present time (through 2005)

<table>
<thead>
<tr>
<th>S (Cur$/)</th>
<th>WPI</th>
<th>CPI</th>
<th>CPI Infl Rate</th>
</tr>
</thead>
<tbody>
<tr>
<td>KOR (1997Q2)</td>
<td>888.100</td>
<td>88.500</td>
<td>91.875</td>
</tr>
<tr>
<td>KOR (2005Q4)</td>
<td>971.6</td>
<td>110.5</td>
<td>118.4</td>
</tr>
<tr>
<td>% Change</td>
<td><strong>+9.4</strong></td>
<td><strong>+24.9</strong></td>
<td><strong>+29%</strong></td>
</tr>
</tbody>
</table>

As expected, Argentina’s price level has undergone a much larger shift than Korea’s and its inflation rate is significantly higher. Korea’s exchange rate has almost
returned to its original value and its inflation rate in the previous year was a modest 2.5%. Although the Argentina’s price level has not fully adjusted, as evidenced by the change in price level being less than the change in exchange rate, there seems to be a relationship between the two as suggested by the PPP condition. Let’s look at this graphically:

Argentina and Korea: Exchange Rate and Price Level Following Devaluation (Note: dates on bottom are measured as quarters since onset of each country’s crisis. Thus Period 1 for Argentina occurs many years after Korea.)

Argentina’s exchange rate has not had much of a recovery following the devaluation. At the same time both price indices have steadily increased. On the other hand, Korea’s exchange rate has appreciated to a value that is close to where it started, so according to the PPP condition the inflationary pressure brought on by exchange rate movement is much smaller.
According to the monetary model, two of the policy instruments which affect inflation are the money supply and the interest rate. Let’s look at how the two countries have differed in their money supplies and interest rates:

**Argentina and Korea: Money Supply and Interest Rate**

While Korea’s money supply did not change much in the four years after its devaluations, Argentina’s has exploded. The monetary model predicts a one-to-one relationship between the money supply and price level: a one percent increase in the money supply should translate into a one percent increase in the price level. Thus Argentina’s huge increase in money supply is another possible factor explaining why it has not been able to control its inflation. Interest rates in the two countries have not diverged very much from each other.
Others have blamed overly aggressive fiscal policy for Argentina’s problems. A director of an economic consulting agency based in Buenos Aires, remarked that “For the first time in Argentina’s economic history there is, more than a consensus, almost unanimity among economists over the beneficial effects that a tightening in fiscal policy would have…But we should not think that by itself fiscal policy can have the effects usually achieved with monetary policy” (Mander 2006).

The data confirms that fiscal spending in Argentina has exhibited an upward trend in the past few years. However, an increase in government revenue has accompanied this increase in spending so the net result is not very much change in the fiscal balance.
Modeling Inflation

What is the cause of Argentina’s inflation? Is it loose monetary policy, expansionary fiscal policy, a continued reaction to the 2002 devaluation, or a combination of multiple factors?

To answer this question we will employ a slightly more in-depth model than the one used earlier, following the example used in Siregar and Rajaguru (2005). Starting with the basis of the monetarist view, the rate of inflation ($\Delta p_t$) should equal the growth rate of the nominal money supply ($\Delta m^s_t$) minus the growth rate of the real money demand ($\Delta(m^d_t/p)$) as before. See Appendix B for a more detailed explanation of the model, regression output, and the version of the testable model used.

The choice of the dependent variable—CPI or WPI—does not significantly alter the findings. The high R-square values reflect the explanatory power of the dependent variables. Using both measures of inflation, the money supply and multiple lags are a significant determinant of the dependent variable, as expected from our previous look at the simultaneous rise in the money supply and price level. The interest rate also enters into both results significantly in both regressions. In short, the interest rate and money supply appear to be the driving forces behind Argentina’s inflation.

Although Siregar and Rajaguru (2005) use CPI in their analysis of Indonesia’s economy when using the same model, as argued above WPI is a better descriptor of the price level following major shocks to the economy such as a deep devaluation, since it is freer to adjust. The change in money supply along with its second, third, and fourth lags are all significant at the 95% level and correctly (positively) signed. The model predicts that a 10% change in the money supply five months into the future will have a cumulative
effect of a 3.67% increase in the price level. A 10% change in today’s money supply is predicted to increase today’s inflation rate by .76%. Expectation of inflation also seems to add to inflation, as the fourth lag of the change in price level has a significant impact on the current rate of inflation as shown in Appendix B.

Two more of the independent variables enter into the final results: expected depreciation and interest rate. An expectation of depreciation (as measured by actual depreciation in the previous period) is also expected to increase the inflation rate. As there were continued expectations of a weakening of the peso, people were less inclined to hold money. Vendors increase prices to compensate for the expectation of the money being worth less and the overall result is inflation. Finally, increases in the interest rate lead to higher inflation, although the values of the coefficients on the interest rate and its third lag are small compared to the other variables.

Policy Implications

After the previous persuasive argument about the forces inflating Argentina’s economy, it is surprising that Argentinean authorities have failed to come to grips with the problem. The Purchasing Power Parity condition, the basis of the monetary model, predicts that the price level will continue to adjust until the ratio of the nominal exchange rate to the two price levels (domestic and foreign country) arrives at its previous value. In Argentina’s case, the price level will rise and inflation will occur until goods are expensive enough to compensate for the greatly depreciated exchange rate.

The other inflation-causing variables uncovered in this paper after using a monetary framework were the money supply and interest rate. As predicted by the monetarist view, the rising money supply has been a major factor in Argentina’s
inflation. In the long run, it is a well established fact that the rate of inflation equals the rate of money growth. The fact that a shorter time horizon is being examined and that a deep devaluation had recently occurred does not seem to change this relationship. Also, since interest rate affects the real money supply, it is not surprising that it has contributed to Argentina’s inflation.

What should Argentinean monetary authorities do in order to counteract the inflationary pressures in their economy? The answer lies in being able to control the sources of money growth. There are two factors contributing to the inability of Argentina to control its money supply: an attempt to hold down interest rates and the desire to keep the exchange rate at its devalued level. In an effort to keep the exchange rate at its depreciated value, perhaps the Central Bank has been buying large amounts of dollars for pesos. This increases the money supply and holds down the exchange rate at the same time (these official dollar balances are then largely switched into United States Treasury bonds). By intervening in the foreign exchange market, Argentina floods the market with pesos. Also significant is the low interest rates that Argentinean policy has produced. Low interest rates boost the demand for money since credit is cheaper to obtain. In other words, because of its exchange rate and interest rate policies, the Argentine central bank’s hands are tied when it comes to the money supply. A solution to deal with both problems would be to gradually reduce the increases in money supply by not targeting the interest rate or exchange rate at disequilibrium levels. This could be done by allowing interest rates to rise and the currency to appreciate.

The problem with this solution (and presumably the reason Argentina has not allowed this to happen) is that the ramifications to other parts of the economy are
uncertain. Higher interest rates and an appreciated exchange rate could discourage business activity and disrupt the economy, especially in the short-term adjustment process. Elected leaders are hesitant to undertake any economic reforms which could slow the economy in the short term since their popularity, and thus chance for reelection, would fall. Argentina’s president, Néstor Kirchner, has followed many other South American leaders in enacting socialist policies and turning away from free market economics. Given Argentina’s recent economic growth and the president’s 75% approval rating (COHA 2006), it is likely that Argentina will continue to regulate its economy. Since inflation is a side effect of those regulations, inflation could be a problem for the foreseeable future.

Conclusion

The main point of this analysis is that the monetary model can be useful in understanding inflation in an economy following a deep devaluation. Even though prices are not as free to adjust as assumed in the model, the independent variables in the model explain most of the movements in both price level and inflation. Furthermore, the Wholesale Price Index is advantageous for use in open economy models such as this monetary model since it able to adjust more quickly than the Consumer Price Index. Countries such as Argentina who are experiencing difficult to manage levels of inflation can look to the model for a guide about how to control movements in their price levels. Finally, the loss of control over monetary policy associated with holding down an exchange rate can have unintended consequences – in Argentina’s case, an exploding money supply that has resulted in inflation.
References


_Southern Economics Journal_, 48, pp.78-86.


Appendix A: Panel data set with no country effects

Since the country-specific intercepts were found to be statistically significant, the regressions without country effects were not included in the body of this paper. However, the model seemed to fit well when using CPI.

Results for emerging markets (dependent variable = CPI, no country effects)

cpi_t = C_0 + m_t - \alpha_1 y_t + \alpha_2 i_t

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.625a</td>
<td>.390</td>
<td>.371</td>
<td>.12067</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), i, m, y

Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
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<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>m</td>
<td>.366</td>
<td>.056</td>
<td>15.474</td>
</tr>
<tr>
<td></td>
<td>y</td>
<td>-.218</td>
<td>.084</td>
<td>-.351</td>
</tr>
<tr>
<td></td>
<td>i</td>
<td>.002</td>
<td>.001</td>
<td>.150</td>
</tr>
</tbody>
</table>

Without allowing for different country intercepts and using CPI, the model does surprisingly well. Each variable is statistically significant (at the 10% level) with the correct sign, although the R-square value is low.

Results for emerging markets (dependent variable = WPI, no country effects)

wpi_t = C_0 + m_t - \alpha_1 y_t + \alpha_2 i_t

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.471a</td>
<td>.222</td>
<td>.197</td>
<td>2.07870</td>
</tr>
</tbody>
</table>

a. Predictors: (Constant), i, m, y
Again, the coefficients are statistically significant (at the 10% level), but this time all have the wrong sign. The R-square is again quite low, reflecting the importance of allowing differences across countries as each country has a unique economy and had a unique reaction to the crisis.

**Testing Open Economy Model**

In the main part of the paper, the open economy monetary model was not examined in much detail. The following is a test of that model.

I now compare each economy to the United States by using OLS to estimate

\[ p_t - p_t^* = \alpha_i + (m_t - m_t^*) - \alpha_1(y_t - y_t^*) + \alpha_2(i_t - i_t^*) \]

As argued above, the WPI is a better measure of the price level following a crisis, so that as the measure of price level will be used for both countries. For all data, the asterisk denotes data points from the United States. The others are specific to each country in the analysis.

**Results for emerging markets in an open economy**

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.938a</td>
<td>.881</td>
<td>.870</td>
<td>.11341</td>
</tr>
</tbody>
</table>

*a. Predictors: (Constant), thai, m, philip, i, kor, arg, mala, y*
The model still explains most of the variation in price level (see the high R-square value), this time with relative price levels. However, the coefficient for the GDP term is incorrectly signed. As before, the different country intercepts are large and statistically significant.

**Appendix B: Siregar and Rajaguru’s Model**

\[
\Delta p_t = (\Delta m_t^s) - (\Delta (m^d/p))
\]

where all variables are in logarithmic forms.

The base real money demand is a function of income \((y_t)\) and the domestic interest rate \((r_t)\). However, in an open economy, studies (Arango and Nadiri 1981, Girton and Roper 1981, Miles 1981, Bordo and Choudhri 1982, Cuddington 1983, Khalid 1999 and Sriram 2001) have shown that external factors are significant in the demand for money. Thus

\[
(m^d/p)_t = f(y_t, r_t, rf_t, ed_t),
\]
Where \((ed_t)\) is the expected depreciation rate of the local currency (it is negative if there was a depreciation last period), proxied by the actual depreciation in the previous period. Also, \((rf_t)\) is the foreign interest rate, proxied by the interest rate in the United States.

Substituting equation (2) into equation (1), we obtain an expression for domestic inflation:

\[
\Delta p_t = f(\Delta y_t, \Delta r_t, \Delta rf_t, \Delta ed_t, \Delta m_t^s) \quad (3)
\]

Still following from Siregar and Rajaguru (2005), the following first order conditions should hold.

\[
\frac{\partial \Delta p_t}{\partial \Delta ed_t} > 0 \quad (4)
\]

Holding other factors constant, a rise in \((ed_t)\) lowers money demand. Therefore the supply of money will be relatively higher than the demand so inflation will be expected to rise.

\[
\frac{\partial \Delta p_t}{\partial \Delta rf_t} > 0 \quad (5)
\]

A rise in the foreign interest rate will lower the demand for money as the cost of holding money rises. Like the case above, inflation is expected to rise.

\[
\frac{\partial \Delta p_t}{\partial \Delta y_t} < 0 \quad (6)
\]

A rise in income increases the demand for money. Since the money supply is being held constant, the demand for money will be relatively higher and the inflation rate should fall.

\[
\frac{\partial \Delta p_t}{\partial \Delta r_t} > 0 \quad (7)
\]

Like with the foreign interest rate, a higher domestic interest rate increases the cost of holding money, so the demand for money will fall, resulting in increased inflation.

\[
\frac{\partial \Delta p_t}{\partial \Delta rf_t} > 0 \quad (8)
\]
Increasing the money supply while holding other factors constant should lead to a higher inflation rate.

Our working model will be the following:

\[ \Delta p_t = a + \sum \alpha_i \Delta m_{s,t-i} + \sum \beta_i \Delta y_{t-i} + \sum \delta_i \Delta ed_{t-i} + \sum \theta_i \Delta r_{t-i} + \sum \gamma_i \Delta r_{f,t-i} + \epsilon_t \]

where \( \alpha, \beta, \delta, \theta, \) and \( \gamma \) are the coefficients on the money supply, income, expected devaluation, interest rate, and foreign interest rate terms, respectively. The expected signs of the coefficients are consistent with equations 4-8. Furthermore, \( a \) and \( \epsilon \) are a constant and an error term, respectively. As before, all variables are in the logarithm form.

Up to six lags of the dependent variables are included, and then subsequently the statistically insignificant lags are excluded. Due to the small time period which we are working with, monthly data will now be used instead of quarterly to ensure a sufficiently large sample size. Unfortunately, output data is not available on a monthly basis. Two sets of trials were run: one with monthly output data as estimated from the quarterly data, and another with output data completely excluded. In the trial with the estimated output data, the output and its lags were not significant, so they were dropped altogether.

The following tables report the results. Separate tests were run, using CPI and WPI as the dependent variables.
## Argentina Results (dependent variable = CPI)

### Model Summary

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>0.946*</td>
<td>0.894</td>
<td>0.867</td>
<td>0.0027768</td>
</tr>
</tbody>
</table>

*a. Predictors: (Constant), r4, rf, ms1, ms3, ed4, r1, r, r3, cpi1*

### Coefficients

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td>t</td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>0.003</td>
<td>0.001</td>
<td>3.269</td>
</tr>
<tr>
<td>rf</td>
<td>-0.15</td>
<td>0.007</td>
<td>-0.148</td>
<td>-2.141</td>
</tr>
<tr>
<td>r</td>
<td>0.07</td>
<td>0.003</td>
<td>0.156</td>
<td>2.024</td>
</tr>
<tr>
<td>ms1</td>
<td>0.072</td>
<td>0.013</td>
<td>0.344</td>
<td>5.606</td>
</tr>
<tr>
<td>r1</td>
<td>0.13</td>
<td>0.003</td>
<td>0.337</td>
<td>4.547</td>
</tr>
<tr>
<td>cpi1</td>
<td>0.248</td>
<td>0.096</td>
<td>0.292</td>
<td>2.593</td>
</tr>
<tr>
<td>ms3</td>
<td>0.049</td>
<td>0.013</td>
<td>0.220</td>
<td>3.671</td>
</tr>
<tr>
<td>r3</td>
<td>-0.005</td>
<td>0.003</td>
<td>-0.182</td>
<td>-1.735</td>
</tr>
<tr>
<td>ed4</td>
<td>0.039</td>
<td>0.009</td>
<td>0.455</td>
<td>4.151</td>
</tr>
<tr>
<td>r4</td>
<td>0.013</td>
<td>0.003</td>
<td>0.466</td>
<td>4.614</td>
</tr>
</tbody>
</table>

*a. Dependent Variable: cpi*

\[
\Delta p_t = .003 + .248\Delta p_{t-1} + .072\Delta M_{t-1} + .049\Delta M_{t-3} + .039ed_{t-4} + .007\Delta r_t \\
+ .013\Delta r_{t-1} - .005\Delta r_{t-3} + .013\Delta r_{t-4} - .015\Delta rf_t \\
(.001)** (.096)** (.013)*** (.013)*** (.009)*** (.003)**
\]

*Note: ( ) is standard error; *Significant at 10%, **Significant at 5%, ***Significant at 1%*
Argentina Results \textit{(dependent variable = WPI)}

\textbf{Model Summary}

<table>
<thead>
<tr>
<th>Model</th>
<th>R</th>
<th>R Square</th>
<th>Adjusted R Square</th>
<th>Std. Error of the Estimate</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>.930a</td>
<td>.865</td>
<td>.829</td>
<td>.0077608</td>
</tr>
</tbody>
</table>

\textit{a. Predictors: (Constant), wpi4, ms4, ed, ms, ms2, ms3, r, r3, ed3}

\textbf{Coefficients\textsuperscript{a}}

<table>
<thead>
<tr>
<th>Model</th>
<th>Unstandardized Coefficients</th>
<th>Standardized Coefficients</th>
<th>t</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>B</td>
<td>Std. Error</td>
<td>Beta</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>(Constant)</td>
<td>-.002</td>
<td>.003</td>
<td>-.571</td>
</tr>
<tr>
<td></td>
<td>ed</td>
<td>.151</td>
<td>.052</td>
<td>.233</td>
</tr>
<tr>
<td></td>
<td>ms</td>
<td>.076</td>
<td>.036</td>
<td>.148</td>
</tr>
<tr>
<td></td>
<td>r</td>
<td>.017</td>
<td>.008</td>
<td>.170</td>
</tr>
<tr>
<td></td>
<td>ms2</td>
<td>.091</td>
<td>.039</td>
<td>.164</td>
</tr>
<tr>
<td></td>
<td>ed3</td>
<td>.102</td>
<td>.031</td>
<td>.358</td>
</tr>
<tr>
<td></td>
<td>ms3</td>
<td>.118</td>
<td>.038</td>
<td>.216</td>
</tr>
<tr>
<td></td>
<td>r3</td>
<td>.024</td>
<td>.006</td>
<td>.355</td>
</tr>
<tr>
<td></td>
<td>ms4</td>
<td>.082</td>
<td>.036</td>
<td>.172</td>
</tr>
<tr>
<td></td>
<td>wpi4</td>
<td>.182</td>
<td>.053</td>
<td>.396</td>
</tr>
</tbody>
</table>

\textit{a. Dependent Variable: wpi}

\[ \Delta p_t = .182\Delta p_{t-4} + .076\Delta M^e_{t} + .091\Delta M^e_{t-2} + .118\Delta M^e_{t-3} + 082\Delta M^e_{t-4} + 151ed_t + .102ed_{t-3} + .017\Delta r_t + .024\Delta r_{t-3} \]

\[ (.053)** (.036)** (.039)** (.038)** (.082)** (.052)***(.031)***(.008)***(.006)**

A discussion of the results is in the body of this paper.