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Inflation Targeting and the Crisis: An Empirical Assessment

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An Empirical Assessment

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Abstract: This paper appraises how countries with inflation targeting fared during the current crisis, with the goal of establishing the stylized facts that will guide and motivate future research. We find that relative to other countries, IT countries lowered nominal policy rates by more and this loosening translated into an even larger differential in real interest rates; were less likely to face deflation scares; and saw sharp real depreciations not associated with a greater perception of risk by markets. We also find some weak evidence that IT countries did better on unemployment rates and advanced IT countries have had relatively stronger industrial production performance. Finally, we find that advanced IT countries had higher GDP growth rates than their non-IT peers, but no such difference for emerging countries or the full sample.

"Inflation targeting is being put to the test – and it will almost certainly fail" – Joseph Stiglitz, 2008.

I. Introduction

In September 15th 2008, the failure of Lehmann Brothers triggered a once in a lifetime storm in global financial markets that tipped the global economy into a tailspin. Credit spreads widened, asset prices collapsed, and the wheels were set in motion for significant economic contractions in nearly every country in the world in the subsequent months. This event may define the research agenda of economists for years to come and how different policy frameworks fare in dealing with such a shock will have an important impact on how we are going to carry out prudential regulation, monetary and fiscal policy for several decades.

One of the major questions facing macroeconomists in the post-crisis is whether the monetary policy regimes of the Great Moderation years should survive or be scrapped.

In this paper, we thus focus on the inflation targeting monetary framework (IT). Our goal is to fill IT's scorecard when dealing with a global sudden stop. Since that is a first take on this question, and the events are still unfolding, our primary goal is to uncover the stylized facts instead of testing the implications of macroeconomic models or establishing the relative importance of different mechanisms at work; and we stand ready to update this paper as new evidence accumulates.

The advantages or pitfalls of inflation targeting are the subject of many empirical papers, but the focus of the literature has been mostly on inflation and output outcomes over several years (e.g. Ball and Sheridan, 2005; Batini and Laxton, 2007; Gonçalves and Salles, 2008; Brito and Bystedt, 2009), but not on the response to specific global shocks and the policy challenges they ensue.

One influential interpretation of inflation targeting due to Anna Schwartz (as described in Romer, 2006, pp. 532) is that IT is not more than a "conservative window dressing" as the key factor is a commitment by the central bankers to achieve low inflation outcomes. Under this view, there would be no difference between outcomes for IT and non-IT countries that are committed to low inflation. Conversely, IT differs from other monetary frameworks aiming price stability. Some economists argue that IT's emphasis on credibility and communication matters for inflation expectations. Also important, IT is typically accompanied by (somewhat) flexible exchange rates and this feature may give it an extra resiliency to some external shocks that some other monetary frameworks may lack.[1]

On one side, it should be mentioned that IT has been subject to many pointed criticisms. Its narrow focus on inflation may blind central bankers from other worthwhile objectives such as reducing unemployment (E.g. Stiglitz, 2008); IT central banks may also lose sight to important determinants of financial stability as they adopted intellectual frameworks suited to chieving this narrow goal (Buiter, 2009). Those criticisms may be particularly relevant during the period we study. More generally, IT may suffer from some problems typical for countries with flexible exchange rates, more so for emerging markets, as flexible exchange rates may also be destabilizing in the presence of liability dollarization (Calvo and Reinhart, 2002).

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[1] Hungary tried to have an exchange rate target whilst it operated an inflation targeting framework, but it abandoned their narrower exchange rate target after 2004 and its wider +/- 15 percent target was abandoned in February 2008 (Stone and others, 2009, pp. 43-45)

On the other side, there are indeed some reasons why IT might provide the proper tools for dealing with the 2008 financial crisis.

First, for many economists, the risk of deflation is a crucial consideration for policymaking in the aftermath of the 2008 financial crisis (Decressin and Laxton, 2009). When facing deflationary risks, the credibility of an inflation targeting regime may then play an important role at avoiding a liquidity trap and the perils of a zero interest rate corner. This has been underscored by the communication strategy of IT central banks. For instance, in the words of Governor Carney of the Bank of Canada: "Just as inflation targeting has proven its ability to prevent the entrenchment of high and volatile inflation, it also has the power to prevent the onset of persistent deflation."[2]

Second, the credibility of IT frameworks also allows for emerging market IT adopters, which typically have a greater volatility and upside risks of inflation as an advanced country, to have a considerably greater scope for monetary policy easing without compromising their inflation outlooks (Ghosh and others, 2009).

Third, it is also the case that during periods of global booms and excess liquidity, IT central banks may be more prone to have tight monetary policy leaning against the wind, in pursuit of their inflation target. As IT countries were found to have higher interest rates during the expansion phase prior to the crisis, their procyclical interest rates may hinder the onset of lending booms or make the high yield from foreign assets of dubious quality less attractive thereby protecting their financial system. Moreover, when a crisis hits, countries that start from a position of higher nominal interest rates have more room for rate cuts and therefore less need for costly extraordinary fiscal measures.

Fourth, as we mentioned above, there is a significant correlation between inflation targeting and flexible exchange rate regimes. Flexible exchange rates have long been recognized in the literature as shock-absorbers (e.g. Broda, 2004; Edwards and Levy Yeyati, 2005; Mendoza 1995) and may explain the relative performance of IT countries.

In the next section we present the methodology; in section III, the main results; in section IV, we examine other considerations; in section V we conclude.

II. METHODOLOGY

The regression we want to estimate is:

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[2] Remarks by Governor Carney Remarks by Mark Carney to the Halifax Chamber of Commerce, Halifax, Nova Scotia, in 27 January 2009 (downloaded from http://www.bankofcanada.ca/en/speeches/2009/sp09-2.html)

$$y_{it} = \lambda_i + \lambda_t + \phi_t \times IT_i + \varepsilon_{it} \qquad (0.1)$$

where y_{it} is the dependent variable of interest, λ_i is a country specific effect, λ_t is a time-effect, and ε_{it} is a idiosyncratic shock. The parameter of interest is ϕ_t, which measures the difference in variable y_{it} between inflation-targeting and other countries.

We also define the time-effect for inflation targeting and other countries:

$$\eta_t^{IT} \equiv \lambda_t + \phi_t \qquad (0.2)$$

$$\eta_t^{O} \equiv \lambda_t \qquad (0.3)$$

Equation 0.1 can be estimated with OLS, thereby capturing a notion of a mean IT effect or using median (quantile) regression, measuring the effect of IT on the median IT country relative to the median country adopting other monetary policy framework. Then we can examine the coefficients of time dummies (with standard error bands) and the coefficients of the IT – time dummies interactions against time.

Our full sample excludes countries for which nominal GDP in dollars (variable *ngdpd* in the WEO) in 2002 was less than USD 10 billion; Zimbabwe because it is an outlier on several dimensions; Angola, Qatar, Sudan and United Arab Emirates because their inflation rates at the INS dataset are constant over several months, and the United States as the source of the initial shock. This leaves us with a full sample of 84 countries. Notice that Iceland, perhaps the inflation targeter facing the most troublesome crisis, and also the only one that has suspended IT during the crisis, is cut off the sample because it does not meet the criteria on nominal GDP. But that is true also for Latvia, an emerging market with a fixed exchange rate system and one of the countries with largest drop in output in 2008/09.

We start by analyzing monetary policy responses, first through nominal interest rates, then through the resulting real interest rates; their impact on inflation and real exchange rates. We also look at EMBI spreads and CDS premia in order to assess how markets evaluated IT countries relative to their counterparts. Then finally we look at economic activity outcomes, in particular, unemployment rates, industrial production and GDP growth rates.

III. RESULTS

Since the event is very recent, we focus on variables that are high frequency (monthly when feasible, quarterly otherwise), and available for the vast majority of advanced and emerging market economies (there is no point in including small poor developing countries since they typically do not have the institutional capability for inflation targeting).

We present results for the full sample; but also for subsamples of emerging market and advanced countries. We define emerging markets as countries for which we can obtain the J.P. Morgan EMBI spread (see the Data Appendix for the details). For each regression we use a balanced panel from January 2006 to August 2009. Since data availability differs across countries, so does country coverage in the regressions. The details on data availability and sample coverage are in the Data Appendix.

To compare the performance of different monetary regimes as they react to a major financial disruption, it is only natural that we start out by looking at how interest rates behaved in IT and non-IT countries before and after the crisis. The experience in the Great Depression and in Japan during the nineties highlights the ineffectiveness of monetary policy when nominal interest rates approach the zero bound and the standard tools of monetary policy are unable to lower the real interest rate. It is then crucial that a monetary regime allows for sharp reductions in nominal interest rates that result in sharp reductions in real interest rates when that is called for by a global sudden stop.

We focus first on **policy rates**. We have a sample with 49 countries, of which 21 are inflation targeters, with data through November 2009. Countries in the Euro area are classified as non-IT countries and we use the common Euro area policy rate for their policy rate (details of the sample composition are in the Data Appendix). Concentrating first on nominal rates, from the beginning of 2008 to August 2008, on average there were nominal rate increases for both groups of countries, but slightly more so for IT countries. The tightening momentum in IT countries can be grasped by noticing that in September 2008, i.e. after the Lehman failure, 6 out of 22 IT countries tightened their policy rates (Brazil, Chile, Indonesia, Israel, Peru and Sweden). However, as the crisis deepened, IT countries cut their policy rates by 2 percentage points more (Chart 1, a) and the difference in mean policy rates across the two groups has been statistically significant and persistent (Chart 1, b).
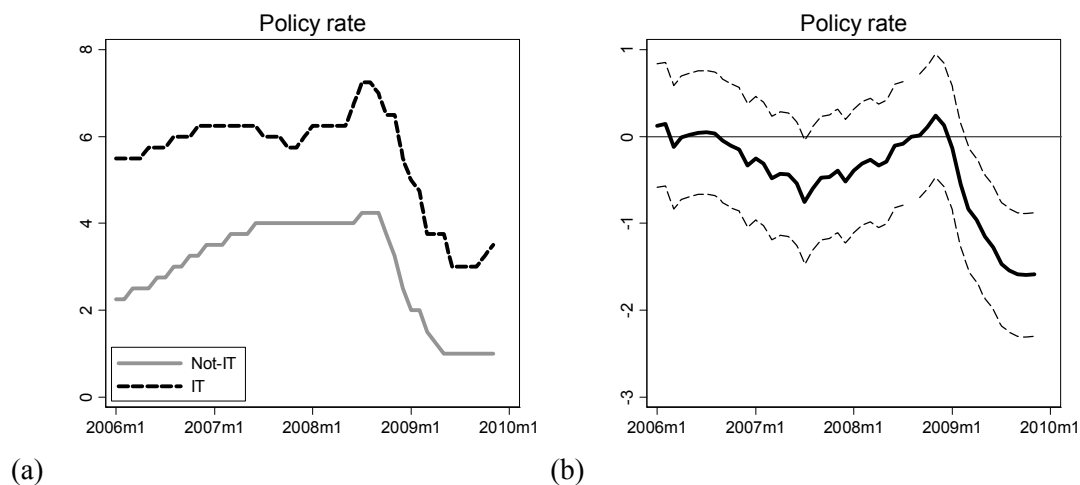

(a)   (b)

Chart 1. (a) Median policy rate for IT and non-IT countries; (b) Difference in the time effects of

policy rates for IT and non-IT countries, (August 2008 is the base period).

Then we move to the effect on real policy rates. Ideally we would have an ex-ante measure of real interest rates based on some forward-looking expectations of inflation. Those are indeed available for a few countries through the yield curve on nominal and real bonds or from expectation surveys. But in the interest of having a wider sample, we calculate real interest rates using the backward looking 12 month inflation rate. The evidence supports that IT countries have managed to avoid an increase in their real policy rates since the crisis (chart 2,a), which corresponds to a loosening of their real policy rates relative to non-IT countries since the crisis struck by about 4 percentage points (chart 2,b).
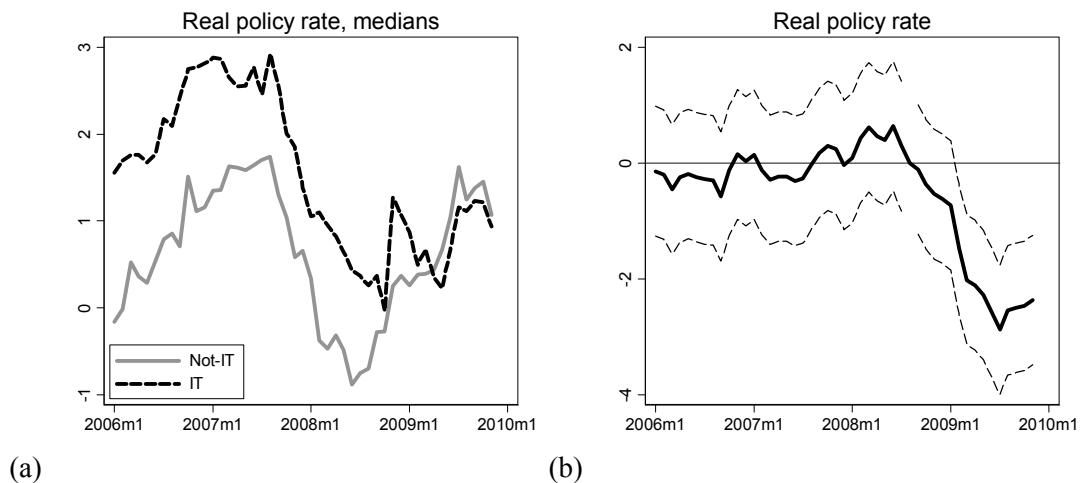

(a)   (b)

Chart 2. (a) Median real policy rates for IT and non-IT countries; (b) Difference in the time effects of real policy rates for IT and non-IT countries (August 2008 is the base period).

We now want to understand how IT countries managed to translate their relative loosening of nominal policy rates into a loosening in real interest rates. On the **inflation** front (n=84, of which 25 IT countries; data through November 2009), IT seems to have better anchored inflation expectations, even in the immediate aftermath of global financial turmoil. Price levels dropped across the board in the last two months of 2008: the average annualized inflation rate was lower by 5 percent for IT countries, 6½ percent for the others in December 2009 relative to August 2009; and both the median IT and non-IT country had negative monthly inflation in December 2009 (Chart 3, a). While the path of inflation for the median IT and non-IT countries did not differ significantly since the crisis started, IT countries seem to have had a better track record at avoiding persistent deflationary processes in the subsequent months. IT countries were less likely to go through a deflation scare, defined as

the event of three consecutive negative readings of the monthly inflation rate, with a statistically significant difference for 2008M12-2009M1 and 2009M6 (Chart 3,b).[3]
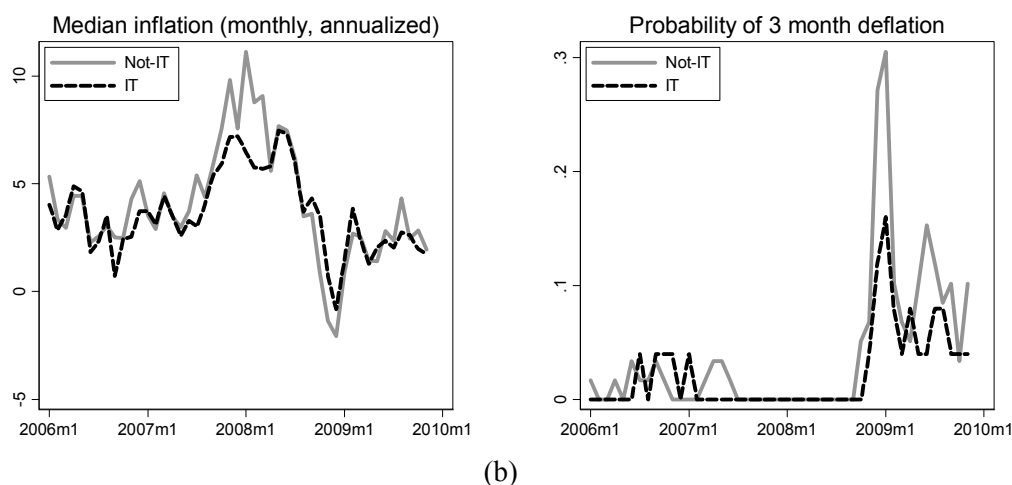

(a)   (b)

Chart 3. (a) Median monthly annualized inflation for IT and non-IT countries; (b) Probability of 3 subsequent months of negative inflation rates for IT and non-IT countries.

Having established thus far that IT countries seem to have on average better dodged the deflation bullet and been able to lower nominal and real interest rates by more than non-IT countries, we examine whether their real exchange rate has helped inject external demand when that was most needed.

The **real effective exchange rate** (REER, n=84, of which 25 IT countries; data through August 2009) of IT countries depreciated sharply in relation to other countries with the onset of the global crisis. With August 2008 as a base period, the real effective exchange rate depreciation for the average IT country was more than 15 percentage points by the first quarter of 2009 and while their exchange rates bounced back since 2009Q2, they are on average about 5 percent weaker in August 2009 than they were at the outset of the crisis (Chart 4). This finding of sharp real depreciation for IT countries after the crisis unfolded, followed by some appreciation towards pre-crisis levels is valid for the full sample of 89 countries but it is also robust to including only the subset of 31 emerging markets, and to excluding countries with pegs or heavily managed floats against the U.S. dollar before the crisis.[4]

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[3] In August 2009, there were 2 IT countries with 3 consecutive readings of monthly negative inflation (Chile and Republic of Serbia) and 7 non-IT countries (Bulgaria, China, P.R.: Mainland, Ireland, Japan, Libya, Lithuania and Taiwan Province of China).

[4] We define pegs or heavily managed floats against the U.S. dollar as currencies whose exchange rate against the U.S. dollar had a monthly standard deviation of less than 1% in the period from 2006M1 through 2008M8. There are 18 such countries in our full sample: Argentina, Belarus, China, P.R.: Mainland, China, P.R.: Hong

As striking as this finding may seem, it is no artifact of sample choice or driven by outliers. In an universe of 85 countries, of which 25 were IT countries, the 12 countries with the largest real depreciations six months into the crisis (February 2009) were all IT countries (starting from the largest real depreciations, those are: Poland, with -31½ percent, Mexico, Republic of Korea, Australia, Brazil, Hungary, Colombia, New Zealand, Indonesia, United Kingdom, Sweden, and Turkey, with -17½ percent). The flip side of the concentration of IT countries among the ones with large real depreciations is the absence of IT countries among the top 30 countries with real appreciations during that period (e.g. Japan appreciated by 26½ percent, and Venezuela, Rep. Bol. by 24 percent).

Since IT countries had larger real depreciations than other countries with flexible exchange rate systems, it would be interesting to sort out whether IT countries are better inoculated against fear of floating than non-IT floaters (say, because IT emerging market countries may be less prone to liability dollarization).
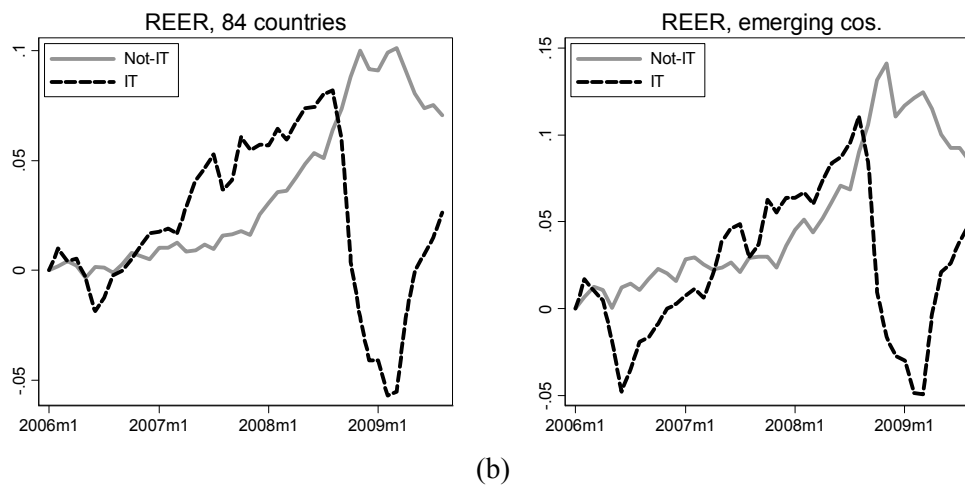

(a)   (b)

Chart 4. Changes in log real effective exchange rates (REER) for IT and non-IT countries, since January 2006, (a) average for all countries in the sample; (b) average for 31 emerging market countries.

But a real effective depreciation may be of little help if accompanied by a disruption of confidence, higher risk premia and a larger assessment of sovereign default risk by the markets. So we next turn to the behavior of two measures of risk premia, the EMBI spread and the premia on sovereigns' credit default swaps.

Kong, Ecuador, Egypt, El Salvador, Guatemala, Kuwait, Nigeria, Oman, Panama, Saudi Arabia, Sri Lanka, Ukraine, Venezuela, Rep. Bol., Vietnam, Republic of Yemen

For the balanced panel of emerging market countries for which I have **EMBI spread** data for the period of analysis (n=29, of which 12 IT countries, with data through December 2009), we can show that the real exchange rate depreciation for IT countries was not driven by a relative increase in risk perception of those countries (Chart 5). On the left panel, we display median EMBI spreads for both groups of countries – if we used means, the spike in late 2008 for non-IT countries would be exacerbated. EMBI spreads for IT and non-IT emerging countries rose sharply at the outset of the crisis, but increases for non-IT countries were sharper.[5] Hence there was a sharp reduction in the average EMBI spread for emerging market IT countries relative to other emerging markets: while in November 2008 the average spread of IT countries was about 400 basis points wider than it was two months before, for non-IT emerging markets this figure was 700 basis points; moreover, spreads for IT E.M.s started to narrow in November 2008, but continued to widen for other E.M.s until December 2008 when they were more than 800 basis points above their pre-crisis levels. Interestingly, EMBI spreads for both IT and non-IT emerging countries all but returned to August 2008 levels by October 2009.
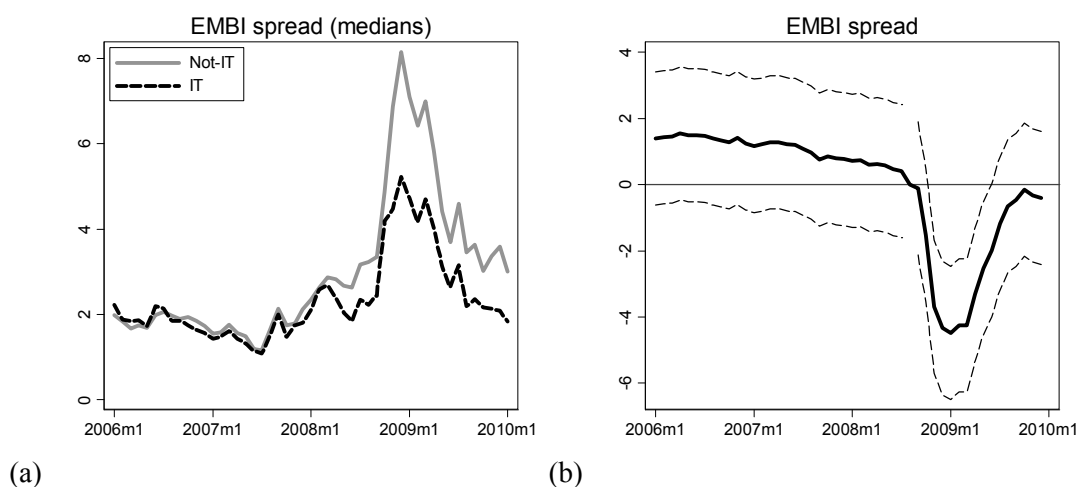

(a)   (b)

Chart 5. (a) Median EMBI spread for IT and non-IT countries, since January 2006; (b) difference between time effects of IT and non-IT countries (August 2008 is the base period).

CDS spreads (n= 33, of which 15 IT countries) are also a gauge for financial markets sentiment about countries and tell a similar story as EMBI spreads do: in October 2008, CDS spreads increased across the board, but starting in December 2008, the average spread for IT countries is between 50 and 100 basis points lower than for other countries. While this difference is economically significant and matches the evidence from EMBI spreads (which regards only emerging markets), that is not statistically significant at the usual levels and the

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[5] The spreads for Argentina, Ecuador, Pakistan, Ukraine and Venezuela, Rep. Bol., all of them non-IT countries, increased by more than 1,000 basis points at their peak relative to August 2008.

point estimates of differences and means are driven by outliers (e.g. Ukraine's large increase in CDS spreads).

In summary, the evidence from risk spreads is that while they have mostly returned to their pre-crisis levels as we speak, it is fair to say that IT emerging countries on average managed to smooth this shock much better than other emerging markets.[6]
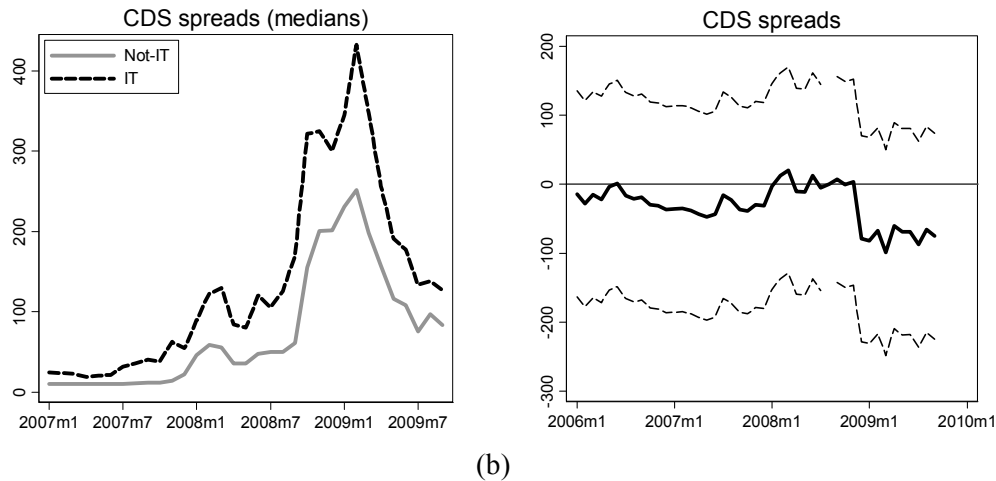

Chart 6. (a) Median CDS spreads for IT and non-IT countries; (b) Difference in the time effects of CDS premia for IT and non-IT countries (August 2008 is the base period).

But the ultimate variables of interest are the measures of economic activity: unemployment rates, industrial production and GDP.

The effect of the crisis on **unemployment rates** (n=50, of which 22 IT countries; data through August 2009) was initially very similar across countries with different monetary policy frameworks. Both the median IT and non-IT countries entered 2008 with a declining path for unemployment rates. With the onset of the crisis, unemployment rates spiked up everywhere but they did by more for the median IT country up to the first 2 months of 2009. From then on, unemployment rates seem to have stabilized for IT countries, and not so for non-IT ones, but *thus far the difference is not statistically significant.* However using 12 month changes in the unemployment rate, we find that the unemployment rate of non-IT countries started increasing at a faster pace since the first 2 months of 2009, and by June 2009, a statistically significant difference had emerged favoring IT countries: their unemployment rate was then increasing annually by about ½ percentage point less than other countries.[7] With the caveat of the very small sample sizes, this effect is driven by the

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[6] That is not only driven by a few outliers, since this result is true for median regressions too.

[7] Qualitatively and quantitatively similar results are obtained when using seasonally adjusted unemployment rates in levels, albeit less statistical significance. In particular, when using unemployment rates in levels, the

(continued)

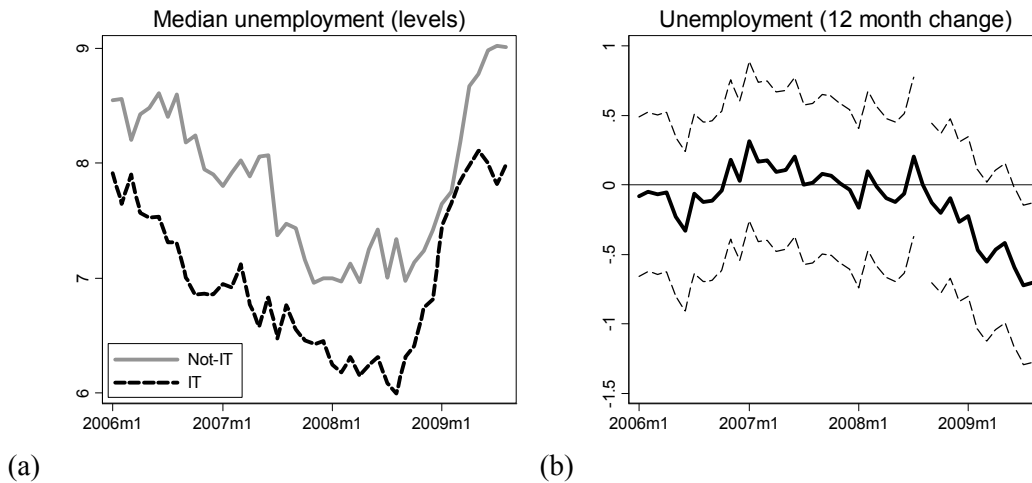advanced economies sample – for emerging markets (n=14, of which 9 IT countries) no IT effect was found.

| Median unemployment (levels) | Unemployment (12 month change) |
| (a) | (b) |

Chart 7. (a) Median unemployment for IT and non-IT countries; (b) Difference in time effects of changes in unemployment rates for IT and non-IT countries (August 2008 is the base period).

The results on **industrial production** (n=53, of which 20 IT countries, with data through September 2009) are very striking: IT countries seem to be ahead in their road to recovery of industrial production to pre-crisis levels. While in December 2008, both IT and non-IT countries had industrial production on average 9 percent lower than at the outset of the crisis; by the most recent observation (September 2009), there is an economically and statistically significant difference: the loss in industrial output is running about 12½ percent of August 2008 levels for non-IT countries, while the same figure for IT countries is about 8½ percent. When we examine the results for advanced and emerging countries, we find that much of the performance advantage seems to be driven by the advanced countries subsample (n=26, of which 7 IT countries[8]), more specifically by the very poor performance of non-IT advanced countries relative to all other subset of countries. Conversely, there is no statistical difference in post-crisis behavior of IT and non-IT emerging countries with regards to industrial production performance.

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difference between IT and non-IT countries has a slightly smaller magnitude (0.35 percentage points in August 2009), but the confidence intervals are wider therefore the difference is not statistically significant (results available upon request).

[8] Those are Canada, Czech Republic, Republic of Korea, Norway, Sweden and United Kingdom.
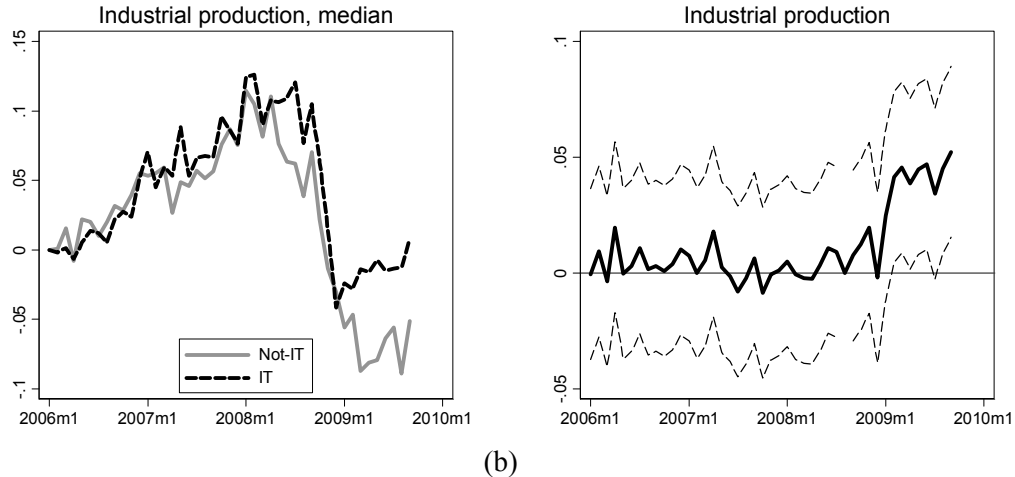
Chart 8. (a) Median change in industrial production since January 2006, for IT and non-IT countries; (b) Difference in time effects of industrial production for IT and non-IT countries, (August 2008 is the base period).

Last but not the least, the results on the evolution of **real GDP** (n=49, of which 21 IT countries, data from 2001 through 2009Q2) tell an interesting story.[9] To skip dealing with seasonal effects, we use growth rates relative to the same quarter in the previous year. There are interesting patterns in the data, even as we cannot claim statistical significance to the differences we report. It appears that IT countries do relatively better when the world economy is doing worse. The differential in growth rates for the median IT over non-IT country was positive in the aftermath of the financial turmoil and growth slowdown occurred in the post 9-11 and after the onset of the current crisis. On the other hand, there was a small difference in mean growth rates favoring non-IT countries in the booming period leading up to the crisis (chart 9,b). While we believe that we cannot argue that those differences are causal, as they may be caused by differences in the characteristics of the IT/non-IT countries or by the adoption of policies other than IT (omitted variables problem), the evidence shows that IT countries seem to be more resilient than other countries during global slumps or slowdowns.

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[9] Results qualitatively similar if seasonally adjusted quarterly growth rates are used instead.
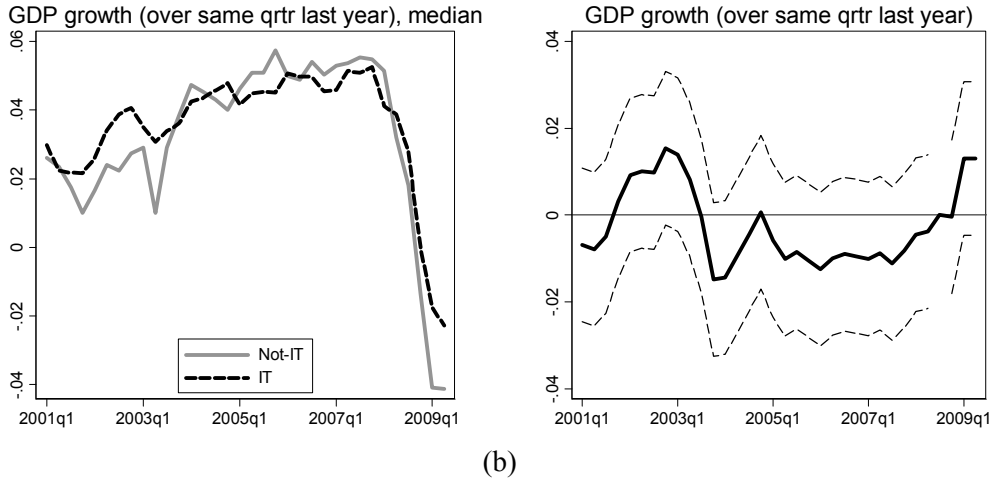
Chart 9. (a) Median GDP growth rate since 2001Q1, for IT and non-IT countries; (b) Difference in time effects of GDP growth rate for IT and non-IT countries, (2008 Q3 is the base period).

IV. ROBUSTNESS AND OTHER CONSIDERATIONS

We should now mention two other important factors that might be at play.

A. Dealing with time aggregation

The estimates presented in the previous section are suggestive that economic activity may have contracted by less for IT countries. However, in general the differences are not statistical significant, perhaps because there is too much idiosyncratic variation in the quarterly and monthly series we analyzed. One way to improve the signal-to-noise ratio is to use a coarser time aggregation, such as by semester.

The regression results using semiannual data for the economic activity measures are reported in Table 1, for a sample of 51 countries from 2003H1 to 2009H1. We estimate a double fixed effects model (country and time effects), with robust standard errors. For the sake of comparability, we keep the sample of countries constant across all regressions. The results show that there is a marginally significant difference in GDP growth rates in 2009 favoring IT countries (column 1), but the effect is concentrated among the advanced IT countries. As regards industrial production, the effect in favor of IT countries is economically significant (of the order of 7 percentage points) and marginally significant for the full sample and the non-advanced countries sub-sample. Finally, the model does not identify any statistically significant difference for the unemployment rates.

B. Omitted variables

If countries choose their monetary and exchange rate regimes instead of by a mere accident of history, the choice of monetary policy regime may reflect risk characteristics of an economy. For concreteness, it is possible that IT countries face a common risk factor that drives their performance. In that case, IT is not allocated randomly and differences in the performance of IT and non-IT countries may reflect other subjacent factors. It is therefore interesting to examine if our finding that IT countries did not fare worse and may have fared slightly better with regards to economic activity stands after we add controls for other factors identified in the literature as relevant explanatory variables for the economic contraction in the current crisis.

The existing literature on the determinants of contractions in the current crisis (e.g. Blanchard and Faruqee, 2010) has indicated some variables correlated to GDP contractions in the current crisis, such as the ratio of short-term external debt to GDP, the degree of openness to trade, the change in the commodity terms of trade, and the average GDP growth of trading partners.[10]

For each one of those factors, we run a regression of the growth rate in the first semester of 2009 (relative to the first semester of the previous year), as we report in Table 2 below. In column 1, we report a positive but statistically insignificant relation between IT and growth in the first semester of 2009, for a sample of 56 advanced and non-advanced countries. In column 2, we split the sample and find that any positive effect, even if statistically insignificant, is driven by the subset of advanced countries.

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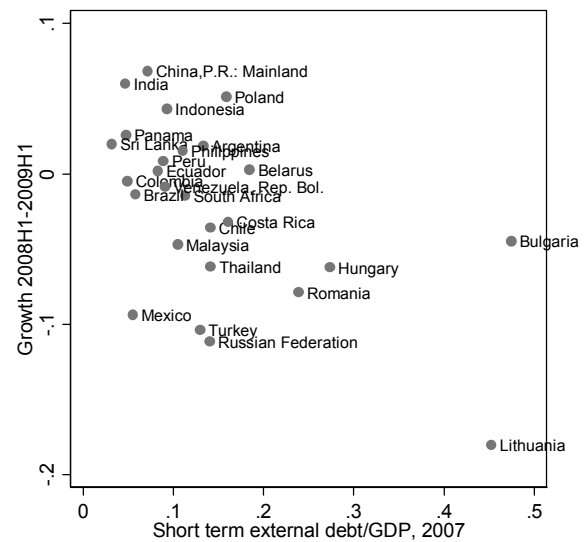
[10] Our preferred measure of terms of trade is an index of commodity terms of trade, including 43 commodities, with coverage for 55 countries. Because it is based on internationally traded commodities, it is arguably exogenous to national policies (e.g. exchange rates) and thus it is used for much of the Fund's work on exchange rate assessment.

Alternatively, we used the monthly terms of trade measure provided by Datastream, which compiles individual country authorities data, and for this measure found that in a sample of 12 IT and 13 non-IT countries, IT countries suffered on average a severe terms of trade shock, with a relative drop that reached 10 percentage points by the end of 2009 (results available upon request).

In column 3, we focus on non-advanced countries and replicate a result previously presented by Blanchard and Faruqee (2010) that short-term external debt was a very important risk factor for GDP contractions: an additional 10 percentage points of GDP of short-term external debt in 2007 implies on average a 3 percent reduction in growth rates in the first semester of 2009. It is also true that short-term external debt/GDP ratio accounts for more variation in economic activity in the crisis aftermath than any other variable we analyzed.

In column 4, we find that openness to trade, measured as average ratio of exports and imports of goods and services to GDP over 2003-2007 has a negative effect, marginally insignificant, while we control for inflation targeting. However, changes in the commodity terms of trade and trading partners GDP growth are not significant once we control for inflation targeting.

V. CONCLUSION

In the beginning of 2008, the most immediate problems for many policymakers were high commodity and fuel prices and their effect on inflation. In that context, some voiced concerns that inflation targeting was inadequate and should be abandoned by both developing and advanced. However it turned out that the greatest challenge for monetary frameworks since then was not fast rising commodity prices driven by buoyant global demand, but the major financial and trade disruptions and the greatest recession the world economy has seen since the Great Depression.

This paper sets out to fill the scorecard of inflation targeting in dealing with this tail event. It presents results of a descriptive nature with the goal of establishing the stylized facts that will guide and motivate future research. We would like to caution the reader that we do not claim that the differences that we find in the data between IT and non-IT countries are causal. They may be, but it is beyond the scope of this paper to establish the validity of causal claims.

To sum-up the findings, IT has had a positive scorecard thus far. The monetary policy of IT countries appears to be more suited to dealing with the crisis. Relative to other countries, IT countries lowered nominal policy rates by more and this loosening translated into an even larger differential in real interest rates. With this monetary stimulus, IT countries on average seem to have dodged the deflation bullet better than other countries. With their flexible exchange rate regimes, IT countries also saw sharp real depreciations which were not associated with a greater perception of risk by markets. Perhaps as a result of that, there is some weak evidence that IT countries did better on unemployment rates and advanced IT countries have had relatively stronger industrial production performance. For GDP growth rates, we found that advanced IT countries had higher GDP growth rates than their non-IT peers, but no such difference for emerging countries or the full sample, or when we added controls such as short-term external debt to GDP for the subset of emerging countries.

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Table 1. OLS Regressions with time and country effects: 2003H1-2009H1

	(1)	(2)	(3)	(4)	(5)	(6)
	GDP growth		**Ind. Production**		**Unemployment**	
IT x 2009	0.020		0.070		-0.236	
	[1.72]		[2.41]*		[0.35]	
IT x 2009 x Not advanced		0.009		0.074		-0.720
		[0.63]		[1.98]*		[0.85]
IT x 2009 x Advanced		0.033		0.065		0.343
		[2.86]**		[1.89]		[0.54]
Observations	642	642	640	640	642	642
Number of countries	51	51	51	51	51	51
R-squared	0.61	0.61	0.54	0.54	0.36	0.36

Robust t statistics in brackets

* significant at 5%; ** significant at 1%

Table 2. OLS Regression for cross-section of countries

	(1)	(2)	(3)	(4)	(5)	(6)
			Growth 2008H1-2009H1			
Inflation targeting	0.011		-0.018			
	[0.012]		[0.020]			
Inflation targeting x Advanced		0.024		0.018	0.032	0.024
		[0.017]		[0.018]	[0.016]*	[0.017]
Inflation targeting x Not advanced		-0.009		-0.012	-0.026	-0.009
		[0.017]		[0.017]	[0.020]	[0.018]
Short-term external debt/GDP, 2007			-0.306			
			[0.091]***			
Openness/GDP, 2003-2007 average				-0.013		
				[0.008]		
Change in terms of trade, 2008-09					0.441	
					[0.436]	
Growth 2008H1-2009H1, trading partners						-0.004
						[0.756]
Advanced		-0.035		-0.030	-0.062	-0.035
		[0.016]**		[0.016]*	[0.021]***	[0.016]**
Observations	56	56	26	56	47	56
R-squared	0.015	0.1	0.334	0.138	0.217	0.1

Notes: Standard errors in brackets. Constant not reported.

* significant at 10%; ** significant at 5%; *** significant at 1%

Data Appendix

Our full sample excludes countries for which nominal GDP in dollars (variable *ngdpd* in the WEO) in 2002 was less than USD 10 billion; Zimbabwe because it is an outlier on several dimensions; Angola, Qatar, Sudan and United Arab Emirates because their inflation rates at the INS dataset are constant over several months, and the United States. This leaves us with a full sample of 84 countries. Notice that Iceland, perhaps the inflation targeter with the most troublesome crisis, and also the only one that has suspended IT during the crisis, is cut off the sample because it does not meet the criteria on nominal GDP.

The 84 countries are: Algeria, Argentina, Australia, Austria, Bangladesh, Belarus, Belgium, Brazil, Bulgaria, Cameroon, Canada, Chile, China, P.R.: Mainland, China, P.R.: Hong Kong, Colombia, Costa Rica, Croatia, Cyprus, Czech Republic, Côte d'Ivoire, Denmark, Dominican Republic, Ecuador, Egypt, El Salvador, Finland, France, Germany, Greece, Guatemala, Hungary, India, Indonesia, Iran, I.R. of, Ireland, Israel, Italy, Japan, Kazakhstan, Kenya, Korea, Republic of, Kuwait, Lebanon, Libya, Lithuania, Luxembourg, Malaysia, Mexico, Morocco, Netherlands, New Zealand, Nigeria, Norway, Oman, Pakistan, Panama, Peru, Philippines, Poland, Portugal, Romania, Russian Federation, Saudi Arabia, Serbia, Republic of, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sri Lanka, Sweden, Switzerland, Syrian Arab Republic, Taiwan Prov. of China, Tanzania, Thailand, Tunisia, Turkey, Ukraine, United Kingdom, Uruguay, Venezuela, Rep. Bol., Vietnam, and Republic of Yemen.

There are 25 **IT countries** in the sample. The IT classification was based on Friedman and Laxton (2009) and Roger (2009) and the countries coded as IT are: Australia, Brazil, Canada, Chile, Colombia, Czech Republic, Guatemala, Hungary, Indonesia, Israel, Republic of Korea, Mexico, New Zealand, Norway, Peru, Philippines, Poland, Romania, Republic of Serbia, South Africa, Sweden, Switzerland, Thailand, Turkey, and United Kingdom.

There are 4 countries that have **fully-fledged inflation targeting** (Friedman and Laxton, 2009), i.e. they have inflation targeting and they publish their endogenous interest rate forecast: Czech Republic, New Zealand, Norway and Sweden.

We define **emerging market countries** (n=31, of which 12 IT countries, with data through December 2009) as those for which we could gather the J.P. Morgan EMBI spread: Argentina, Brazil, Bulgaria, Chile, China, P.R.: Mainland, Colombia, Dominican Republic, Ecuador, Egypt, El Salvador, Hungary, Indonesia, Kazakhstan, Lebanon, Malaysia, Mexico, Pakistan, Panama, Peru, Philippines, Poland, Russian Federation, Republic of Serbia, South Africa, Sri Lanka, Tunisia, Turkey, Ukraine, Uruguay, Rep. Bol. Venezuela, and Vietnam.

The definition of **advanced economies** is the same as the WEO (n=30): Australia, Austria, Belgium, Canada, China, P.R.: Hong Kong, Cyprus, Czech Republic, Denmark, Finland,

France, Germany, Greece, Ireland, Israel, Italy, Japan, Republic of Korea, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Singapore, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Taiwan Prov. of China, and United Kingdom. Notice that the United States has been excluded from the sample, and that the Czech Republic belongs to both the advanced and emerging economies sample.

The **real effective exchange rate** (REER), the **nominal effective exchange rate** (NEER) and **inflation rate** all come from the IMF/INS database. The REER is based on trade-weighted CPI indexes.

The **unemployment rate** data comes from several sources: IMF/IFS, IMF/GDS, Haver and Datastream/Eurostat. **IFS** countries are Armenia, Australia, Austria, Belarus, Belgium, Brazil, Canada, Czech Republic, Denmark, Finland, Germany, Hungary, Japan, Republic of Korea, Luxembourg, Netherlands, Norway, Poland, Romania, Russian Federation, Slovak Republic, Slovenia, Sweden, Switzerland, Turkey, United Kingdom, United States, and Uruguay. **GDS** countries are Chile, Colombia, Israel, Mexico, New Zealand, Peru, Philippines, South Africa, and Thailand. **Haver** countries are Venezuela, Bulgaria, Croatia, Russia, Ukraine, Hong Kong, Taiwan Province of China, and Kazakhstan. **Eurostat** countries are Austria, Belgium, Bulgaria, Cyprus, Czech, Denmark, Estonia, Finland, France, Germany, Hungary, Ireland, Italy, Latvia, Luxembourg, Netherlands, Norway, Poland, Portugal, Slovakia, Slovenia, Spain, and Sweden. There are 49 countries (22 IT) with monthly unemployment data up to August 2009.

Industrial production (n=59) data comes from IFS, Haver or Datastream. IFS countries are Armenia, Austria, Belgium, Brazil, Bulgaria, Canada, Croatia, Czech Republic, Denmark, Euro Area, Finland, France, Germany, Greece, Hungary, India, Ireland, Israel, Italy, Japan, Jordan, Republic of Korea, Lithuania, Luxembourg, Malaysia, Mexico, Netherlands, Nicaragua , Norway, Poland, Portugal, Romania, Slovak Republic, Slovenia, Spain, Sweden, Tunisia, Turkey, United Kingdom, United States. Haver countries are Argentina, Belarus, Chile, Colombia, Ecuador, Egypt, Indonesia, Peru, Philippines, Russian Federation, Singapore, South Africa, Sri Lanka, Taiwan, Thailand, Ukraine, Uruguay, and Venezuela. Datastream countries are Cyprus, Kazakhstan (both with monthly data), Australia, China, P.R.: Hong Kong, New Zealand and Switzerland (with quarterly data, interpolated log-linearly to a monthly frequency).

Policy rate (n=47, of which 21 IT countries) data comes from the IMF/GDS database. It covers the following countries: Argentina, Australia, Austria, Belgium, Brazil, Bulgaria, Canada, Chile, China, P.R.: Mainland, China, P.R.: Hong Kong, Colombia, Cyprus, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, India, Indonesia, Ireland, Israel, Italy, Japan, Korea, Republic of, Lithuania, Luxembourg, Malaysia, Mexico, Netherlands, New Zealand, Norway, Peru, Philippines, Poland, Portugal, Romania, Russian

Federation, Singapore, Slovak Republic, Slovenia, South Africa, Spain, Sweden, Taiwan Prov.of China, Turkey, Ukraine and United Kingdom.

The variables **short rate** (n=45, of which 21 IT countries) come from IMF/GDS database. Coverage for short rate goes through October 2009.

The variable **discount rate** (n=45, of which 19 IT countries, sample through July 2009) comes from IMF/IFS database, variable 60...ZF... with the exceptions of Australia (60L..ZF...) and Mexico (60P..ZF...).