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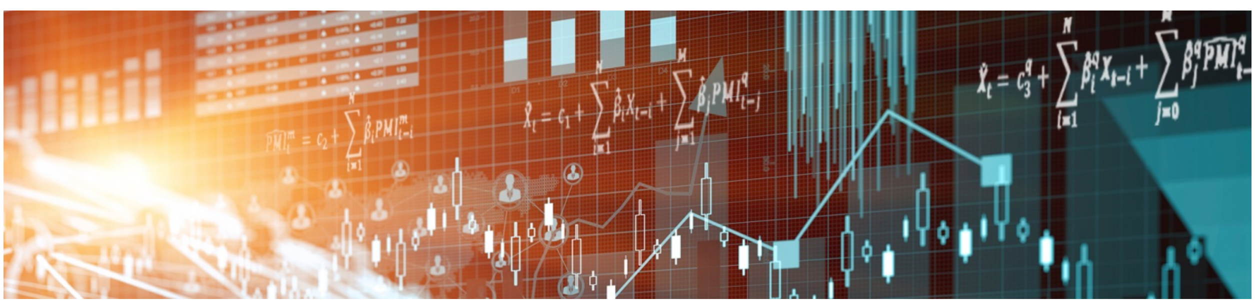
The Effects of Inflation Targeting for Financial Development



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Abstract

The adoption of inflation targeting (IT) by central banks leads to an increase of 10 to 20 percent in measures of financial development, with a lag. We also find evidence that the financial sector benefits of IT adoption were higher for early-adopting central banks. Our results suggest that roughly 12 to 14 years after the Reserve Bank of New Zealand adopted inflation targeting in 1989, the benefits for financial development for new adopters of inflation targeting may have been negligible.

Bank topics: Financial institutions; Inflation targets; Transmission of monetary policy
JEL codes: E44, E58

Résumé

L'adoption d'un régime de ciblage de l'inflation par les banques centrales entraîne une hausse de 10 à 20 % des mesures du développement des marchés financiers, avec un certain décalage. Nous constatons que les avantages pour le secteur financier ont été plus marqués dans les pays ayant adopté très tôt un tel régime. En effet, d'après nos résultats, les effets positifs sur le développement de ces marchés auraient été négligeables pour les pays qui ont adopté le ciblage de l'inflation plus tard, soit de douze à quatorze ans environ après la Banque de réserve de Nouvelle-Zélande en 1989.

Sujets : Institutions financières; Cibles en matière d'inflation; Transmission de la politique monétaire
Codes JEL : E44, E58

1 Introduction

The widespread adoption of inflation targeting (IT) by central banks is a testament to its perceived effectiveness for the conduct of monetary policy. IT has many theoretical virtues: it provides transparency for households and firms, it is achievable, and its effectiveness depends on the central bank's credibility, which encourages the central bank to prioritize IT. The Reserve Bank of New Zealand (RBNZ) was the first central bank to announce an inflation target in 1989, soon followed by Canada in 1991.

In this note, we focus on the relationship between IT and financial development. Specifically, does IT increase financial development? It is plausible that lower (and stable) inflation increases demand for investment and savings as a result of decreased uncertainty about the level (and volatility) of future real interest rates. In empirical work, Boyd, Levine and Smith (2001) posit that high levels of inflation reduce financial development. This suggests that IT may lead to an increased demand for financial intermediation. One concern is that increases in financial intermediation, particularly if too rapid, may lead to financial stability concerns that could hamper financial development. Fazio, Tabak and Cajueiro (2015) use detailed information on bank balance sheets to investigate the effects of IT on bank stability in a sample of 70 countries. They find that IT adoption increases financial stability and that banks in IT countries manage systemic risk similarly to those in non-IT countries.

Despite the popularity of IT among central banks, empirical evidence that IT adoption leads to beneficial macroeconomic outcomes is hardly conclusive. Johnson (2002), Vega and Winkelried (2005), Bean (2009) and Walsh (2009) find evidence that IT adoption lowers a country's inflation rate and in some instances volatility in the growth of gross domestic product (GDP). However, Lin and Ye (2007) and Ardakani, Kundan Kishor and Song (2018) suggest that IT is more likely to be adopted by countries where it is more likely to appear successful (i.e., countries that already have low inflation rates). They argue that estimates of the efficacy of IT are inaccurate. Brito and Bystedt (2010) find no evidence that IT adoption is successful in developing economies and suggest that the success of IT depends on the level of financial and economic development. There is also mixed evidence that IT lowers the volatility of inflation or has changed the conduct of monetary policy (see, for instance, Ball and Sheridan 2004 and Creel and Hubert 2015). Even if there is little conclusive evidence on the benefits of IT, there appears to be no evidence that IT adoption is associated with harmful macroeconomic outcomes, such as an increased volatility of GDP growth or inflation. One concern with these studies is that the outcomes examined depend on many factors in addition to monetary policy, so it is difficult to isolate the impact of IT adoption.

We use two measures of financial development: the ratio of private credit to GDP and a financial development index from the International Monetary Fund (IMF). Our results suggest that the adoption of IT by central banks leads to an increase in financial development, with a lag. Our estimates suggest that IT adoption, on average, increases financial development significantly after one to five years in both measures of financial development that we consider. We find no evidence that existing levels of financial development had an effect on the timing of IT adoption. However, we do find evidence that the financial sector benefits of IT adoption were higher for early-adopting central banks. Without exception, the evidence in this note suggests that the adoption of IT supports financial sector development.

2 Methodology

We address our question empirically using data from Hammond (2012) (since updated) on 30 countries that adopted inflation targeting over the years 1980–2016.[1] We use two measures of financial development. The first measure is the ratio of private credit to GDP, which we obtain from the Bank for International Settlements (BIS). It covers 22 of the 30 countries in our sample. Credit-to-GDP is, by construction, a ratio independent of the nominal base, and so changes in the inflation rate do not automatically change its value. Credit-to-GDP has been criticized as a measure of financial development since both a large economy with high credit volumes and a small economy with low credit volumes can have the same ratio (Rajan and Zingales 1998). One consequence is that the ratio may be difficult to interpret for a cross-section of countries; however, time-series variation for a given country can be reasonably interpreted as a change in financial leverage.

The second measure of financial development we consider is an index created by the IMF (Svirydzenka 2016) and available for our full 30-country sample. This index (FD) is constructed from 20 data series for each country that reflect measures of the depth, access and efficiency of financial markets and financial institutions, none of which directly depends on the IT regime. While the IMF's FD is a broad-based index of financial development that leverages data from the banking

[1]The sample of countries we examine is listed in the Appendix.

sector, stock markets and debt markets and is comparable across countries, a change in the index level can imply a large change in only one data series or alternatively a small change in all. One consequence is that it is difficult to isolate a specific sector where financial development occurred.

Neither measure, the credit-to-GDP ratio or the IMF's FD index, is directly dependent on the monetary policy regime in a given country. We argue that if IT adoption affects financial development, then both measures should reflect this change once we control for country-specific and time-specific variation that is independent of IT adoption. For each country we create a binary variable for whether the central bank has an announced inflation target (IT = 1). Table A-1 presents summary statistics for the variables we study. Figure A-1 plots financial development, either FD or credit-to-GDP, before and after IT adoption for the countries in the sample. For comparability, we normalize each index to equal 1 at the time of IT adoption. Both measures show an increase after IT adoption, with a lag.

To quantify whether financial development increases upon the adoption of IT, we specify panel regressions of the form:

$$Y_{i,t} = \alpha_i + \delta_t + \beta_j IT_{i,t-j} + e_{i,t}, \tag{1}$$

where $Y_{i,t} = \{Credit/GDP, FD\}$, α_i is the country fixed effect that accounts for time-invariant characteristics relevant for financial development, δ_t is a time dummy to account for common changes in financial development over time, and β_j is the effect of IT adopted in period $t-j$ for $j \geq 1$. Examining different horizons accounts for the possibility that the effects of IT for financial development are not instantaneous and increase or decrease over time. If qualitatively our estimates of the β_j differ across our two measures of financial development after controlling for α_i and δ_t, this would suggest that caution is warranted in the interpretation of any estimated effects of IT on financial development.

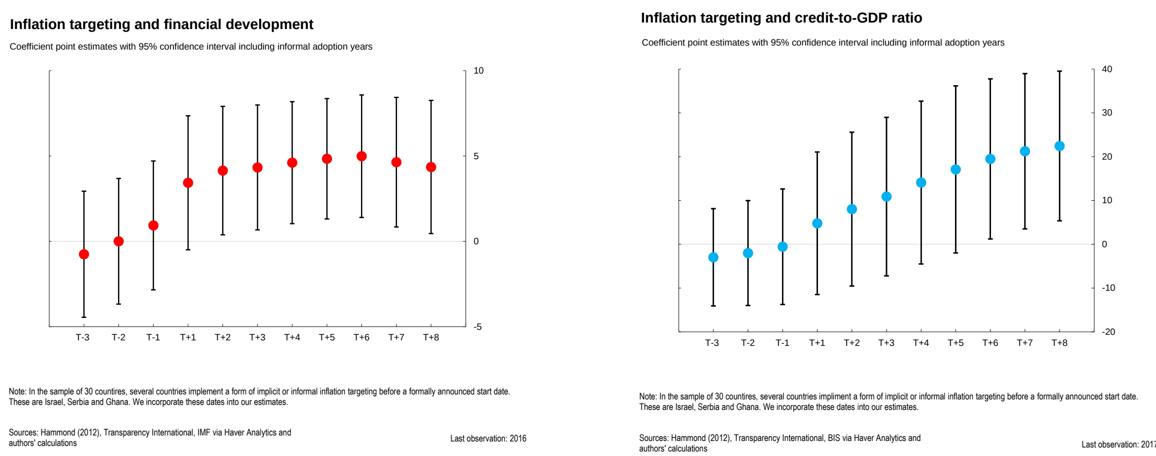
A second concern is that a policy change such as IT adoption may be pre-announced and financial development may adapt in anticipation. To address this issue, we specify panel regressions of the form:

$$Y_{i,t} = \alpha_i + \delta_t + \beta_m IT_{i,t+m} + e_{i,t}, \tag{2}$$

where β_m is the effect of anticipated IT adoption in period $t+m$. If β_m is significantly different from

Figure 1: Financial development and inflation targeting estimates

(a) (b)



zero, then this suggests that financial development leads to IT adoption and makes interpretation of the β_j unclear.

We interpret the time series $\beta = \{\beta_m, \beta_j\}$ as the response of financial development to IT adoption, similiar to the local projections method of Jorda (2005). Figures 1a and 1b show that IT adoption leads to an increase in financial development in both measures we consider, with a lag. The bounded lines around each point estimate are the 95 percent confidence intervals. The level of the IMF FD index increases roughly 6 percentage points, and this effect is significant after two years. Similarly, credit-to-GDP increases roughly 20 percentage points, and this effect is significant after five years. These estimates appear comparable as both represent a roughly 10 to 20 percent change in the average value of their respective index. We also note that neither series shows any evidence that anticipated adoption of IT increased financial development.

One concern with the results presented in Figures 1a and 1b is that the timing of IT adoption may be related to the level of financial development even after controlling for country fixed effects and year fixed effects.[2] However, both figures demonstrate that there was no evidence of increased financial development in the years immediately before IT adoption. Nevertheless, it is possible that the timing of IT adoption is correlated with a time-varying and country-specific factor that is

[2]Certainly, one might suspect that a central bank's incentive to adopt IT would depend on its inflation experience. The literature that examines the effect of IT adoption for inflation has investigated this issue.

related to growth in financial development. If true, this would imply that the results do not show a causal relationship.

To address the possible endogeneity of IT adoption, we control for IT adoption using an index of perceived public sector corruption, the Corruption Perceptions Index (CorPI), compiled by Transparency International (Alvarez-Diaz, Saisana, Montalto and Tacao Moura 2018). CorPI is an annual index started in 1995 that uses 13 indicators and surveys from international sources to construct a standardized measure of corruption, ranging from 0 to 100. Changes in levels of perceived public corruption may affect the decision to adopt IT, since a credible IT regime constrains inflationary public sector spending. However, the level of perceived public corruption may not affect the level of financial development itself if, as we suspect, both corrupt and non-corrupt countries have an incentive for financial development conditional on their average level of corruption (which is captured by the fixed effects).[3]

We estimate a panel probit model for the timing of IT adoption using two lags of the CorPI and year dummies as predictors of the change in monetary policy regime. We specify a population average probit model because parameter identification in panel probit models is challenging when the panel-level variance is a very large proportion of the total variance, as is the case in our data. We use the probit estimates to construct the inverse Mill's ratio, which we include as an additional regressor in our baseline panel regressions to control for the timing of IT adoption. We note that these regressions have fewer observations than the baseline sample, since the CorPI data start in 1995, and thus omit the effects for countries that were early IT adopters. Our results suggest that there is no evidence that endogenous timing is a concern because none of the Mill's ratio coefficients is significant and there is no quantitative difference when we include the Mill's ratio in our estimates of the effect of IT adoption.[4] Our estimates of the effects of IT adoption for financial development are, however, smaller in magnitude and increase in significance with a longer lag. We conclude that our baseline results are not biased by the timing of IT adoption.

[3]To examine whether CorPI is unrelated to the measures of financial development we use, we first estimate fixed-effect panel regressions with year dummies on two lags of CorPI (the instruments we use) and find that the coefficient estimates are insignificant.

[4]These estimates are available upon request. We note that the first-stage regressions suggest that the two lags of CorPI are strongly significant with an F-statistic of roughly 16.

3 Early versus late adoption

We next investigate whether the beneficial effects of IT adoption were stronger for early IT adopters. We examine this issue by constructing for each country in our sample a variable measuring the time in years between IT adoption and 1989 when the RBNZ became the first central bank to announce IT.[5] Although this variable is included in our α_i terms, we interact it with the IT variable for each country to capture the relative effect of being an early IT adopter. We include the interaction term in our baseline specifications for FD and credit-to-GDP. Table 1 presents our estimates.

Table 1: Early versus late adoption of inflation targeting

	International Monetary Fund financial development index				
Years since adoption	T+1	T+2	T+3	T+4	T+5
IT adoption	12.07**	12.58**	12.64**	12.68**	12.34**
	(3.02)	(3.26)	(3.34)	(3.35)	(3.22)
IT adoption delay	-0.866**	-0.859**	-0.847**	-0.829*	-0.752*
	(-2.94)	(-3.00)	(-2.94)	(-2.72)	(-2.39)
Observations	1080	1050	1020	990	960
Countries	30	30	30	30	30
	Credit-to-GDP ratio				
Years since adoption	T+1	T+2	T+3	T+4	T+5
IT adoption	37.54**	38.89**	39.68**	40.67**	41.45**
	(3.32)	(3.35)	(3.43)	(3.49)	(3.48)
IT adoption delay	-3.247***	-3.203***	-3.100**	-2.984**	-2.888*
	(-4.67)	(-4.12)	(-3.73)	(-3.18)	(-2.63)
Observations	742	728	714	699	683
Countries	22	22	22	22	22

All regressions include fixed effects and year dummies. Standard errors are clustered by country. Stars represent statistical significance: * p<0.05, ** p<0.01 and *** p<0.001. Years since adoption refers to the number of years since the country adopted IT so that the estimated effect is the change in FD or credit-to-GDP in that year. IT adoption delay is the interaction between adoption and the years since the first IT adoption by the Reserve Bank of New Zealand in 1989. Thus a country that adopted IT in 1999 would lose 10 times the estimated coefficient in benefits from the estimated coefficient for IT adoption, e.g., 12.07 - 8.66 = 3.41.

Early-adopting IT countries appear to experience larger and more immediate financial development than later adopters. Indeed, we find that IT adoption leads to a statistically significant 12-percentage-point increase in FD one year after adoption and that this effect declines by a statistically significant 0.87 percentage points for each year between the date of IT adoption and 1989. We find that these effects are statistically unchanged at horizons of up to five years after IT adoption. The estimates are qualitatively similar for credit-to-GDP, where the one-year lagged effect of

[5] While the announcement occured in December 1989, formal enactment did not occur until February 1990.

IT adoption was roughly 40 percentage points. This effect declines by a statistically significant 3 percentage points for each year adoption is delayed. These estimated effects are also statistically unchanged for horizons of up to five years after IT adoption.

The estimates suggest that the benefits of IT adoption for financial development were significantly higher for early adopters such as New Zealand, Canada and Australia. Indeed, we cannot rule out the possibility that IT adoption today would have no effect on financial development for the adopting country.[6] It is possible that financial markets believed that the central banks of later adopters were implicitly targeting inflation before they had formally announced inflation targets. However, given that our estimates control for country and year fixed effects, any explanation for the declining benefits of IT adoption would seem to require country-specific time variation. Further research to determine why the benefits of IT adoption for financial development appear to have declined would seem warranted.

[6] We caution that these results rest on the presumption that the benefits of IT adoption decline linearly with respect to time. It is plausible that the benefits of IT adoption change non-linearly over time.

4 Appendix

Table 1: Summary statistics

Sample of countries/central banks and their respective variable information*†

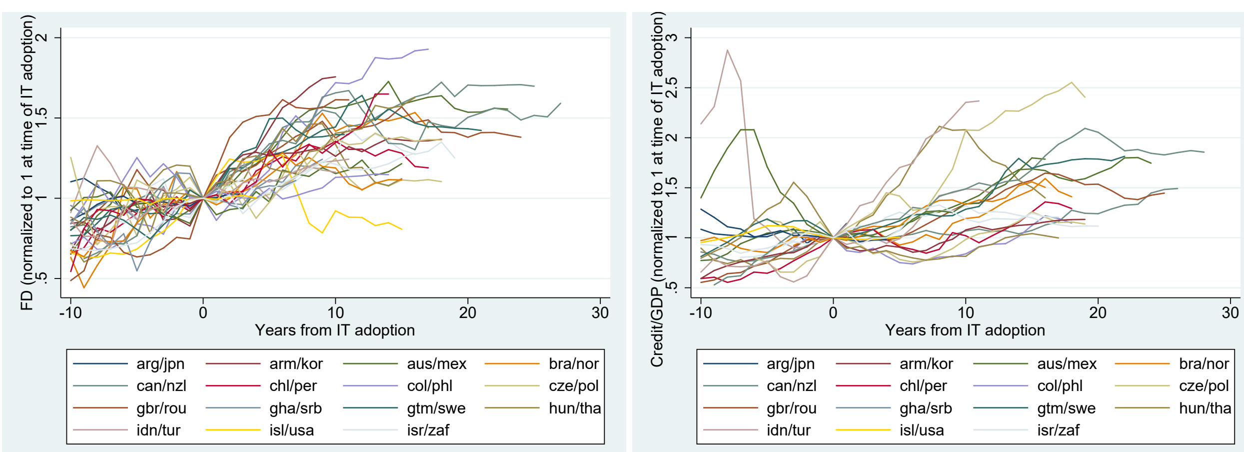
			IT date	CorPI	FD	CRD
New Zealand	nzl	Reserve Bank of New Zealand (RBNZ)	Dec-89	93.072	0.487 (0.114)	134.626 (43.018)
Canada	can	Bank of Canada (BoC)	Feb-91	86.509	0.670 (0.166)	152.489 (28.354)
United Kingdom	gbr	Bank of England (BoE)	Oct-92	82.127	0.737 (0.136)	133.824 (42.241)
Sweden	swe	Sveriges Riksbank	Jan-95	90.874	0.584 (0.168)	164.066 (45.610)
Australia	aus	Reserve Bank of Australia (RBA)	Jun-93	84.793	0.678 (0.204)	139.655 (38.922)
Israel	isr	Bank of Israel (BoI)	Jun-97	65.081	0.463 (0.115)	109.714 (14.937)
Czech Republic	cze	Czech National Bank (CNB)	Dec-97	48.190	0.258 (0.162)	79.068 (11.626)
Poland	pol	National Bank of Poland (NBP)	1998	49.058	0.432 (0.098)	52.758 (22.196)
South Korea	kor	Bank of Korea (BoK)	Apr-98	49.398	0.648 (0.181)	142.284 (33.831)
Brazil	bra	Brazilian Central Bank	Jun-99	37.498	0.394 (0.152)	55.855 (10.196)
Chile	chl	Central Bank of Chile	Sep-99	70.870	0.380 (0.107)	94.603 (26.085)
Colombia	col	Banco de la República	Oct-99	34.728	0.259 (0.101)	50.309 (7.587)
South Africa	zaf	South African Reserve Bank (SARB)	Feb-00	47.013	0.439 (0.109)	61.224 (8.357)
Thailand	tha	Bank of Thailand (BoT)	May-00	34.150	0.484 (0.122)	101.463 (32.897)
Mexico	mex	Bank of Mexico (BdeM)	2001	32.921	0.331 (0.051)	32.261 (7.395)
Norway	nor	Norges Bank	Mar-01	86.912	0.549 (0.161)	178.055 (37.052)
Hungary	hun	Magyar Nemzeti Bank (MNB)	Jan-01	49.840	0.373 (0.132)	75.232 (26.248)
Iceland	isl	Central Bank of Iceland	Mar-01	87.178	0.560 (0.142)	
Norway	nor	Norges Bank	Mar-01	86.912	0.549 (0.161)	178.055 (37.052)
Peru	per	Central Reserve Bank of Peru (BCRP)	Jan-02	37.565	0.229 (0.068)	
Philippines	phl	Bangko Sentral ng Philipinas (BSP)	Jan-02	29.523	0.332 (0.051)	
Guatemala	gtm	Bank of Guatemala	Jan-05	28.564	0.206 (0.052)	
Indonesia	idn	Bank Indonesia (BI)	Jul-05	26.307	0.274 (0.081)	37.511
Romania	rou	National Bank of Romania (NBR)	Aug-05	36.524	0.134 (0.117)	
Armenia	arm	Central Bank of Armenia (CBA)	Jan-06	30.683	0.102 (0.085)	
Turkey	tur	Türkiye Cumhuriyet Merkez Bankası	Jan-06	39.399	0.331 (0.135)	37.016
Ghana	gha	Bank of Ghana (BoG)	May-07	38.834	0.119 (0.012)	
Serbia	srb	National Bank of Serbia (NBS)	Jan-09	37.318	0.131 (0.109)	
United States	usa	Federal Reserve System (the Fed)	Jan-12	74.540	0.724 (0.172)	133.692 (20.229)
Japan	jpn	Bank of Japan (BoJ)	Jan-13	71.492	0.693 (0.118)	178.884 (23.209)
Argentina	arg	Central Bank of Argentina (BCRA)	Jun-16	32.315	0.308 (0.065)	31.503 (14.490)

* IT adoption date, averages for available countries: CorPI (Corruption Perception Index, 1980-2018), FD (Financial Development Index, 1980-2016), CRD (Credit-to-GDP Index, 1980-2017) where figures in parentheses are standard deviations.

† Formal adoption date where certain countries only have annual figures. Sweden announced Jan-93; Israel, Serbia and Ghana informally adopted IT in 1992, 2006 and 2002, respectively. We use both formal and informal years of adoption dates in our calculations.

Sources: Hammond (2012), Transparency International, IMF and BIS via Haver Analytics and authors' calculations

Figure A-1: Financial development and inflation targeting



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