The Impact of Inflation on Financial Sector Performance*

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Abstract: A growing theoretical literature describes mechanisms whereby even predictable increases in the rate of inflation interfere with the ability of the financial sector to allocate resources effectively. This paper empirically assesses these predictions. The evidence indicates that there is a significant, and economically important, negative relationship between inflation and both banking sector development and equity market activity. Further, the relationship is nonlinear. As inflation rises, the marginal impact of inflation on banking lending activity and stock market development diminishes rapidly. Moreover, we find evidence of thresholds. For economies with inflation rates exceeding 15 percent, there is a discrete drop in financial sector performance. Finally, while the data indicate that more inflation is not matched by greater nominal equity returns in low-inflation countries, nominal stock returns move essentially one-for-one with marginal increases in inflation in high-inflation economies.

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1. Introduction

There is now a substantial body of evidence indicating that sustained—and, therefore, likely predictable—high rates of inflation can have adverse consequences either for an economy's long-run rate of real growth or for its long-run level of real activity.[1] This finding raises an obvious question. By what mechanisms can a perfectly understood and permanent increase in the inflation rate affect long-run real output?

A growing theoretical literature describes mechanisms whereby even predictable increases in the rate of inflation interfere with the ability of the financial sector to allocate resources effectively. More specifically, recent theories emphasize the importance of informational asymmetries in credit markets and demonstrate how increases in the rate of inflation adversely affect credit market frictions with negative repercussions for financial sector (both banks and equity market) performance and therefore long-run real activity [Huybens and Smith 1998, 1999]. The common feature of these theories is that there is an informational friction whose severity is endogenous. Given this feature, an increase in the rate of inflation drives down the real rate of return not just on money, but on assets in general. The implied reduction in real returns exacerbates credit market frictions.[2] Since these market frictions lead to the rationing of credit, credit rationing becomes more severe as inflation rises. As a result, the financial sector makes fewer loans, resource allocation is less efficient, and intermediary activity diminishes with adverse implications for capital investment. The reduction in capital formation negatively influences both long-run economic performance and equity market activity, where claims to capital ownership are traded [Huybens and Smith 1999 and Boyd and Smith 1996].

Existing models also emphasize that only when inflation exceeds certain "critical" rates do informational frictions necessarily play a substantial role. For example, in Azariadis and Smith (1996) or Boyd, Choi, and Smith (1997), when inflation is very low, credit market frictions may be "nonbinding," so that inflation does not distort the flow of information or interfere with resource allocation and growth. However, once the rate of inflation exceeds some threshold level, credit market frictions become binding, and there is a discrete drop in financial sector performance as credit rationing intensifies. These models further predict the existence of a second threshold rate of inflation. Once inflation exceeds this threshold, perfect foresight dynamics are associated with endogenous oscillation in all variables, so that inflation is highly correlated with inflation variability and asset return volatility.

Furthermore, related models suggest the existence of a third inflation threshold [Boyd and Smith 1998; Huybens and Smith 1998, 1999]. In some cases, once the rate of inflation exceeds this critical level, perfect foresight dynamics do not allow an economy to converge to a steady state displaying either an active financial system or a high level of real activity.[3] When this occurs, further increases in inflation have no additional detrimental effects on the financial system. Thus, in effect, these models imply that once the rate of inflation reaches a certain critical threshold, “all of the damage to the financial system has already been done.” Further increases in inflation will have no additional consequences for financial sector performance or economic growth.

Thus, the theoretical literature on credit market frictions, finance, and growth delivers empirically testable implications regarding the consequences of higher long-run or permanent rates of inflation.

1. Higher rates of inflation are associated with greater inflation and stock return variability.
2. Higher inflation implies less long-run financial activity. In economies with high inflation, intermediaries will lend less and allocate capital less effectively, and equity markets will be smaller and less liquid.
3. Several inflation thresholds may characterize the relationship between inflation and financial sector conditions. Most prominently, once inflation exceeds a critical level, incremental increases in the (long-run) rate of inflation may have no additional impact on financial sector activity.
4. Higher long-run inflation implies lower long-run levels of real activity and/or slower long-run growth rates.

This paper evaluates these theoretical predictions regarding the impact of predictable inflation on the financial system. We concentrate on the links between sustained inflation and financial sector performance because a large and growing literature already shows that the financial system influences long-run rates of economic growth. Thus, we employ data on inflation, banking sector activity, equity market size, equity market liquidity, and the rates of return on stocks for up to 100 countries over the period 1960–1995 (data permitting). Since the specific theoretical predictions that we study concern the consequences of different long-run rates of inflation, we primarily use data averaged over the entire period, so that we have one observation per country. We then examine the cross-sectional relationship between inflation and financial sector conditions. Aggregating the data enables us to focus on the long-run, as opposed to the cyclical relationship between inflation and financial sector activity. As described below, however, we also conduct a panel estimation to exploit the time-series dimension of the data and control for possible endogeneity and omitted variable bias associated with the pure cross-sectional estimator.

Methodologically, we also examine potential non-linearities in the data and we consider alternative theories regarding the relationship between inflation and financial sector performance. One alternative theory is a fiscal story: governments combine high inflation with various restrictions on the financial sector to help fund expenditures.[4] As a result, they have both poorly developed financial systems and high inflation. A second story is a purely passive one: higher growth (whose sources may be sought elsewhere) implies lower inflation, ceteris paribus. If financial services are a normal good, higher real activity also implies that rapidly growing economies have more rapidly developing financial systems than slower growing economies. Hence, when viewed over long periods, there may be a negative relationship between inflation and financial development from this source alone.

Consequently, we regress each of our measures of financial sector conditions on inflation plus a conditioning information set selected to control for other theories of the finance-inflation relationship. Specifically, we include a measure of fiscal conditions (to control for the degree of government temptation to engage in financial repression), and a set of variables designed to control for economic development and other factors influencing financial sector development. Further, in some econometric specifications, we allow for non-linearities in the relationship between financial sector performance and inflation. In one specification, we examine threshold relationships by allowing (a) the intercept in the finance-inflation relationship to shift once inflation exceeds some threshold rate and (b) the slope of the finance-inflation relationship to change also. In a second specification, we transform the data to allow for non-linearities that are not characterized by discrete thresholds.

The results we obtain are as follows:

(1) At low-to-moderate rates of inflation, there is a strong negative association between inflation and (a) lending by the financial sector to the private sector, (b) the quantity of bank assets, and (c) the volume of liabilities issued by banks.

(2) At low-to-moderate rates of inflation, there is a pronounced inverse relationship between inflation and

measures of stock market liquidity and trading volume. There is a robust positive relationship between inflation and stock return volatility.[5]

(3) The data strongly support the presence of a nonlinear relationship between inflation and financial sector performance, perhaps driven by threshold rates of inflation. As inflation rises, financial sector performance falls, but the marginal impact of additional inflation on the financial sector also diminishes rapidly. Thus, for example, we find that once the average rate of inflation exceeds 15 percent per year, financial sector performance drops precipitously, but at the same time, the partial correlation between inflation and measures of intermediary or equity market activity essentially disappears.

(4) The data support the presence of a nonlinear relationship between inflation and nominal equity returns. Again, this non-linearity may be driven by threshold rates of inflation. For example, we find that for economies with average rates of inflation below 15 percent per year, *nominal* equity returns are approximately uncorrelated with inflation. For economies with inflation rates above this threshold, however, inflation and nominal equity returns vary essentially one-for-one.[6]

Based on pure cross-sectional regressions, this paper's findings are consistent with models that emphasize that predictable inflation can exacerbate informational frictions and impede financial sector performance with negative repercussions for economic activity. Since past work demonstrates that the functioning of banks and equity markets can materially affect long-run economic growth, this paper focuses only on the relationship between sustained inflation and the functioning of banks and equity markets.[7] Thus, its main contribution is to elucidate the impact of sustained inflation rates on financial sector performance. To assess the confidence with which we can make this causal statement, we augment our cross-sectional investigation with an alternative estimation strategy.

More specifically, we also employ a dynamic-panel, Generalized-Method-of-Moments (GMM) estimator proposed by Arellano and Bover (1995) and Blundell and Bond (1997). While the cross-sectional methods are standard ones for looking at long-run relationships, they also have various shortcomings. Purely cross-sectional analyses do not (1) exploit the time-series dimension of the data, (2) control for potential simultaneity bias, or (3) control for country-specific effects, which may induce omitted variable bias. The panel-GMM estimator confronts each of these issues.

Using the panel-GMM estimator, our findings are completely unaltered. For countries with low-to-moderate rates of inflation, there is a very strong negative association between inflation and financial intermediary development. Furthermore, as inflation rates rise, the partial correlation between inflation and intermediary activity falls. These results are again very supportive of the theoretical predictions outlined above and thereby illuminate one mechanism via which predictable increases in the inflation rate interfere with resource allocation and economic growth.

The remainder of the paper proceeds as follows. Section 2 describes the data, and presents simple correlations. Section 3 undertakes a formal analysis of these correlations, controlling for a number of factors that might affect both the rate of inflation, and the development of the financial system. Section 4 evaluates the sensitivity of our cross-sectional analyses to changes in the sample of countries, sample period, conditioning information set, and estimation technique. Here, we use the system, dynamic-panel GMM estimator to control for potential biases induced by country-specific effects and endogeneity. Section 5 offers some concluding remarks.

2. Data and Summary Statistics

To investigate the inflation-finance relationship, we use two datasets based on longitudinal availability.

2.1. Banking Data Set: 1960–1995

The "banking data set" focuses on measures of banking development. It covers the period 1960–1995. There is a maximum of 97 countries, though most of the analysis focuses on 65 countries.[8] We present results on three measures of financial intermediary development.

LIQUID LIABILITIES is the ratio of liquid liabilities of the financial sector (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) to *GDP*.[9] This indicator measures the overall size of the formal financial intermediary sector, and has been found to be very strongly associated with both the level and rate of change of real per capital *GDP* (King and Levine 1993a,b, c).

An alternative measure is *BANK ASSETS,* which is the ratio of total assets of "deposit money banks" (commercial banks and other deposit taking banks) divided by *GDP*.[10] This variable measures the importance of deposit money banks, as reflected in their total assets, relative to the economy. Both LIQUID LIABILITIES and

BANK ASSETS are expressed as a percent of GDP.[11] *LIQUID LIABILITIES* and *BANK ASSETS* are size measures and do not consider the allocation of capital between the private and public sectors.

Finally, our preferred financial intermediary development measure is PRIVATE CREDIT. This measure equals banking institution credits to the private sector as a percent of GDP.[12] Thus, PRIVATE CREDIT is not merely a measure of size. It isolates credits to the private sector and excludes credits issued to the government, government agencies, and public enterprises. This measure of financial development has been found to exert a causal impact on economic growth (Levine, Loayza, and Beck 2000).[13]

For inflation (*PI*), we compute an Ordinary Least Squares (OLS) measure of average inflation from the CPI data. Our results are unaltered when we compute the inflation rate using simple logarithmic differences. [14]

Table 1.A. presents correlations over the period 1960–1995. All three of the financial development indicators are negatively and significantly correlated with inflation at the one-percent confidence level. All the financial variables are positively and significantly correlated with each other at high confidence levels.

Table 1.B. presents means and medians after sorting by inflation and creating quartile groups. The first noteworthy feature is that the inflation rate in the highest inflation quartile dramatically exceeds that in the rest of the sample. The second noteworthy feature is that as inflation rises across quartiles, the three banking sector performance measures tend to fall, and often decline very substantially. Note, however, that most of the "action" occurs at the extremes—in the sense that the two middle quartile groupings differ substantially from the lowest and highest inflation quartiles. The second and third quartiles, however, do not exhibit much difference in banking development, suggesting that the finance-inflation relationship may be nonlinear.

2.2. Stock Market Data Set: 1970–1995

The "stock market data set" covers the period 1970–95, includes data on a maximum of 49 countries, and incorporates five financial performance measures.[15] Except where specifically indicated stock market data were obtained from the International Finance Corporation's *Emerging Markets DataBase.*

MCAP equals the value of listed domestic company shares on each country's major stock exchanges as a percent of *GDP*. *MCAP* measures the overall size of markets. Analysts frequently use this as an indicator of stock market development, although of course *MCAP* does not measure stock market activity, but merely the value of listed shares. While positively associated with the level of economic development (Demirguc-Kunt and Levine 1996), *MCAP* is not robustly linked to economic growth (Levine and Zervos 1998).

VALUE TRADED equals the total value of domestic equities traded on each country's major stock exchanges as a percent of *GDP*. The total value traded ratio measures the organized trading of equities as a share of national output. *VALUE TRADED* complements the market capitalization ratio (*MCAP*) because *VALUE TRADED* reflects the actual volume of market transactions along with the overall size of the market.

TURNOVER equals the total value of domestic shares traded (times 100) divided by the total value of domestic shares (that is, *VALUE TRADED**100/MCAP*). Thus, *TURNOVER* measures trading volume relative to the size of the market. Both *VALUE TRADED* and *TURNOVER* are frequently used as indicators of market liquidity—the ability to trade equities easily. The measures complement one another since *VALUE TRADED* measures trading relative to the size of the economy and *TURNOVER* measures trading relative to the size of the market. Both *VALUE TRADED* and *TURNOVER* are very highly correlated with the level of real per capita *GDP* as well as its rate of growth (Demirguc-Kunt and Levine 1996 and Levine and Zervos 1998).

VOLATILITY is a measure of stock market volatility and is computed as a twelve-month rolling standard deviation estimate that is based on market returns. We cleanse the return series of monthly means and twelve months of autocorrelations following the procedure defined by Schwert (1989). We then multiply this by 100 to make it comparable with the other variables.

Finally, *EQUITY RETURNS* is the rate of growth of the nominal stock market price index for each country. Thus, this measures the nominal rate of return (excluding dividends) from holding the index portfolio of each country's major stock exchange. We then multiply this by 100 to make it comparable with the other variables.

Table 2 presents correlations among the stock market variables and inflation. Stock return volatility is positively and highly significantly correlated with inflation. Although MCAP, VALUE TRADED, AND TURNOVER are negatively correlated with inflation, these simple correlations are not significant at the 0.05 level. Nominal stock returns are strongly positively correlated with inflation, with a correlation coefficient of 0.97. However, we will show below that both the weak simple correlations between stock market activity and inflation and the strong correlation between inflation and nominal equity returns mask a richer and more interesting pattern of relationships.

Table 2.B. presents means and medians after the data have been sorted by inflation and broken into quartiles. The lowest inflation quartile of countries clearly has both the largest and the most liquid stock markets. The highest inflation quartile of countries clearly has the smallest and least liquid stock markets. The most substantial differences in the degree of equity market development, however, are between the lowest inflation quartiles, and all the others. As with the banking development indicators, there is evidence of a negative correlation between inflation and equity market activity, and evidence of non-linearities in the empirical relationships. Finally, note that the nominal equity returns – and nominal equity return volatility – differ very little across the three lowest inflation quartiles. However, both are notably large in the highest inflation quartile.

3. Regressions: Inflation and Financial Market Development

Our preliminary examination suggests a negative relationship between inflation and both banking and equity market development. It also appears that the relationships might be nonlinear. To further explore the empirical association between inflation and financial development, we estimate three types of regressions. First, we use simple linear regressions that control for other economic factors that may be associated with financial development to gauge the independent partial correlation between financial development and inflation. Second, we allow for breaks—discrete changes in the slopes and intercepts—in the relationship between inflation and financial development. Such breaks might occur if there are threshold affects associated with the rate of inflation exceeding some critical level. Third, we repeat the first set of regressions replacing the inflation rate with two simple nonlinear transformations of inflation—specifically, the inverse inflation rate and the exponential function of the inflation rate—in order to see if these nonlinear specifications better describe the data.

3.1. Banks: Simple Linear Regressions

Table 3 presents regression results when the dependent variable is one of the three financial development indicators. To assess the strength of the partial correlation between these financial development indicators and inflation, we include other variables in the regressions that might be expected to be associated with financial development or with the rate of inflation. Many theoretical analyses (for example, Greenwood and Jovanovic 1990, or Greenwood and Smith 1996) suggest that the level of economic activity may affect financial market development, and clearly it could also affect the rate of inflation. Consequently, we include two variables that are frequently used in cross-country regressions to control for the level of development: the logarithm of initial (1960) real per capita GDP (*INCOME)*), and the logarithm of initial secondary school enrollment (*SCHOOL*). Also, political risk and corruption may affect both the level of financial development (LaPorta, Lopez-de-Silanes, Shleifer, and Vishny 1998) and the rate of inflation. To control for political factors that might affect market stability, we include a measure of the number of revolutions and coups (*REVOLUTION*). Controlling for corruption yields similar results. Furthermore, various trade and price distortions—other than inflation—may affect the willingness of agents to engage in financial contracting. Consequently, we include the average black market exchange rate premium (*BLACK MARKET*) as a general indicator of price, trade, and exchange rate distortions.[16] Finally, inflation and financial development may be negatively correlated only because both are correlated with fiscal policy, as noted in the introduction. To control for this possibility, we included the ratio of central government expenditure to *GDP* (*GOV*) as an additional explanatory variable in equation (1).[17] Thus, Table 3 presents parameter estimates from the following regression:

(1) Financial Development Indicator = ***a*** + **b***INCOME* + **c***SCHOOL* + **d***REVOLUTION* + **e***BLACK MARKET* + **f***GOV* + **g***PI* + *u*,

where *u* is the residual and *a, b, c, d, e, f,* and *g* are estimated regression coefficients. All tables report White's (1980) heteroskedasticity-consistent *t*-statistics.

As indicated in Table 3, there is a statistically significant negative relationship between inflation and all of the banking sector development indicators. All are significantly negatively associated with inflation after controlling for the level of economic development, political stability, the black market exchange rate premium, and fiscal policy. To assess the economic magnitude of the inflation coefficient, consider an increase in the inflation rate by its sample median value of nine percent. The coefficient estimates in Table 3, then, suggest that *PRIVATE CREDIT* falls by 2.8 percent, which is only 12 percent of the sample median value of *PRIVATE CREDIT* (24 percent). Inflation affects the other financial development measures in a similar fashion.[18]

Figure 1 bolsters the earlier argument that the inflation-finance relationship is nonlinear. Figure 1 presents the partial scatter diagram of *PRIVATE CREDIT* against inflation controlling for the other right-hand-side variables.[19] Thus, Figure 1 allows us to assess whether there is a linear relationship between inflation and financial development, after controlling for the other factors. In fact, the figure strongly suggests that relationship is not a simple linear one. We now proceed to investigate in more detail the nature of these non-linearities.

3.2. Banks: Threshold Regressions

As discussed in the Introduction, some theoretical models predict that there are threshold effects associated with the rate of inflation exceeding some "critical" level: the finance-inflation relationship may differ depending upon whether or not the rate of inflation lies below or above some value.[20] We now allow both the slope and the intercept in equation (1) to differ at high and low rates of inflation. Let the dummy variable *HIPIXX* equal 1 if inflation is greater than a critical value, XX,and zero otherwise. We then estimate the equation:

(2) $$\text{Financial Development Indicator} = \boldsymbol{a} + \mathbf{b}INCOME + \mathbf{c}SCHOOL + \mathbf{d}REVOLUTION + \mathbf{e}BLACK\ MARKET + \mathbf{f}GOV + \mathbf{g}PI + \mathbf{h}HIPIXX + \mathbf{i}[(PI)*HIPIXX] + u.$$

Thus, if inflation is greater than *XX*, the intercept is (*a*+*h*), while if inflation is less than *XX* the intercept is (*a*). Similarly, if inflation is greater than *XX*, the coefficient on inflation is (*g*+*i*), while the slope is *g* if inflation is less than *XX*. Estimating these "threshold" regressions allows us to examine whether there is an important change in the finance-inflation relationship as inflation exceeds some "critical level" (*XX*).[21] While Bruno and Easterly identify 40 percent inflation as a critical inflation rate, they focus on inflation crises with a median duration of six years. We are examining a much longer period, 35 years, and very few countries had average annual inflation rates of greater than 40 percent for this period. Thus, we experimented with critical values ranging from 7.5 percent to 40 percent inflation rates. These different thresholds produce qualitatively similar results. In Table 3, we report the results using a critical value of 15 percent inflation, so that countries with inflation rates averaging more than 15 percent per annum over the 1960–95 period are classified as "*HIPI*15" countries.[22, 23]

Table 3.B. shows that allowing for a discrete break better captures the finance-inflation relationship than does a simple linear regression. Inflation is negatively associated with all of the financial development indicators in countries with inflation rates of less than 15 percent, and is significantly negatively correlated with *BANK ASSETS* and *PRIVATE CREDIT* at the 5 percent level. Moreover, the economic magnitude of the finance-inflation relationship is now much larger than in the linear specification. Using the same conceptual experiment as before, an increase in inflation by the median value (9 percent), in a "low inflation" country, is now associated with a 26 percent fall in the measure of financial depth, *PRIVATE CREDIT*, which is about the sample median value of *PRIVATE CREDIT* (24 percent). Thus, after allowing for threshold effects, the marginal impact of inflation on financial development is much greater in countries with rates of inflation below the threshold level.

Furthermore, in countries with high inflation rates — that is, in countries with rates of inflation exceeding the threshold — the partial correlation between inflation and financial development essentially disappears. In particular, note that the sum of the regression coefficients on *PI* and *PIHIPI*15 in Table 3 always approximately equals zero (that is, $g + i \approx 0$). Table 3 reports Wald *F* statistics testing the hypothesis that these coefficients do sum to zero, and the data do not reject this hypothesis at any reasonable significance level. This suggests that not only are there threshold effects in the relationship between inflation and financial development, but that once inflation exceeds this threshold, further increases do not further affect the financial system.

The data also illustrate that countries with inflation rates in excess of the threshold rate of inflation have substantially lower financial development. For instance, the coefficient on the *HIPI*15 dummy variable is -42 percent in the *PRIVATE CREDIT* regression, while the sample median for PRIVATE CREDIT is 24 percent. This represents additional evidence of a nonlinear relationship between financial development and inflation.

To summarize, there is evidence of a threshold in the inflation-finance relationship. At moderate inflation rates, there is a strong negative association between inflation and financial development. For countries whose rate of inflation is above some critical level, the estimated intercept of the banking development relation is much lower than it is for countries below the threshold. Moreover, in economies with rates of inflation exceeding this threshold, the partial correlation between inflation and financial activity essentially disappears.

3.3. Banks: Regressions Using A Nonlinear Transformation

Alternative functional forms also capture the notion that the finance-inflation relationship "flattens" at high inflation rates. To investigate an alternative, we replace the inflation rate with its inverse (*INVPI* = 1/*PI*) in equation (1). Table 3 presents the results of regressions using this simple nonlinear transformation.

The inverse of the inflation (*INVPI)* enters the *BANK ASSETS*, *LIQUID LIABILITIES,* and *PRIVATE CREDIT* equations positively and significantly. At higher initial inflation rates, a marginal increase in inflation has less of an impact on banking development. Figure 2 presents the partial scatter plot of *PRIVATE CREDIT,* against the inverse inflation rate. As shown, the nonlinear transformation of inflation has a much more consistent relationship with *PRIVATE CREDIT* than the linear specification graphed in Figure 1.

3.4. Markets: Simple Linear Regressions

We now repeat our empirical procedures using the equity market data set. Table 4 presents the results from regressing the five stock market performance indicators on inflation, plus the same set of control variables used with the banking dataset. First, <u>none</u> of the performance measures *MCAP*, *VALUE TRADED*, and *TURNOVER* is significantly related to inflation. Second, the volatility of equity returns (*VOLATILITY*) is positively and significantly associated with inflation. Finally, the association between nominal stock returns and inflation is statistically significant and economically large. A 10-percentage point increase in inflation is associated with a 13-percentage point increase in nominal stock returns.

3.5. Markets: Threshold Regressions

Table 4 shows that allowing for threshold levels of inflation dramatically improves the model's fit. Specifically, Table 4 reports the results of estimating equation (2) with a 15 percent inflation threshold for the various equity market variables.[24] Inflation now enters the *VALUE TRADED* regression with a negative, significant, and economically large coefficient. The coefficient implies that if inflation increases by its sample median of about 8 percent (while remaining below the threshold), then *VALUE TRADED* falls by about 19, which is large relative to the sample median of almost 14 percent. Similarly, the regressions indicate that inflation is significantly related to *TURNOVER*, at the 0.01 level, with a correspondingly large coefficient. In addition, the coefficients on *HIPI*15 indicate that, on average, countries with inflation rates in excess of 15 percent have discretely and significantly smaller intercept terms for *VALUE TRADED* and *TURNOVER* than do countries with lower rates of inflation. For stock market volatility (*VOLATILITY*), none of the inflation measures is statistically significant, suggesting that the linear relation in Table 4 is a better specification for this variable.

As in the banking regressions, the threshold regressions employing *VALUE TRADED* and *TURNOVER* indicate that the finance-inflation relationship flattens significantly at rates of inflation in excess of 15 percent. Indeed, in the *VALUE TRADED* and *TURNOVER* regressions we do not reject the hypothesis that the coefficients on *PI* and *PIHIPI*15 sum to zero. This suggests that once inflation exceeds 15 percent, further increases are not associated with significant further changes in stock market activity.

The threshold regression involving nominal equity returns offers an interesting contrast. For countries with average annual inflation rates of less than 15 percent, there is no significant relationship between the long-run rate of inflation and nominal equity returns. Once the rate of inflation exceeds 15 percent the intercept term declines: the coefficient on *HIPI*15 is large, negative, and statistically significant. However, for economies with rates of inflation already in excess of 15 percent, marginal increases in inflation are matched by even greater than one-for-one (1.36 = 0.98 + 0.38) increases in nominal stock returns. Past studies find that nominal equity returns are uncorrelated with inflation (see Amihud 1996 or Boudoukh and Richardson 1993, and the references they cite). Most such studies focus on economies with low rates of inflation (however see Amihud 1996 for one exception). Our results confirm this finding, but *only for low inflation countries*. For countries with sustained inflation rates in excess of 15 percent, nominal equity returns move closely with inflation.[25]

We conclude that there is evidence of both a negative correlation between inflation and equity market development, and of threshold effects in this relationship. Even in low inflation countries, marginal increases in inflation rates are associated with substantially less liquid stock markets. And high inflation economies (those with average inflation rates in excess of 15 percent) on average have significantly smaller and less liquid equity markets than their lower inflation counterparts. However, it is also the case that, in high inflation countries, incremental increases in the rate of inflation have only small incremental effects on stock market development. Finally, the relationship between nominal equity returns and inflation is almost a mirror image of the inflation-liquidity link. More inflation in a low-inflation environment is not matched by greater nominal equity returns. In high-inflation economies, however, equity returns move at least one-for-one with marginal increases in inflation rates.

3.6. Markets: Regressions Using A Nonlinear Transformation

The observation that the relationship between equity market development and inflation "flattens" as inflation rises can be captured in other ways. Again, as a specific possibility, we replace *PI* with its inverse (*INVPI* = 1/*PI*) in equation (1), and redo these regressions for the stock market size and liquidity variables (*MCAP*, *VALUE TRADED*, and *TURNOVER*). The estimated coefficients illustrate the nonlinear relationship that emerged from the threshold regressions. For example, the Table 4 coefficient estimates suggest that a permanent increase in the inflation rate from 5 percent to 6 percent will on average be associated with a fall in *VALUE TRADED* of 3.5 ($88/[5]^2\}*1$), where the mean value of *VALUE TRADED* is about 13. However, a permanent increase in the inflation rate from 20 percent to 21 percent will on average be associated with a fall in VALUE TRADED of only about 0.25 ($\{88/[20]^2\}*1$). Finally, consider a permanent increase in the inflation rate from 40 to 41 percent. In this case, the fall in VALUE TRADED is economically negligible, less than 0.06 ($\{88/[40]^2\}*1$), which is less than one-half of one percent of the mean value of VALUE TRADED. This clearly illustrates the "flattening" of the inflation-liquidity relationship.

4. Panel Estimation and Other Sensitivity Analyses

In this section, we examine the sensitivity of the results to changes in sample period, country sample, conditioning information set, measures of financial sector development, and econometric procedure.

4.1. Sensitivity Analyses

We tested for the potential effects of outliers on our results in two ways. First, we removed very high-inflation countries (countries with average annual inflation rates of greater than 100 percent) from the sample, and re-estimated all of the regressions. For the banking development data set, these countries included Argentina, Brazil, Bolivia, and Peru; for the stock market data set, these countries included Argentina, Brazil, and Sri Lanka. Omission of these countries did not materially affect our findings. Second, we tested for the affect of influential data points using the procedure suggested by Belsley et al. (1980), and described in Greene (1993, p. 287–288), using a critical value of 2.5. Our conclusions are unaffected by removing country observations that exert a large effect on each equation's residuals.

We also studied a much wider array of banking sector development measures than those reported above. We examined all of the measures constructed by King and Levine (1993a,b) and Levine and Zervos (1998).[26] We get the same kind of results with these alternative measures of banking sector development. Also, we considered alternative conditioning information sets in light of the work by Levine and Renelt (1992). We have used other measures of political instability and policy indicators without altering our conclusions.

We have re-done the regressions over different sub-periods without materially altering the results. For the banking variables, we re-did the analyses for each of the decades. For each sub-period the results are very similar to those for the entire sample, with the exception of the period 1960–69. During that decade, the empirical relationship between inflation and the banking development indicators is substantially attenuated. However, during the sixties the average rate of inflation in the *highest* inflation quartile was only about 14 percent. We regard this finding as confirming our results.[27] For the equity market data, we looked at the 1980s and 1990s as separate sub-periods. The results for each sub-period closely resemble those for the entire sample.

To further check for evidence of a non-linearities, we specified the econometric model in both quadratic and logarithmic forms. Those results also strongly indicate that there is a robust negative relationship between inflation and financial market performance and that the relationship is nonlinear: marginal increases in inflation are associated with much smaller declines in financial development at higher inflation rates.

4.2. Panel Estimation

In this section, we present the results of a panel estimator. The panel estimation (i) exploits the time-series (as well as the cross-section) dimension of our data set, (ii) controls for the possibility that there is an important country-specific variable inducing omitted variable bias, and (iii) accounts for the possibility that financial market performance and inflation are simultaneously determined variables. We conduct the analysis for the banking performance measures. We cannot conduct the panel estimation with the stock market data because not enough of the countries have sufficient observations. The panel consists of sixty-four countries over the period 1960–1995. We average data over five year non-overlapping periods so that, data permitting, there are seven observations per country and a sample size of 448. In the following, the subscript *t* therefore refers to one of these five-year periods.

Moving to a panel is a useful diagnostic tool in the current setting even though there are important conceptual problems with using data averaged over five-year periods. The theoretical predictions that we are assessing focus on the long-run relationship between inflation and financial sector performance. Thus, this paper seeks to abstract from shorter-run, business-cycle interactions between inflation and the financial sector. In moving to the panel, we compromise the length of the aggregation period in order to exploit the time-series nature of the data. Thus, while we use the panel procedure to evaluate the robustness of the cross-sectional results, we prefer the cross-section analysis since it is more precisely linked with the theories underlying our investigation. Nevertheless, the panel results confirm the cross-sectional findings.

We use the dynamic GMM estimator proposed by Arellano and Bover (1995) and described in this Journal by Levine, Loayza, and Beck (2000). Blundell and Bond (1997) show that this estimator reduces the inefficiencies and inconsistencies of alternative panel estimators (e.g., Arellano and Bond 1991).[28]

The consistency of the GMM estimator depends on (1) the validity of the instruments and (2) the assumption that the differenced error terms do not exhibit second order serial correlation. We use two tests proposed by Arellano and Bond (1991) to test these assumptions. The first is a Sargan test of over-identifying restrictions, which tests the overall validity of the instruments by analyzing the sample analog of the moment conditions used in the estimation procedure. The second test examines the assumption of no second-order serial correlation. Failure to reject the null hypotheses of both tests gives support to our estimation procedure.

The panel estimates confirm our findings: inflation exerts a strong negative impact on banking sector development. Specifically, Table 5.A. summarizes the panel estimates using the simple specification with the inflation rate included as a regressor. For brevity, we include only the coefficients on inflation along with the results of the specification tests.[29] While there is some attenuation of the coefficient estimates in moving from the pure cross-section regressions to the GMM panel estimates, the two sets of results are quite consistent with the earlier linear specification. Similarly, the GMM panel estimates also confirm our cross-sectional findings when using the inverse of the inflation rate.[30] Part B of Table 5 presents results where the inverse of the inflation rate (*INVPI*) is included as a regressor. Again, while there is some attenuation of the coefficient estimates relative to the pure cross-section estimates, the GMM panel estimates are consistent with our earlier finding that inflation exerts a strong impact on banking sector development, especially at low-to-moderate rates of inflation. Furthermore, the diagnostic tests indicate that our econometric specification and the assumption of no serial correlation in the white-noise error terms cannot be rejected.

5. Conclusions

Recent theoretical work stresses that predictable increases in inflation can intensify informational asymmetries, leading to less intermediary or equity market activity. Recent empirical work shows that a deterioration in financial sector performance has large, negative implications for economic growth. Theory further predicts that the inflation-finance relationship may exhibit strong non-linearities. For example, informational frictions may become binding only when inflation exceeds certain thresholds. When inflation passes these thresholds, some theories suggest that we will observe a corresponding collapse in financial system performance with adverse effects on resource allocation and economic activity. Since previous empirical work highlights the impact of financial sector development on economic growth, this paper focuses on empirically assessing these theoretical predictions regarding the impact of sustained inflation rates on financial sector performance.

The evidence indicates that there is a significant, and economically important, negative relationship between inflation and financial development. This correlation emerges essentially independently of the time period considered, the empirical procedure employed, or the set of variables that appear in the conditioning information set. It is also not sensitive to inclusion or exclusion of countries that have experienced extraordinarily high rates of inflation. Finally, the negative relationship between inflation and financial sector performance emerges even after controlling for simultaneity and omitted variable biases. Thus, a preponderance of evidence indicates that sustained inflation and financial sector performance display a strongly negative association.

Moreover, we have found that the empirical relationship between inflation and financial sector activity is highly nonlinear. For example, in low-inflation countries, the data indicate that more inflation is not matched by greater nominal equity returns. This finding is consistent with the theories outlined in the Introduction. In high-inflation economies, however, nominal stock returns move essentially one-for-one with marginal increases in inflation rates. In terms of banking and stock market development, the data also exhibit nonlinearities. Bank lending activity, bank liability issues, stock market size and liquidity display strong negative correlations with inflation, but only for countries with low-to-moderate rates of inflation. As inflation rises, the marginal impact of additional inflation on banking and stock market development diminishes rapidly. Furthermore, we find evidence of thresholds. The data suggest that for economies with annual inflation rates above about 15 percent, there is a large discrete drop in financial sector development relative to countries with inflation rates below this threshold. Since financial sector development is strongly linked with long-run economic performance, our findings are consistent with the view that as inflation – even predictable inflation – passes certain critical values, there will be negative implications for long-run economic performance.

Endnotes

1. For evidence on inflation and growth, see Barro (1995), Bruno and Easterly (1998), Bullard and Keating (1995), DeGregorio (1992), Fischer (1993), Levine and Renelt (1992), and Wynne (1993).

2. For example, lower real rates of return reduce agents' incentives to lend, and increase their incentives to borrow. Consequently, lower real returns can reduce the availability of credit and draw additional, lower quality borrowers into the pool of credit seekers. The diminished availability of funds and the erosion in the quality of the borrower pool increases the severity of credit market frictions.

3. In these cases the economy may converge to a steady state with an underdeveloped financial system or a low level of real activity.

4. See: Bencivenga and Smith (1992) Roubini and Sala-i-Martin (1992, 1995) or Chari, Jones, and Manuelli (1996).

5. The correlation between inflation and inflation variability is also extremely high (0.97).

6. Using time-series data for a few countries, many authors have noted that inflation and nominal equity returns are approximately uncorrelated. See, for instance, Amihud (1996), Boudoukh and Richardson (1993), Breen, Glosten, and Jagannathan (1989), Erb, Harvey, Viskanta (1995), and Jovanovic and Ueda (1996). To our knowledge we are the first to explore the cross-sectional relationship between average inflation and average equity returns, and we are the first to consider the possibility of inflation thresholds explicitly.

7. See: Beck, Levine, and Loayza (2000), Demirguc-Kunt and Maksimovic (1998), King and Levine (1993a,b,c), Levine (1998), Levine and Zervos (1998), Levine, Loayza, and Beck (2000), Rajan and Zingales (1998), and the review by Levine (1997).

8. The 97 countries in Banking data set are as follows: Argentina, Australia, Austria, Bahamas, Bangladesh, Barbados, Belgium, Bolivia, Botswana, Brazil, Burkina Faso, Burundi, Cameroon, Canada, Chile, Colombia, Congo, Costa Rica, Cote d'Ivoire, Cyprus, Denmark, Dominican Republic, Ecuador, Egypt, Arab Rep., El Salvador, Fiji, Finland, France, Gabon, Gambia, Germany, Ghana, Greece, Guatemala, Guyana, Haiti, Honduras, Iceland, India, Indonesia, Ireland, Israel, Italy, Jamaica, Japan, Jordan, Kenya, Korea, Republic of, Lesotho, Liberia, Luxembourg, Madagascar, Malaysia, Malta, Mauritius, Mexico, Morocco, Myanmar, Nepal, Netherlands, New Zealand, Niger, Nigeria, Norway, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Portugal, Rwanda, Senegal, Seychelles, Sierra Leone, Singapore, South Africa, Spain, Sri Lanka, St. Vincent and the Grenadines, Sudan, Suriname, Swaziland, Sweden, Switzerland, Syrian Arab Rep., Taiwan, Tanzania, Thailand, Togo, Trinidad and Tobago, United Kingdom, United States, Uruguay, Venezuela, Zaire, Zimbabwe.

9. *IFS* line 551, or *IFS* lines 34+35 if 551 is unavailable. GDP is obtained from *IFS* line 99b. Also, note that nonbank financial intermediaries include saving banks, postal saving institutions, and finance companies.

10. Total assets are from IFS lines 22a-d.

11. If a country's liquid liabilities equals its GDP, then LIQUID LIABILITIES has a value of 100.

12. The credit data are from *IFS* lines 22d + 42d.

13. This paper is more careful than past studies in deflating financial development measures. While financial balance sheet items are measured at the end of the year, GDP is measured over the year. Some authors partially correct this problem by using an average of balance sheet items in year t and t-1 and dividing by GDP in year t (e.g., King and Levine 1993a,b,c). This, however, does not fully resolve distortions, especially in highly inflationary environments. This

paper first deflates end-of-year financial balance sheet items by end-of-year consumer price indices (CPI, IFS line 64). Second, we compute the average of the real financial balance sheet items in year t and t-1. Third, we deflate the GDP series by the annual CPI deflator. Finally, we divide the average of the real financial balance sheet items in year t and t-1 by the real GDP value measured in year t.

14. Specifically, if $P(t)$ is the price index for a country in year t, we estimate the regression equation $Ln[P(t)] = a + bt$ and employ the slope coefficient b as our measure of the average rate of growth in the price level. This method puts less emphasis on the endpoints. The log difference measure of inflation equals {*ln* [*P* (end of sample)] - *Ln* [*P* (beginning of sample)] }/ {Number of price observations -1}, where P is the CPI index.

15. The 49 countries in the Stock Market data set are as follows: Argentina, Australia, Austria, Belgium, Bangladesh, Brazil, Canada, Switzerland, Chile, Cote d'Ivoire, Colombia, Costa Rica, Germany, Denmark, Egypt, Arab Rep., Spain, Finland, France, United Kingdom, Greece, Hong Kong, India, Israel, Italy, Jamaica, Jordan, Japan, Korea, Republic of, Luxembourg, Morocco, Mexico, Malaysia, Netherlands, Norway, New Zealand, Pakistan, Peru, Philippines, Portugal, Singapore, Sweden, Thailand, Trinidad and Tobago, Turkey, Taiwan, Uruguay, United States, South Africa, Zimbabwe.

16. Real per capita *GDP* is from the Penn-World Tables 5.6. Secondary school enrollment is from the IMF's International Financial Statistics and the World Bank's World Development Indicators. The number of revolutions and coups per year are from Banks (1994). The black market exchange rate premia are from Picks Currency Yearbook through 1989 and World Currency Yearbook afterwards.

17. We would prefer to use a measure of the government budget deficit rather than total government expenditures. However, reliable data on central government budget deficits during the 1960s and 1970s are scant. When we re-run the regressions using the government budget deficit rather than government expenditures over the 1980s, the results are qualitatively very similar to those reported here.

18. Note, we discuss this in a "causal" way. We deal formally with simultaneity bias below.

19. Specifically, we regress *PRIVATE CREDIT* on a constant, *INCOME, SCHOOL, REVOLUTION,* GOVY, and *BLACK MARKET* and collect the residuals $u(L)$. Then we regress *PI* on the same set of explanatory variables and collect the residuals $u(P)$. Finally, we plot $u(L)$ against $u(P)$ and display the associated regression line. This is the projection of the regression plane from equation 5 into *PRIVATE CREDIT-PI* space.

20. Bruno and Easterly (1998) and Bullard and Keating (1995) provide evidence of threshold effects in the relationship between inflation and real performance.

21. As noted by Greene (1993, p. 236), if the high-inflation group has the same error disturbance variance as the low-inflation group, then pooling the observations of the two groups increases the efficiency of the regression's standard error. However, if the variances differ, then pooling will produce biased estimates of both disturbance variances.

22. These countries are Argentina, Bolivia, Brazil, Chile, Colombia, Ecuador, Ghana, Iceland, Israel, Indonesia, Mexico, Nigeria, Peru, Sierre Leone, Sudan, Tanzania, Uruguay, and Zaire.

23. Note, we do not estimate multiple thresholds, or identify a "best" threshold as in Barnes (1999). Rather, we evaluate the existence of a nonlinear relationship between inflation and financial development.

24. For the stock market data set, there are 13 countries with average annual inflation rates above 15 percent for the 1970–1993 period: Argentina, Brazil, Chile, Colombia, Costa Rica, Greece, Israel, Jamaica, Mexico, Peru, Portugal, Turkey, and Uruguay.

25. The result that nominal equity returns are uncorrelated with inflation -- in low-to-moderate inflation

environments -- supports the notion that higher inflation rates are associated with lower real returns on savings. This is the channel through which inflation "matters" in the theoretical literature cited in the introduction. As we show, this inverse relationship between inflation and real equity returns breaks down in economies with sustained high rates of inflation (for time-series documentation, see Barnes, Boyd, and Smith 1999). To our knowledge, the existing theoretical literature offers no guidance as to why inflation and real equity returns cease to be negatively correlated at relatively high inflation rates.

26. Specifically, we studied (1) Quasi-Liquid Liabilities, which equals Liquid Liabilities minus money held outside of the banking system and demand deposits (relative to GDP); (2) COMMERCIAL-CENTRAL BANK, which equals the ratio of commercial bank assets divided by commercial bank plus central bank assets (this measures the degree to which banks versus the central bank allocate society's savings.); and (3) BANK PRIVATE CREDIT, which equals deposit money bank credits to the private sector as a percent of *GDP*, which is a more narrow measure than PRIVATE CREDIT.

27. When the 1960s are removed from the sample, the empirical relationship is even stronger than what we have reported. Similarly, when we replicate the tests with the banking data set over the equity market sample period, 1970-1995, the results are generally even stronger than reported here.

28. We used Stephen Bond's program for estimating an unbalanced panel. We experimented with different lag structures of the instruments. Specifically, we included all regressors as instruments. Then, we start the instruments for both the levels and differenced equation starting back two periods as required by Arellano and Bover (1995)'s system GMM estimator. We conducted the analyses with (1) just this two period lagged value of all the instruments and (2) the two and three period lagged values of all the instruments for the system. The two procedures give very similar results.

29. The other regressors are INCOME, GOV, and BLACK MARKET. There is not enough time-series variation in SCHOOL or REVOLUTIONS to include them in the panel estimation.

30. It is not possible to use the panel estimator for the threshold specification.

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Table 1

A. Correlation Matrix
Banking Data Set
36 Year Average Data: 1960–1995

	PI	BANK ASSETS	LIQUID LIABILITIES	PRIVATE CREDIT
PI	1.000	-0.317 (0.002)	-0.339 (0.001)	-0.298 (0.003)
BANK ASSETS		1.000	0.832 (0.000)	0.900 (0.000)
LIQUID LIABILITIES			1.000	0.780 (0.000)
PRIVATE CREDIT				1.000

P-values are in parentheses

B. Quartile Averages
Banking Data Set Sorted by Inflation
Means (Medians in Parentheses)
36 Year Average Data: 1960–1995

QUARTILE	PI	BANK ASSETS	LIQUID LIABILITIES	PRIVATE CREDIT
ALL	13.840 (8.774)	35.281 (28.677)	41.810 (36.289)	34.672 (23.895)
1	5.274 (5.425)	54.463 (46.600)	62.671 (60.113)	56.743 (47.860)
2	7.761 (7.692)	31.880 (29.062)	35.424 (32.949)	31.589 (23.651)
3	10.324 (10.299)	32.062 (26.707)	39.961 (37.462)	29.036 (23.036)
4	31.602 (22.020)	22.441 (17.091)	28.839 (22.112)	20.350 (20.162)
N	94	94	94	94

PI = annual inflation rate. BANK ASSETS = total assets of the deposit money banks as a percentage of GDP. LIQUID LIABILITIES = liquid liabilities of the financial sector (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) as a percentage of GDP. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector as a percentage of GDP.

Table 2

A. Correlation Matrix
Stock Market Data Set
PI, MCAP, VALUE TRADED, TURNOVER: 1970–1995
VOLATILITY, EQUITY RETURNS: 1970–1993

	PI	MCAP	VALUE TRADED	TURN-OVER	VOLAT-ILITY	EQUITY RETURNS
PI	1.000	-0.246 (0.076)	-0.196 (0.167)	-0.059 (0.694)	0.843 (0.000)	0.974 (0.000)
MCAP		1.000	0.509 (0.001)	0.204 (0.233)	-0.259 (0.122)	-0.125 (0.459)
VALUE TRADED			1.000	0.875 (0.000)	0.066 (0.696)	-0.096 (0.565)
TURNOVER				1.000	0.171 (0.313)	0.005 (0.978)
VOLATILITY					1.000	0.836 (0.000)
EQUITY RETURNS						1.000

P-values are in parentheses

B. Quartile Averages
Stock Market Data Set Sorted by Inflation
Means (Median in Parentheses)
PI, MCAP, VALUE TRADED, TURNOVER: 1970–1995
VOLATILITY, EQUITY RETURNS: 1970–1993

QUARTILE	PI	MCAP	VALUE TRADED	TURN-OVER	VOLAT-ILITY	EQUITY RETURNS
ALL	19.189 (7.887)	29.534 (17.928)	13.479 (5.059)	35.947 (26.332)	6.832 (5.122)	20.041 (10.283)
1	3.729 (3.587)	64.544 (49.446)	34.072 (23.308)	67.265 (44.257)	5.013 (3.888)	8.684 (6.903)
2	6.731 (6.991)	26.797 (19.074)	8.251 (7.535)	23.482 (28.175)	4.550 (4.231)	10.046 (10.756)
3	10.585 (9.493)	32.078 (16.983)	8.431 (4.822)	26.558 (24.328)	5.862 (5.723)	8.494 (8.200)
4	52.904 (39.857)	13.367 (8.266)	3.567 (1.812)	24.771 (14.901)	12.991 (8.690)	61.592 (49.608)
N	49	48	48	46	37	38

PI = annual inflation rate. MCAP = market capitalization as a percentage of GDP. VALUE TRADED = value of domestic equities traded on domestic exchanges as a percentage of GDP. TURNOVER = value of domestic equities traded as a percentage of market capitalization. VOLATILITY = measure of stock market volatility, computed as a twelve-month rolling standard deviation based on market returns. EQUITY RETURNS = growth rate of the nominal stock market price index.

Table 3

Regressions with Banking Data Set

Estimated Coefficients (White's Heteroskedasticity-corrected T-statistics in Parentheses)
36 Year Average: 1960–1995

											Test	Statistics
Explanatory Variables:	Constant	Income	School	Revolution	Black Market	GOV	PI	HIPI15	PIHIPI15	INVPI	Adj. R^2, n	Wald R-Statistic (P-Value)[1]
Dependent Variables:												
A. Linear Regressions												
Bank Assets	-31.247 (-0808	9.587 (2.003)	5.595 (1.548)	-9.428 (-1.086)	-0.029 (-1.195)	0.400 (0.65)	-0.351 (-3.602)				0.462 65	
Liquid Liabilities	13.875 (0.398)	5.159 (1.23)	7.710 (2.131)	-14.087 (-1.48)	0.007 (0.808)	0.085 (0.103)	-0.404 (-4.12)				0.410 64	
Private Credit	-30.300 (-0.768)	10.941 (2.334)	7.777 (2.028)	-10.081 (-0.949)	-0.055 (-1.998)	-0.051 (0.078)	-0.430 (-3.612)				0.500 65	
B. Threshold Regressions												
Bank Assets	-0.399 (–0.011)	8.325 (1.969)	5.309 (1.526)	-10.358 (-1.441)	-0.008 (-0.276)	0.166 (0.244)	-2.397 (-1.945)	-36.970 (-2.461)	2.369 (1.899)		0.501 65	0.077 0.783
Liquid Liabilities	33.486 (0.865)	4.433 (1.075)	7.820 (2.228)	-14.907 (-1.81)	0.023 (1.985)	-0.132 (-0.147)	-1.604 (-1.363)	-31.223 (-2.173)	1.540 (1.277)		0.428 64	0.361 0.551
Private Credit	6.554 (0.157)	9.452 (2.132)	7.375 (2.045)	-10.984 (-1.213)	-0.031 (-1.03)	-0.319 (-0.472)	-2.931 (-2.692)	-41.807 (-3.143)	2.843 (2.556)		0.541 65	0.907 0.345
C. Regressions with INVPI												
Bank Assets	-39.760 (–1.271)	7.588 (2.009)	5.496 (1.809)	-8.163 (-1.287)	0.001 (0.044)	0.224 (0.356)				175.83 2 (3.542)	0.567 65	
Liquid Liabilities	6.112 (0.191)	3.422 (0.865)	7.688 (2.263)	-15.721 (-2.131)	0.017 (1.343)	-0.057 (-0.068)				147.35 3 (3.162)	0.457 64	
Private Credit	-39.403 (-1.149)	8.663 (2.607)	7.658 (2.211)	-10.149 (-1.333)	-0.026 (-0.888)	-0.227 (-0.363)				191.11 0 (3.939)	0.580 65	

PI = annual inflation rate. BANK ASSETS = total assets of the deposit money banks as a percentage of GDP. LIQUID LIABILITIES = liquid liabilities of the financial sector (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) as a percentage of GDP. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector as a percentage of GDP. INCOME = logarithm of initial real per capita GDP. SCHOOL = logarithm of initial secondary school enrollment. REVOLUTION = measure of the number of revolutions and coups. BLACK MARKET = black market exchange rate premium. GOV = government expenditures as a share of GDP. HIPI15=1 if PI is 15 or greater, 0 otherwise. PIHIPI15=PI*HIPI15. INVPI=1 / annual inflation rate.

[1] Tests null hypothesis that the coefficient on PI plus the coefficient on PIHIPI15 equal zero.

Table 4

Stock Market Data Set

PI, MCAP, VALUE TRADED, TURNOVER: 1970–1995
VOLATILITY, EQUITY RETURNS: 1970–1993
Estimated Coefficients (White's Heteroskedasticity-corrected T-statistics in Parentheses)

											Test	Statistics
Explanatory Variables:	Constant	Income	School	Revolution	Black Market	GOV	PI	HIPI15	PIHIPI15	INVPI	Adj. R^2, n	Wald R-Statistic (P-Value)[1]
Dependent Variables:												
A. Linear Regressions												
MCAP	71.538 (1.189)	-5.969 (-0.843)	12.164 (2.155)	-3.416 (-0.305)	-0.170 (-0.713)	0.595 (0.945)	-0.124 (-1.451)				0.044 41	
Value Traded	-29.836 (-0.642)	6.037 (0.909)	1.402 (0.372)	0.807 (0.149)	-0.064 (-0.633)	-0.528 (-0.833)	-0.090 (-1.185)				0.030 41	
Turnover	-95.883 (-0.822)	18.262 (1.193)	-13.765 (-0.979)	6.648 (0.645)	-0.444 (-1.636)	-1.205 (-0.868)	0.032 (0.186)				-0.015 39	
Volatility	-1.509 (-0.175)	0.078 (0.281)	1.791 (1.141)	0.427 (0.279)	0.042 (1.169)	-0.200 (-2.712)	0.181 (5.579)				0.734 33	
Eqty	9.949 (0.406)	1.398 (1.662)	-6.661 (-1.718)	-8.203 (-2.673)	-0.176 (-1.714)	0.216 (0.962)	1.329 (19.197)				0.955 34	
B. Threshold Regressions												
MCAP	94.359 (1.141)	-7.607 (-0.903)	12.160 (2.033)	-6.217 (-0.447)	-0.171 (-0.421)	0.418 (0.742)	-0.559 (-0.163)	-19.766 (-0.823)	0.574 (0.172)		0.036 41	0.011 0.917
Value Traded	15.591 (0.432)	2.514 (0.457)	1.170 (0.345)	5.602 (1.032)	0.059 (0.515)	-0.420 (-0.623)	-2.409 (-2.518)	-28.450 (-2.736)	2.393 (2.561)		0.158 41	0.121 0.730
Turnover	3.644 (0.037)	10.300 (0.784)	-13.752 (-1.154)	17.664 (1.398)	-0.175 (-0.721)	-0.875 (-0.548)	-5.067 (-2.988)	-60.771 (-3.068)	5.246 (3.189)		0.139 39	2.325 0.138
Volatility	-0.214 (-0.025)	0.054 (0.194)	1.802 (1.223)	1.227 (0.673)	0.048 (1.284)	-0.197 (-2.549)	0.018 (0.097)	-1.177 (-0.384)	0.160 (0.867)		0.718 33	17.864 (0.000)
Eqty	25.454 (1.145)	1.039 (1.330)	-7.805 (-1.981)	-4.092 (-0.963)	-0.154 (-1.372)	0.237 (1.166)	0.376 (0.816)	-11.397 (-1.985)	0.984 (2.226)		0.959 34	194.205 (0.000)

Table 4 (cont.)

Stock Market Data Set

PI, MCAP, VALUE TRADED, TURNOVER: 1970–1995
VOLATILITY, EQUITY RETURNS: 1970–1993
Estimated Coefficients (White's Heteroskedasticity-corrected T-statistics in Parentheses)

											Test	Statistics
Explanatory Variables:	Constant	Income	School	Revolution	Black Market	GOV	PI	HIPI15	PIHIPI15	INVPI	Adj. R^2 n	Wald R-Statistic (P-Value)[1]
Dependent Variables:												
C. Regressions with INVPI												
MCAP	88.332 (1.523)	-10.254 (-1.477)	13.104 (2.032)	-1.477 (-0.148)	-0.094 (-0.449)	0.818 (1.744)				93.597 (1.859)	0.133 41	
Value Traded	-13.985 (-0.408)	2.072 (0.475)	2.416 (0.721)	2.929 (0.593)	0.037 (0.549)	-0.349 (-0.698)				88.210 (2.445)	0.253 41	
Turnover	-80.423 (-0.831)	13.572 (1.163)	-10.502 (-0.883)	11.346 (1.09)	-0.039 (-0.162)	-1.081 (-0.859)				133.72 7 (1.878)	0.124 39	

PI = annual inflation rate. MCAP = market capitalization as a percentage of GDP. VALUE TRADED = value of domestic equities traded on domestic exchanges as a percentage of GDP. TURNOVER = value of domestic equities traded as a percentage of market capitalization. VOLATILITY = measure of stock market volatility, computed as a twelve-month rolling standard deviation based on market returns. EQUITY RETURNS = growth rate of the nominal stock market price index. INCOME = logarithm of initial real per capita GDP. SCHOOL = logarithm of initial secondary school enrollment. REVOLUTION = measure of the number of revolutions and coups. BLACK MARKET = black market exchange rate premium. GOV = government expenditures as a share of GDP. HIPI15 = 1 if PI is 15 or greater, 0 otherwise. PIHIPI15 = PI*HIPI15. INVPI=1/annual inflation rate.

[1]Tests the null hypothesis that the coefficient on PI plus the coefficient on PIHIPI15 equals zero.

Table 5
Panel GMM Estimation---Banking Panel Data Set: 1960-1995
Five year averages. Seven observations per country, data permitting

A. Regressions with Inflation, plus conditioning information

Only Inflation results are reported

Dependent Variable	Coefficient	t-statistic	Sargan P-value	2nd order serial corr. P-value	Countries
BANK ASSETS	-0.36	13.35	0.39	0.79	64
LIQUID LIABILITIES	-0.31	17.76	0.41	0.56	64
PRIVATE CREDIT	-0.27	15.30	0.22	0.93	64

B. Regressions with 1/Inflation, plus conditioning information

Only the Inverse of Inflation results are reported

Dependent Variable	Coefficient	t-statistic	Sargan P-value	2nd order serial corr. P-value	Countries
BANK ASSETS	43.9	9.49	0.28	0.15	64
LIQUID LIABILITIES	25.0	4.29	0.41	0.94	64
PRIVATE CREDIT	43.1	6.26	0.29	0.47	64

PI = annual inflation rate. INVPI = 1 / PI. BANK ASSETS = total assets of the deposit money banks as a percentage of GDP. LIQUID LIABILITIES = liquid liabilities of the financial sector (currency plus demand and interest-bearing liabilities of banks and non-bank financial intermediaries) as a percentage of GDP. PRIVATE CREDIT = credit by deposit money banks and other financial institutions to the private sector as a percentage of GDP. *Conditioning information set*: INCOME = logarithm of initial real per capita GDP. BLACK MARKET = black market exchange rate premium. GOV = government expenditures as a share of GDP.

Figure 1:
Partial Scatter Plot of
Private Credit vs Inflation

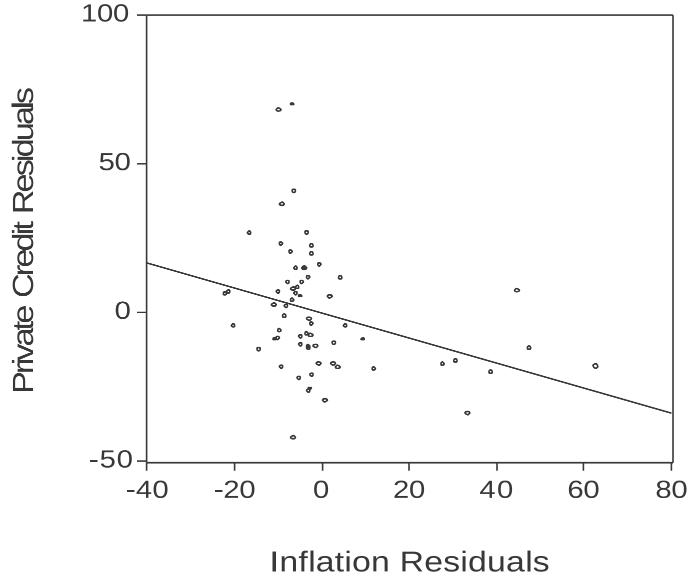

Figure 2
Partial Scater Plot of
Private Credit vs Inflation