Inflation, Inflation Uncertainty,
Political Instability, and Economic Growth

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Abstract

This paper uses a new data set that better measures inflation uncertainty to investigate the effects of inflation and inflation uncertainty on economic growth. In the cross section of forty-four countries that the new data allows, inflation uncertainty has a significant negative impact on economic growth. Uncertainty performs better than inflation crisis as an explanatory variable of economic growth. However, the improved measure does not overcome the multicollinearity problem between inflation and inflation uncertainty. More importantly, measures of political instability dominate inflation and inflation crisis, in the sense of a Davidson-MacKinnon test. It thus appears that in this data set political instability accounts for the negative effect of inflation on economic growth. The evidence against an independent effect from inflation uncertainty is relatively weak.
Fischer (1993) and Barro (1995) presented evidence of a significant negative relationship between inflation and economic growth. However, the source of the negative relationship remains a subject of dispute. Fischer argues that inflation proxies for generally poor policy. Sala-i-Martin (1991) suggests that the role of inflation may be created by spurious correlation arising from an omitted variable. For example, high inflation uncertainty may be the cause of slow growth, but the high cross-country correlation between inflation and inflation uncertainty may cloud the true underlying relationship. More generally, he argues that inflation may proxy for government failures that are to blame for the sluggish growth. In this paper we investigate these conjectures about the nature of the effect of inflation on economic growth, and focus on the possibility that political instability lies behind the inflation-growth nexus.

Political instability may directly disrupt production or may hamper growth by threatening property rights that are essential to material progress. Since Barro (1991), the number of revolutions and coups per year has been a standard variable in growth equations to capture this effect. More such disruptions tend to lower growth. Alesina, Ozler, Roubini, and Swagel (1992) and Mauro (1995) using different measures and methods also find that political instability retards economic growth.

Cuikerman, Edwards, and Tabellini (1992) (hereafter CET) argue that politically unstable countries are prone to high inflation. In the CET model, a high probability of a political regime shift dissuades the incumbent government from investing in the infrastructure necessary to collect income taxes. Instead, the incumbents will rely on seigniorage. Davis and Kanago (1996) argue that in the CET setting a more unstable government causes greater inflation uncertainty. Cuikerman and Meltzer (1986) make a similar point from a different perspective. In their model, political instability refers to changes in the preferences of the Central Bank, and preferences that change more frequently cause both higher and more uncertain money growth. In short, political instability may generate both high and uncertain inflation. So, inflation uncertainty and inflation may be significant in growth regressions only because they proxy for political instability.

Earlier studies of the effect of inflation uncertainty on economic growth used the sample standard deviation of inflation as the measure of inflation uncertainty. This measure implies that the expected rate of inflation over the period was constant and equal to the sample mean. This simplification was forced by the absence of survey data and the cost of constructing a regression
based measure of expected inflation for each country; and amounts to replacing uncertainty with variability. We have compiled from the pages of *Business Asia*, *Business Europe*, and *Business Latin America* annual forecasts of inflation for a cross section of 44 countries which allow us to construct a standard deviation of inflation that is a measure of uncertainty. We use this measure below to study the effects of inflation and inflation uncertainty on growth.

We find that when our measure of inflation uncertainty alone is added to a typical growth equation, it exerts a significant negative influence on growth. This is consistent with earlier studies that used variability. Also like earlier studies, the effect of inflation uncertainty is not robust.\(^1\) Once inflation is also included in the regression, inflation uncertainty no longer affects growth, but neither does inflation. Bruno and Easterly (1995) argue that times of inflation crisis, inflation episodes that equal or exceed 40% per year for two consecutive years, may be the cause of low growth rather than the inflation itself. In our sample, inflation uncertainty retains its explanatory power once a dummy variable that identifies inflation crisis countries is included in the regression, but the crisis dummy is no longer significant. So, our measure of inflation uncertainty contains more information than does inflation crisis. However, it does not overcome the collinearity problem with inflation.

We then include both political instability and an inflation measure in a standard growth equation. In these equations inflation and inflation crisis lose their significance, while the instability measure maintains its significance. Instability also performs better than inflation uncertainty, but the evidence in favor of instability over inflation uncertainty is weaker than it is for the other two inflation variables. This holds for the political instability measure developed by Edwards and Tabellini (1991) and the recent measure used by Mauro (1995). The results are different for revolutions and coups. Revolutions and coups contain more information than inflation crisis, but the same information as inflation or inflation uncertainty.

In the next section we describe the data. In Section 3 we first discuss the basic growth equation and then the results for each of the political variables. We compare the political measures in Section 4. We discuss some issues concerning our results in Section 5, and conclude in Section 6.

\(^1\) See, for example, Levine and Zervos (1993).
2. The Data

Our data on inflation forecasts come from the pages of *Business Latin America*, *Business Asia*, and *Business Europe*. These periodicals have provided annual inflation forecasts for a large set of countries for the last twenty to twenty-five years. The forecasts have generally been given in one of the late December or early January issues. Frequently the forecasts are point estimates. However, sometimes they are given as ranges, sometimes with delimiters such as above, below, nearly, or at least; and sometimes with just a qualitative statement like higher than last year, continued triple digit, or not likely to fall. When ranges are given we use the midpoint. Other cases, where no forecast is given, or where only some qualitative statement such as much higher than last year are counted as missing observations. We make no attempt to adjust for higher or lower than forecasts.

The calculation of a forecast error requires a measure of actual inflation and there are various ways of calculating annual inflation rates. One can use either the percentage change in the price index or the change in the logarithm of the price index. From correspondence with the editors of the Business periodicals, we concluded that the percentage rates of change are used. Timing is also an issue. The inflation rate may be calculated as the percentage change between the annual averages of monthly values, the fourth quarter rates, or the December values. From our correspondence and from comparing the actual rates occasionally reported along with the forecasts, we concluded that the *Business Europe* and *Business Asia* forecasts are fourth quarter to fourth quarter. *Business Latin America* uses December to December forecasts. As much as possible, we use actual inflation rates based on index numbers reported not long after the forecast had ended. That is, we avoid using revised indices which might not bear a close resemblance to what was forecast.\(^2\)

We use the squared forecast errors from 1969 to 1988 derived from this data to calculate the standard deviation over the sample period. We have argued elsewhere that the raw variance or

\(^2\) Details on this data and analysis of the relationship between inflation and inflation uncertainty for this data can be found in Davis and Kanago (1995). To summarize briefly, this data set reinforces several important stylized facts about inflation and inflation uncertainty. Most importantly for this paper, there is a strong positive cross-country correlation between inflation and inflation uncertainty. There is also a positive correlation within about half the countries between inflation uncertainty and concurrent inflation. However, in only a few countries does high inflation in the current period portend high inflation uncertainty in the next period.
standard deviation is not the correct measure of inflation uncertainty. Instead, we suggest that the appropriate measure is the standard deviation of inflation divided by the gross expected rate of inflation, and we call this measure real or relative uncertainty. We use this measure below, but our results also hold for the unadjusted standard deviation.

We use three political instability measures. Edwards and Tabellini measure the frequency of regime shifts from 1971 to 1982. They record a change in the governing party, as opposed to any change in political leadership. So, for example, when a president is succeeded by a member of the same party, no change in government would be recorded. This measure is a measure of the instability of the political system. We also use the measure of political stability compiled and described by Mauro (1995). This measure elicits the responses of Business Intelligence analysts and correspondents on a scale of 0 to 10 on the country's political stability. Political stability is defined by "Conduct of political activity, both organized and individual, and the degree to which the orderly political process tends to disintegrate or become violent." A score of 10 indicates a high degree of stability, while a score of 0 indicates instability. Mauro reports, and we use, the average of this index for the four years 1980 to 1983. We also use the revolution and coups variable from Barro (1991). This is the average number of revolutions and coups per year in the country from 1970 to 1985.

Bruno and Easterly (1995) identify twenty-six countries who suffered one or more inflation crises over the past forty years. Our data on inflation expectations, which begins in the late sixties for most of the countries and ends in 1988, includes forty-four countries, eight of which experienced a crisis. These eight are: Argentina, Bolivia, Brazil, Chile, Costa Rica, Mexico, Peru, and Uruguay. Ecuador began a crisis period in 1988, but since this coincides with the last year in our sample, we did not mark it as a crisis country. The data for output growth rates and levels of real-per-capita GDP come from Fischer (1993) and from Summer and Heston (1991). Secondary school enrollments and revolutions and coups were kindly provided to us by Ross Levine.

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4 The gross expected rate of inflation is one plus the expected rate of inflation. Earlier authors, for example Vroman (1989) and Emery (1993), suggested that the coefficient of variation of inflation was a better measure than the standard deviation. However, our work shows that it is relative uncertainty, not the coefficient of variation that is appropriate.
3. The Results

a. the methodology

We organize our investigation as a specification test. The class of models that we consider are given by

model 1: \( \text{growth} = a_0 + a_1 \text{standard variables} + a_2 \text{inflation variable} + \text{error term} \)

model 2: \( \text{growth} = b_0 + b_1 \text{standard variables} + b_2 \text{political variable} + \text{error term} \)

The three inflation variables provide three variants of model 1. Each variant of model 1 is compared to three variants of model 2 that we create by employing the three different political variables. To compare models, we use the Davidson-MacKinnon J-test.\(^5\) This test is run by combining the two models into one. For example, to compare a variant of model 1 against a variant of model 2 we estimate the combined model

model 3: \( \text{growth} = c_0 + c_1 \text{standard variables} + c_2 \text{inflation variable} + c_3 \text{political variable} + \text{error term}. \)

The Davidson-MacKinnon J-test in this setting is just a t-test of the coefficient estimates of \( c_2 \) and \( c_3 \). If the estimate of \( c_2 \) is significant, but the estimate of \( c_3 \) is not; we say that model 1 is acceptable, but model 2 is not. If the estimate of \( c_3 \) is significant, while the other is not; we say that model 2 is acceptable, but model 1 is not. It is possible that neither or both of the models will be acceptable. In effect, we are testing whether or not the information in or explanatory power of one variable dominates that of another.

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\(^5\) See Davidson and MacKinnon (1981) or, for a textbook discussion, see Maddala (1992).
b. the basic growth equation

In the broad sample of countries covered by the Summer-Heston data, a bivariate regression of growth on initial income does not perform well. The now standard scatter diagram reveals no correlation between initial income and subsequent growth. This result is known as non-convergence; poor countries do not appear to catch-up or converge with rich countries. The inclusion of secondary or primary school enrollments improves matters. The enrollments variable itself is significant with the expected positive sign, and once this measure is included in the regression, the coefficient on initial income is negative and significant. Those countries with low levels of initial income tend to grow faster than those countries with initially high income, and conditional convergence is said to hold. As a result, the basic growth equation regresses the percent change in real per capita GDP against the log of the level of initial per capita GDP and log of secondary school enrollments, or some other measure of human capital, or investment in human capital. These regressors are found in virtually all of the work since Barro (1991).

Our sample differs from the usual sample in two ways. Because of the availability of the forecast data, the sample includes only forty-four countries. Also as a result of data availability, the sample begins in 1969. These two differences in sample specification produce different results for the basic equation. In particular, convergence holds unconditionally. A simple bivariate regression of growth in real per capita GDP from 1969 to 1988 on the log level of per-capita real GDP in 1969, call it Y69, yields

\[
growth = 0.11 - 0.009(Y69) \\
(4.29) \quad (2.79)
\]

where t-statistics are in parentheses.

When primary school enrollments are included in the regression, convergence still holds, the coefficient on lagged income is still significant, but the coefficient on primary school

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6 See, for example, Barro (1991).

enrollments is not. When we include secondary school enrollments instead of primary enrollments, problems occur. The regression for this specification is

\[
\text{growth} = 0.09 - 0.007(Y69) - 0.002(\text{SECENROLL})
\]

\[
(2.15) \quad (1.23) \quad (0.59)
\]

Evidently, in our sample initial income and secondary school enrollments are highly correlated. A regression between the two yields an \( R^2 \) of 0.64 and this correlation produces a multicollinearity problem. We want to avoid contaminating the results on the variables of interest with noise or problems between the controls, so we include only the initial level of income and a constant as standard variables are found in each regression.

c. the results for the inflation variables

We first examine the effects of inflation, inflation uncertainty, and inflation crisis alone. These results are reported in Table 1. Consistent with earlier studies, inflation, inflation uncertainty, and inflation crisis separately have a negative and significant impact on economic growth. The fourth line in this table shows that our data does not overcome the multicollinearity problem between inflation and inflation uncertainty, and inflation and inflation crisis. This is so even though inflation uncertainty here is measured by real uncertainty. However, when real uncertainty and inflation crisis are included in the estimating equation, real uncertainty is significant, but inflation crisis is not. Real uncertainty contains more information about economic growth than does inflation crisis.
Table 1
Results for the Inflation Variables

<table>
<thead>
<tr>
<th>real uncertainty</th>
<th>inflation</th>
<th>inflation crisis</th>
<th>adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>-.024 (4.15)</td>
<td></td>
<td></td>
<td>0.23</td>
</tr>
<tr>
<td>-.03 (2.62)</td>
<td></td>
<td>-.013 (2.22)</td>
<td>0.20</td>
</tr>
<tr>
<td>-.005 (.24)</td>
<td>-.026 (.94)</td>
<td></td>
<td>0.21</td>
</tr>
<tr>
<td>-.016 (2.13)</td>
<td>-.007 (.95)</td>
<td></td>
<td>0.21</td>
</tr>
<tr>
<td>-.0003 (1.25)</td>
<td>-.0004 (.04)</td>
<td></td>
<td>0.21</td>
</tr>
</tbody>
</table>

Notes: t-statistics are in parentheses and were calculated using heteroscedastic-consistent standard errors.

d. the results for the Edwards-Tabellini measure

The E-T measure of political instability measures the number of regime shifts between 1971 and 1982, and the results for this measure are recorded in Table 2. When this measure is entered alone it has the expected negative coefficient and this coefficient is significant at the 5% level. An increase in political instability is associated with slower economic growth as in earlier studies.
Table 2

Results for the Edwards-Tabellini Measure of Political Instability

<table>
<thead>
<tr>
<th>real uncertainty</th>
<th>inflation</th>
<th>inflation crisis</th>
<th>political instability</th>
<th>adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>-.035 (2.29)</td>
<td>0.25</td>
</tr>
<tr>
<td>-.017 (1.66)</td>
<td></td>
<td>-.030 (1.95)</td>
<td>0.26</td>
<td></td>
</tr>
<tr>
<td>-.019 (1.19)</td>
<td></td>
<td>-.033 (2.25)</td>
<td>0.27</td>
<td></td>
</tr>
<tr>
<td></td>
<td>-.008 (1.46)</td>
<td>-.035 (2.42)</td>
<td>0.27</td>
<td></td>
</tr>
</tbody>
</table>

Notes: t-statistics are in parentheses and were calculated using heteroscedastic-consistent standard errors.

We now turn to the "horse race" between the inflation variables and the E-T measure of political instability. When inflation or inflation crisis is included with political instability, political instability clearly dominates. In the terminology of the J-test, for inflation and inflation crisis, Model 1 is unacceptable, but Model 2 is acceptable. The results are not as clear for real uncertainty. Political instability is significant at the 5% level, but real uncertainty is significant at the 10% level. We cannot comfortably conclude that political instability dominates real uncertainty or that either model is preferred to the other.

e. results for the Mauro measure

The results for the Mauro measure are reported in Table 3. Since this measure is a measure of political stability, as opposed to instability, we expect the estimated coefficient on this measure to be positive, and it is in each case. The results for this measure are similar to those for the Edwards-Tabellini measure. In particular, the inflation and inflation crisis variables remain insignificant, while the stability measure is significant. With the Mauro measure, Model 2 remains acceptable, while Model 1 is still not for inflation and inflation crisis. When real uncertainty is
included, the Mauro measure retains its significance, but the coefficient on real uncertainty is nearly so, significant at the 6% level. So we conclude again that political instability dominates two of the inflation variables, but perhaps not the third. Real uncertainty may have an effect independent of political instability.

### Table 3

Results for the Mauro-Measure of Political Stability

<table>
<thead>
<tr>
<th></th>
<th>inflation</th>
<th>real uncertainty</th>
<th>inflation crisis</th>
<th>political stability</th>
<th>adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-0.02</td>
<td>-0.02</td>
<td>.007</td>
<td>0.40</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.59)</td>
<td>(1.91)</td>
<td>(2.21)</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>.009</td>
<td>.008</td>
<td>.007</td>
<td>0.39</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(1.20)</td>
<td>(2.31)</td>
<td>(2.21)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Notes: t-statistics are in parentheses and were calculated using heteroscedastic-consistent standard errors

#### f. results for the revolution and coups measure

The results for the revolution and coups measure are given in Table 4. This variable does not appear to contain any more information than inflation or real uncertainty. When either of these variables is included in a regression with revolutions and coups, neither is significant, and for these two neither Model 1 nor Model 2 is acceptable. Model 1 with inflation crisis is also unacceptable, but, when paired with this alternative, Model 2 becomes acceptable. Revolutions and coups apparently contain different information with regard to economic growth than does inflation crisis.
Table 4
Results for the Revolution and Coups Measure

<table>
<thead>
<tr>
<th>inflation uncertainty</th>
<th>inflation crisis</th>
<th>revolutions and coups</th>
<th>adjusted R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>-0.019</td>
<td>-0.016</td>
<td>-0.016</td>
<td>0.25</td>
</tr>
<tr>
<td>(1.26)</td>
<td>(1.29)</td>
<td>(1.29)</td>
<td></td>
</tr>
<tr>
<td>-0.011</td>
<td>-0.018</td>
<td>-0.021</td>
<td>0.23</td>
</tr>
<tr>
<td>(0.82)</td>
<td>(1.12)</td>
<td>(2.31)</td>
<td></td>
</tr>
<tr>
<td>-0.009</td>
<td>-0.021</td>
<td>-0.021</td>
<td>0.26</td>
</tr>
<tr>
<td>(1.79)</td>
<td>(2.31)</td>
<td>(2.31)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: t-statistics are in parentheses and are calculated using heteroscedastic-consistent standard errors.

4. Which Measure of Political Instability Dominates?

We also ran the Davidson-MacKinnon J-test for the three measures of political instability. Above, we showed that each of the measures were individually significant. A regression which includes all three measures yields the result

\[
growth = 0.09 - 0.014(Y69) - 0.02(E-T) + 0.008 (Mauro) + 0.024 (Revs & Coups)
\]

(2.22) (2.54) (1.41) (2.62) (1.27)

where the t-statistics in parentheses use heteroscedastic-consistent standard errors. The Mauro measure dominates both the Edwards-Tabellini measure and number of revolutions and coups. The political instability measure with the most information is thus Mauro’s.

5. Discussion

The regressions considered above assume that there is no feedback from growth to inflation or political instability. This assumption has been criticized by, among others, Alesina et. al. because it is plausible that low growth leads to political instability thereby inducing a simultaneous equations bias into our results. Two considerations argue against this being a severe
problem. First, after jointly estimating political instability and growth, Alesina et. al. (p. 1) conclude that "Contemporaneous low economic growth is not found to increase the contemporaneous propensity of government change." In addition, CET find that consumption growth and inflation have an insignificant effect on the probability of government change so that there does not appear to be strong feedback from economic growth to either inflation or political instability.

Nevertheless, we attempted to find instruments for political instability in our sample, but were unsuccessful. In particular, we tried to use the ethnolinguistic fractionalization variable that Mauro employed, but for our sample, this variable is not highly correlated with either political variable. A regression of the Mauro measure on fractionalization yields an $R^2$ of less than .17, and instrumental variable estimation renders both the political variable and initial income insignificant. We also tried growth from 1960 to 1969 as an instrument, but this failed also.

6. Conclusion

In this paper we have investigated the possibility that the negative relationship between inflation and economic growth is spurious in the sense that it is driven by a third variable. The third variable employed here is political instability. We used three such measures: the frequency of governmental change, a survey measure used earlier by Mauro, and the number of revolutions and coups per year.

To control for possible direct negative effects on economic growth from increases in inflation uncertainty, we employed a new measure based on published forecasts. This measure captures inflation uncertainty better than earlier measures that typically relied on sample standard deviations or the results of a rolling regression. In our sample political instability dominates both inflation and inflation crisis as explanatory variables of economic growth. Political instability marginally dominates inflation uncertainty.
References


Davis, G. and Kanago, B. "High and Uncertain Inflation: Results From a New Data Set" unpublished manuscript, 1995.


