INSTITUTO
UNIVERSITÁRIO
DE LISBOA

How Different Monetary Policy Strategies Affect Economic Growth

Eduardo Magalhães e Silva

Master in Economics

Supervisor

Prof. Luís Filipe Martins, Associated Professor with "Agregação", ISCTE Business School, Department of Economics

Co-Supervisor

Prof. Alexandra Ferreira-Lopes, Associated Professor, ISCTE Business School, Department of Economics

October 2020

Department of Economics/Department of Political Economy

How Different Monetary Policy Strategies Affect Economic Growth

Eduardo Magalhães e Silva

Master in Economics

Supervisor

Prof. Luís Filipe Martins, Associated Professor with "Agregação", ISCTE Business School, Department of Economics

Co-Supervisor

Prof. Alexandra Ferreira-Lopes, Associated Professor, ISCTE Business School, Department of Economics

October 2020

Acknowledgements

As a preamble to this thesis I would like to greet all those who help to achieve this enterprise and thank them for their kindness, encouragement and guidance.

I am very grateful to Professor Luís Filipe Martins and Professor Alexandra Ferreira Lopes for accepting to be supervisor and co-supervisor. Their motivation, determination and conscientious guidance was crucial to accomplish this demanding venture.

To my parents, brother and remaining members of my family I would like to express my deep appreciation for their support and everlasting encouragement.

Finally, I would like to salute all my fellow bachelor's and master's degree classmates for hours of cheerful debate, source of endless inspiration.

Any omission does not mean lack of appreciation.

Resumo

Para alcançar ou melhorar o crescimento económico, diferentes instrumentos de política monetária podem ser utilizados pelos bancos centrais. Regimes de política monetária convencionais como a âncora cambial ou a adoção de uma regra monetária (tendo como objectivo uma dada taxa de crescimento constante da massa monetária ou sua componente) foram as estratégias dominantes até o surgimento e generalização da meta para inflação. Este último regime foi o mais adotado entre as nações mais desenvolvidas a partir da década de 1990. Após a recessão de 2008, políticas não convencionais, nomeadamente, *quantitative easing*, passaram a ser uma prática comum nos EUA, Reino Unido, UE e Japão. No entanto, as estratégias convencionais não foram descartadas. Utilizando um modelo dinâmico de dados em painel, estudamos como o crescimento económico responde aos diferentes regimes de política monetária implementados entre 1970 e 2018. Os nossos resultados sugerem que a meta de inflação foi comparativamente a mais bem-sucedida estratégia em melhorar o crescimento no cômputo geral da amostra. A regra monetária registou um resultado superior no subperíodo de 1981-2008. A âncora cambial, no subperíodo pós-recessão, apresentou um impacto positivo maior do que os outros dois regimes convencionais.

Palavras-chave: Crescimento Económico, Política Monetária Convencional, *Quantitative Easing*, Bancos Centrais, Dados em Painel.

Códigos do JEL: C23; C51; E52; E58; F43; O47

Abstract

In order to achieve or enhance economic growth, different monetary policies' instruments can be used by the central banks. Conventional monetary policy regimes such as exchange rate targeting and monetary targeting were the dominant strategies until the emergence of inflation targeting. The latter regime was the most adopted among the more developed nations from the 1990s onward. After the 2008 recession, unconventional policies, namely quantitative easing, started to be a common practice in the US, UK, EU and Japan. However, conventional strategies weren't discarded. Using a dynamic panel data model, we study how economic growth respond to the different monetary policy regimes implemented between 1970 and 2018. Our results suggest that inflation targeting was more successful in enhancing growth in the full sample period. Monetary targeting displayed a comparatively higher result than the other two regimes in the 1981-2008 subperiod. Exchange rate targeting displayed a higher positive impact than the other two in the subperiod after the great recession.

Keywords: Economic Growth, Conventional Monetary Policy, Quantitative Easing, Central Banks, Panel Data.

JEL Codes: C23; C51; E52; E58; F43; O47

Table of Contents

Index of Tables

Index of Appendices

List of Abbreviations

CB: Central Bank

ECB: European Central Bank

ERT: Exchange Rate Targeting

EU: European Union

GDP: Gross Domestic Product

IMF: International Monetary Fund

IT: Inflation Targeting

LTRO: Long-term Refinancing Operations

MT: Monetary Targeting

OECD: Organisation de coopération et de développement économiques

QE: Quantitative Easing

SMP: Securities Market Programme

UK: United Kingdom

US: United States of America

ZLB: Zero Lower Bound

Sumário Executivo

O objetivo da presente tese foi a composição de um estudo comparativo das diferentes estratégias de política monetária convencional e seu impacto no crescimento económico de um conjunto de 125 países.

Primeiramente, a revisão de literatura feita recaiu nos poucos artigos que procuraram relacionar política monetária (e seus diferentes tipos: *Inflation targeting* - IT, *Exchange rate targeting* - ERT e *Monetary targeting* - MT) e crescimento económico, com especial ênfase para Wong e Chong (2019). Num segundo plano, o tema de *Quantitative Easing* - QE (política não convencional) e seu contributo para uma nova fase de crescimento económico nas principais economias mundiais (União Europeia - EU, Estados Unidos - US, Reino Unido - UK e Japão). Paralelamente, a discussão da duração do efeito a longo prazo da política monetária (neutralidade do dinheiro ou não) é também alvo de revisão, sobretudo em Jordá *et al.* (2020).

Portanto, a revisão cobriu os propósitos e consequências dos diferentes regimes monetários convencionais, a sua relação causal ou indireta com o crescimento económico (maioritariamente não explorada) e o contributo do QE. Tudo isto tendo em conta os diferentes contextos dentro do grande período temporal estudado e o novo paradigma de baixas taxas de juro e inflação no pós-grande recessão.

Metodologicamente, numa abordagem econométrica usou-se uma estimação de modelos dinâmicos com dados em painel proposta por Blundell e Bond, para atingir o objetivo proposto. A base de dados conta com uma periodicidade anual de 125 países entre 1970 e 2018, selecionados de acordo com a importância e peso das economias no cômputo global, assim como com a quantidade de dados disponíveis. Para obter o efeito dos regimes monetários no crescimento económico construíram-se quatro *dummies*, seguindo a classificação do Fundo Monetário Internacional - IMF e declarações de bancos centrais, três para as políticas convencionais (ERT, IT e MT) e uma para o QE.

Os resultados apontam para uma relação estatisticamente significativa entre as diferentes estratégias de política monetária e o crescimento económico. No período total analisado, o IT é o regime que induz maior crescimento. Ao estudar o período antes da grande recessão (1981-2008), o regime mais bem-sucedido era o MT. No cenário pós- crise, os resultados indicam que o ERT é a estratégia comparativamente mais bem-sucedida. Relativamente à política não convencional, os

resultados são preponderantemente inconclusivos, todavia os significativos indicam um possível impacto negativo no crescimento económico. Finalmente, a estratégia dominante e que aparenta induzir mais o crescimento entre os países desenvolvido é o IT. No que toca aos países em desenvolvimento, os resultados não significativos impedem a conclusão sobre o regime que estimula mais crescimento, pese embora o ERT ser o mais comum entre eles.

1. Introduction

This thesis' aim is to study the effects of different monetary policy strategies on economic growth. The time period analyzed goes from 1970, a year that marked a new era for economic and historical reasons (end of the "golden years"), to 2018, therefore covering several recessions and economic turning points. Several countries changed or adapted their monetary policy regime, sometimes more than once within this period. The existing literature that embraces these themes does not aim for a comparative performance study of the different regimes, with some exceptions (Wong and Chong, 2019).

Exchange rate targeting (ERT) and monetary growth targeting (MT) solely dominated the central bank policy-making paradigm until the late 1980s, a period where inflation targeting (IT) started to be adopted by some developed countries. Some authors argue that monetary growth targeting and inflation targeting are different perceptions of one same regime (Mishkin, 2000), however this is not consensual in literature and evidence shows technical differences.

After the great recession of 2008, unconventional monetary policy, in the shape of quantitative easing (QE) and forward guidance, was used by the most advanced world economies (Europe, US, UK, and Japan). This did not translate in a desertion of the above-mentioned strategies, on the contrary, they complemented each other. Thus, this work also drives for the inclusion of unconventional monetary on the debate of monetary policy impact on growth.

All data collected is from the IMF database: International Financial Statistics (IFS). The 125 chosen countries were selected according to the amount of the available data during the period here discussed (1970-2018) and their importance on the world economy. Subsequently, an unbalanced panel data model was constructed, on which several regressions were made, namely, a dynamic Blundell and Bond regression model.

The classification of the nations' monetary strategy is built on the IMF database, central banks' statements and Wong and Chong (2019). Four dummies were created, one for each of the three conventional regimes and one for quantitative easing.

All the conventional regimes have significant results across the period analyzed. IT is found to be a more successful strategy in stimulating growth comparatively, in the full period (1981-2008), as well as the most common among developed economies. IT has also rose to prominence by replacing ERT and MT in several countries. Before the great recession, the results obtained point that MT is

the regime that better helps to achieve growth when compared to the other two conventional regimes, after it, the results state that is ERT.

This thesis is structured in the following way. On section 2 a literature review is presented, focusing on the contributions, limits and term of influence of the different monetary regimes on economic growth, including unconventional monetary policy. On section 3 variables and the general model are presented. On section 4 this work's methodology is explained, particularly the tests needed. On section 5 regressions results are analyzed and discussed. On section 6 conclusions are disclosed.

2. Literature Review

Monetary policy has different regimes to establish a proper strategy when looking to achieve its priority goals. Exchange rate targeting, monetary (growth) targeting and inflation targeting are the most well-known regimes. Monetary policy "can prevent money from being a problem" as well as "provide stable background for the economy" (Friedman, 1968), so there is room for a relationship with economic growth.

Several studies have been conducted that link one of those three regimes to productivity growth, however comparison of the three regimes' performance and results are very scarce. Wong and Chong (2019) conducted a study whose aim was indeed to fight the "very rare comparison between different monetary policy regimes, and the existing ones led to erroneous results ... consequently failing to prove that any of them reaches economic stable growth". These authors dismiss monetary targeting as a proper regime, following a Mishkin argument that it consists of a variation of inflation targeting (Mishkin, 1999).

Monetary policy should also be able to "breath", that is the "ability to pursue different goals like … pursuit of policies ensuring stability of money on medium and long run" (Woodford, 2007). In addition, any monetary policy shares a "limited contribution to offset major disturbances in the economic system arising from their own sources" (Friedman, 1968).

Economic growth and stability are therefore an ample field to be studied in their connection to monetary policy. Even though there is a theoretical consensus that low interest rates stimulate growth and higher rates slow it down, "nominal GDP growth provides information on long-term and short-term interest rates better than they do on GDP growth, so interest rates follow growth and not the other way around" (Werner and Lee, 2017). There is also an emerging pattern that connects monetary policy regimes with the degree of economic and financial development of countries or groups of countries that adopt them (Aghion *et al*., 2006).

This literature review will elaborate on these three regimes, regarding some theoretical and empirical aspects of them, however an in-depth comparison between them is missing for there is a lack of literature. Therefore, the main purpose of this thesis is to help to bridge this gap. Moreover, this chapter will also cover unconventional policy and how it managed to cope with the recession. But again, there isn't a direct comparison intended between conventional and unconventional monetary policy, just an extension on how unconventional helped to overcome conventional policy

shortcomings. Finally, there is an assessment of the papers that drew more attention for the questions of long-term effects of monetary policy and the impact of the different regimes.

2.1. Different Monetary Policy Regimes and Their Contribution to Stable Economic Growth

Exchange rate targeting consists in adjusting a country's exchange rate to a currency of a zone or country of relative economic stability, low inflation and with which the country has commercial and financial relations. So, this strategy acts like an import of price stability (Leão *et al*., 2019) with the main goal of decreasing inflation, hence the use of exchange rate targeting being most common in underdeveloped countries, which in some cases show hyperinflation. Exchange rate targeting has been dropped by many countries in favour of other regimes in the last decades. It's implementation continues to present a sort of "regional effect", in a sense that its presence is felt in regions where several countries adopt it: " a country would adopt exchange rate target to stabilize exchange rates with neighbours when in the region they have done so… unlikely…if the neighbours don't relate to the home country's economic growth" (Wong and Chong, 2019). The primary goal of this regime is price stability and has beneficial effects in countries that have "a well-advanced degree of financial development" (Aghion *et al.*, 2006) (in low level ones it can harm growth).

However, the countries that most commonly adopt exchange target are developing ones that have a low degree of financial development and therefore are "more likely to have higher exchange rate volatility". This apparent contradiction can be justified because an "appreciation in exchange rate can lead to … higher ability to borrow…and dampen the impact of real shocks" (Aghion *et al.*, 2006). So, there is a calculated move by the authorities to stimulate consumption and indirectly growth by the appreciation of the exchange rate. Yet, the failure to reach stability in these emerging economies persists due to their fragility to shocks, evidencing a negative relationship between productivity growth and exchange rate flexibility.

A fixed exchange target regime can, at a stage, boost growth in less developed countries, but it can't protect the economy from aggregate shocks like a flexible regime (Aghion *et al.*, 2006). Under exchange rate target, regardless of the type (flexible or fixed), there is never any guarantees of a stable economic growth, so it seems more useful to other purposes (much more limited and in

a closer horizon strategy). So, the relationship between this regime and economic growth is vastly uncertain and not a very promising one within a short-term vision.

Inflation targeting in turn is a strategy driven by the public announcement of monetary goals in which the commitment to price stability is the main priority. A diverse set of instruments is used, considering a wide panel of variables. Transparency and accountability are at the centre of the relation that inflation targeting has with the public and the markets (Mishkin, 2001). Inflation targeting appeared at a time where inflation was stabilising and at a low level (Wong and Chong, 2019). Then it started to gain more followers especially due to the "failure of exchange rate to create stability" and with the "gradually reducing predictability of relationship between nominal income and money" (Walsh, 2009). Price stability is the main goal, some say at the expense of other goals (Stiglitz, 2008). Be that as it may, inflation targeting has gained the status of the most common monetary policy strategy among the most advanced economies, something that is consensual in the literature.

Although it wasn't originated here or was exclusive of inflation targeting, this regime "helped expand some properties that foster a proper way monetary policy should be practiced" (Walsh, 2009), namely transparency with central banks' action without government interference and accountability with announcements of targets to the public. These practices, now common at developed countries, should expand to developing countries because "price volatility … presents an enormous setback for investment" (Wong and Chong, 2019), however they all take a long time to establish and at times costly (Svensson, 2000).

Inflation targeting relies heavily on forecast targeting to succeed. Good forecasts serve to "anchor expectations about future value of currency while allowing short-term stability" and it provides a greater certainty for it is "more explicit about mean-term criteria rather that rely on medium target for inflation" (Woodford, 2007). One of the main disadvantages with forecasts is the possibility of policy bias developed by the central bank that could affect it.

The relationship between inflation targeting and economic growth remains largely unexplored. Some literature points out that inflation targeting success is linked with the historical framework in which it grew: "the good luck hypothesis" by Walsh (2009) or that it presents a greater contribution to growth than exchange rate targeting (Wong and Chong, 2019).

In the first case, Walsh (2009) compares countries that adopted inflation targeting with those who didn't, in the same period (from 1980s to 2007) and the results found that no causal relation

between inflation targeting and better inflation outcome is found (all countries in the Organization for Economic Cooperation and Development - OECD experienced decreasing inflation) and inflation volatility has fallen more than output gap volatility for both groups of countries. Inflation targeting also holds the distinctive feature that no country has abandon it as its official regime, so the reliability of this regime endures, thus "avoids sharp swings in policy, something that is crucial in monetary policy" (Friedman, 1968).

In the second case, Wong and Chong (2019) compare the performance of exchange rate targeting and inflation targeting all around the world, with the latter leading to growth more swiftly and holding a stronger growth effect in less developed countries (contrasting with exchange target that as stated earlier can harm these economies). Wong and Chong (2019) built a model that seeks to evaluate the effects of inflation target on economic growth. Filtering the business cycles fluctuation, the equation is estimated for long-run growth at non-overlapping five years, with explanatory variables expressed in five-years average. The methodology also undermines the possible threat of bias by country specific effects with dynamic panel data (addressing endogeneity). To deal with the different regimes in different places, Wong and Chong (2019) resort to subgroups with several criteria: education, financial development, government ideology, among others.

Following the idea of longevity of monetary policy, there is also the issue brought by Werner and Lee (2017) that nominal GDP growth can provide better closure on interest rates than they do on growth, and that monetary policy is "shifting away from interest rates to quantitative easing" (new reality). So perhaps the methodology followed by Wong and Chong (2019) when assessing the potential of different policy regimes needs a reassessment to better understand the information that output growth and its components offer, with causality tests at a first instance. Another remark is that the study of Wong and Chong (2019) emphasizes the price volatility as the main concern for monetary policy and by doing it unconsciously omits the importance of stimulating growth. In fact, it admits that "the growth effect of inflation targeting is smaller when effects from these possible transmissions channels are controlled for". Besides that, it frames the debate towards inflation targeting when comparing to the exchange rate targeting experience.

The potential of inflation targeting in underdeveloped economies, that would deliver stability and a new vigour is analysed by Mukherjee and Bhattacharya (2011). These authors characterize these emerging countries as having "an underdeveloped financial system, dominated by banks in an

oligopolistic environment, and thin interbank markets" (Mukherjee and Bhattacharya, 2011). Turns out that by their research, inflation targeting can't change the course of the interest rate channel, or even hold a significant impact on private consumption behaviour or private investment. Hence, the adoption of this regime doesn't "save" emerging economies from their flaws or even poses as a condition that would allow them to reach a higher level of development and growth.

Finally, monetary targeting is a strategy that is also based on targets' announcements, but instead of prices the emphasis is put on monetary aggregates' growth rates with an assurance on information to conduct this policy. This strategy also holds its purpose better according to the economy's conditions and stability (Schmid, 1999). For this reason, it probably can only have results in the long-term (Mishkin, 2000).

Mishkin (2000) presented an argument sustaining that monetary targeting is an "hybrid" of inflation targeting, with the most famous example being the Bundesbank (Germany's central bank), that responds more to inflation than the announced target: growth of monetary aggregate (Wong and Chong, 2019).

Mishkin (2000) supported his thesis on two arguments: the common principles of the two regimes and the practical examples (in which the adoption was a success or a failure). Firstly, central bank independence, accountability for deviations and announcements of targets that release information to conduct policy (transparency) are amongst the principles shared by the two regimes. Secondly, monetary targeting has worked under certain specific circumstances in some countries where seriousness instead of a "gameplay with artificial means to reach ends" is applied (Mishkin, 2000). However, as mentioned by Mishkin (2000), the seriousness in pursuit of results does not mean a rigid approach. In the Bundesbank an extensible amount of flexibility is applied, in pair with clarity: target only one aggregate at time (Schmid, 1999). Schmid (1999) points that the main flaw of monetary targeting is the demanding preconditions, available only in the most advanced economies: long-term steady infrastructures, early settled liberalization, and low interest rate that do not apply heavy pressure on stabilization.

Monetary targeting's relation with economic growth is a positive one in the long-term. With the stable price goal achieved, "central banks create monetary conditions for steady economic growth and even a high level of employment" (Schmid, 1999). Therefore, it is extremely simplifying and reductive to insinuate that monetary targeting and inflation targeting are twins. Instead, they lead to different results, and when the two are compared, monetary targeting should not be labelled as

a “hybrid regime”, it should be coined as an “exigent but at the same time flexible inflation targeting”.

So, until now most of the literature contends inflation targeting as being the beacon of current and future monetary policy style for its blend of “flexibility, transparency, accountability, commitment to target, promotion of growth and style of communication” (Mishkin, 2000). Yet, there is still the argument that a price stability target instead of an inflation one could make this strategy better for it would make the effect of mistakes insignificant (Woodford, 2007), providing also a greater degree of flexibility.

Furthermore, there is the assistance that a monetary policy regime can bring to foster growth or to recover an economy damaged by a recession, a pivotal point in the study of monetary policy after 2008. Even though monetary policy “can’t replace a good and financial stable policy framework”, inflation target remains throughout the literature as the “best before/during/after crisis regime that best chance to stabilize both inflation and real economy has” (Svensson, 1999).

2.2.2008 Financial Crisis: A New Paradigm

The pre-2008 financial meltdown’s view of flexible inflation targeting as the best strategy is due to its consistency in price stability with very low inflation, besides the reliability brought by the inflation forecast and the transparency within the process communication tactic. Nonetheless, the financial crisis questioned the true effectiveness not only of this regime but also of all monetary policy, as wells as the central banks’ action perimeter, or the value of interest rate as an instrument. The main regimes were target of discussion. Money factors (crucial to understand the financial crisis) were “alien” in inflation targeting but fundamental in the future European Central Bank (ECB) strategy (Clarida, 2010). In fact, the settlement of the Zero Lower Bound (ZLB) deflation scenario made regimes like inflation targeting “an independent source of instability… and would even damage central banks’ credibility” (Issing, 2011).

A new economic paradigm had arrived, where interest rates declined and reached negative values (with constant global investment and savings), something that was presented as a consequence of the combination of “ageing, lower growth and increasing risk premium on global capital markets” (Gross, 2016). Negative interest rates created an atmosphere of “uncertainty about behaviour of individuals and institutions if rates were to decrease further and more time” (Bech and Malkhozov,

2016). There is also the matter of the extension of central banks' action, because to get price stability and to monitor money or credit's development is a near impossible double task (Issing, 2011), and furthermore it questions the degree of central banks' independence (deal with several financial authorities).

A new approach was taken in the most advanced economies with quantitative easing, forward guidance and in some cases the precautious negative interest rates' implementation (not a policy *per se*). These three concepts constitute the main elements of the unconventional monetary policy taken to supplement the challenges the main regimes were not up to.

2.3.Unconventional Monetary Policy

Quantitative easing (QE) consisted mainly in large scale asset purchases (securities) by the central banks with "long-term government bonds financed by an increase in reserves accounts that commercial banks hold in the central banks" (Dell'Aricia *et al.*, 2018). Forward guidance, a communication strategy with the central banks presenting their intentions to "convince the public" (Claeys, 2014) that the policies followed would obtain good results. Negative interest rates imply that the bank would charge rather than pay, was implemented in Japan and in some European countries to cut excess reserves by stimulating lending and assets' purchase. The combined effects of these three elements sook to revive credit supply, decrease lending rates and the improvement of prices across financial markets (Dell'Aricia *et al*., 2018).

The UK and the US followed similar QE programmes (large asset purchases). The US spent $1.9 trillion (12% of US GDP) on US long-term treasury bonds and $1.6 trillion (roughly 10% of US GDP) of mortgage-backed securities, while the UK purchased £375 billion (24% of GDP) of medium and long-term government bonds, all in effort to restore liquidity by decreasing government bonds' rates and thus expanding balance sheets (Claeys, 2014). The UK also used forward guidance to elucidate its intentions, having a substantial effect on yields (particularly upon the QE announcement) and diminishing volatility on expected future interest rates (Dell'Aricia *et al*., 2018). The US economy benefited from QE adoption for it prevented the collapse of consumer lending and had a moderate positive impact on GDP and inflation like in the UK (Claeys, 2014).

Japan had a different background (already harmed by stagnation and deflation since the 1990s) but also used the approach of forward guidance and moderate QE. A combination of flexible fiscal

policy that cut public deficit, an aggressive monetary policy of 2% inflation target, long-term bonds purchase (diversification by asset allocation) and the monetary base's increase (to fight deflation), and finally a sustained growth strategy that would focus on higher wages to boost consumption (Yoshino and Taghizadeh-Hesary, 2014) was used to fight deflation and to steer a growth path. To understand the degree of commitment to this policy under prime-minister Abe's tenure, it is important to highlight that the central bank of Japan increased the monetary base from ¥155 trillion in April of 2013 to ¥387 trillion in May of 2016, with an average annual growth rate of ¥80 million (Yoshino *et al.*, 2018). At the same time, with the same growth rate, the central bank bought ¥319 trillion of Japanese government bonds in May of 2016, coming from ¥98 trillion in April of 2013 (Yoshino *et al.*, 2018). Of course, this pack of policies could not only be the work of the Japanese central bank or even monetary policy. The measures adopted by Japan were deeply political and had other goals besides economic stability like job creation, "fight ageing population" or "better SME's (small and medium enterprises) conditions to access financing "(Yoshino and Taghizadeh-Hesary, 2014). The results found in Japan on inflation and output growth were hard to see, but they were moderately positive, although unable to reach a sustained increase of inflation (Dell'Aricia *et al.*, 2018).

The Eurozone had the most peculiar path among the most developed countries and delayed for too long QE, because there was fear that it would "not be effective, hinder government reform and worsened deflation" (Eichengreen, 2015). Jean-Claude Trichet, the governor of the ECB at the time of the 2008 recession's aftermath, rejected the QE for the reasons above mentioned and opposed debt restructuring for the sovereign debt crisis that fell over Southern Europe countries.

The first great response came with the Securities Market Programme (SMP). This programme consisted in the limited purchase of sovereign bonds in the secondary market, in the southern countries the ECB bought €220 billion in government bonds (Claeys, 2014). The SMP had a "good but short-lived effect by decreasing liquidity premia and the volatility of European government bonds' yields" (Claeys, 2014). Along with the SMP, there were the fine-tuning operations with overnight loans at prevailing policy rates, plus, after the burst of the Lehman Bros, an extension of LTROs' (long-term refinancing operations) maturity and the lowering of collateral demand for loans (Eichengreen, 2015). The aggregate compromise of these operations exceeded €1 trillion (Claeys, 2014). Nonetheless, this was insufficient to overcome the difficulties surrounding the financial markets, namely the deteriorating sovereign debt crisis in Southern Europe that exposed

the increasing heterogeneity between South and North Europe's financial conditions. In fact, the LTROs' maturity extension "failed to trigger credit to the private sector, but prevent collapse: banks either deposit cheap Central Bank (CB) funding at ECB for rainy days or purchase higher yield government bonds" (Claeys, 2014). The focus on inflation targeting and neglect of financial stability called for new leadership. The next governor, Mario Draghi, embrace QE and to some extent forward guidance.

The outright monetary transactions (OMT) programme was Draghi's successful and fortified version of the SMP, a large purchase of bonds (especially in the most fragile countries) in the open market. This allowed a better and increasing SMEs' access to credit (Dell'Aricia *et al.*, 2018). Forward guidance was indirectly present in Draghi's addresses to the public, like in the "whatever it takes" speech (Draghi, 2012). To fight the threat of deflation, Draghi made use of some conventional policies like cutting the deposit rate for commercial banks and then cutting main refinancing rate to zero, or even launching a new programme of asset backed securities' purchase (Eichengreen, 2015). All these initiatives, later followed by CBPP3 (covered bonds purchase programme) that revived the covered bond market, made Draghi successful in his enterprise of restoring financial stability, leading to moderate growth, the depreciation of the euro against dollar, a rise in inflation forecast and better availability of loans (Eichengreen, 2015). However, this was obtained by a great expansion of the ECB's role, not only because of the blend of conventional and unconventional policies, but mainly due to the interference in several governments' recovery plans for the economy (mainly sovereign debt crisis' afflicted countries), to an extent not usually seen.

Going now to the nature and effects of unconventional monetary policy. While studying unconventional policy, Kuttner (2018) established a connection between QE and the declining interest rates. These lowering interest rates "aren't an end to itself, it affects all other decisions of different agents", and the large drop on yields is mostly likely to be induced by large asset purchase than forward guidance because the 1 year ahead forward rate little changed (Kuttner, 2018).

As seen in all cases mentioned, credit creation and better allocation of it to SMEs was a general concern of central banks, so unconventional policy revive credit. Another effect of the policies pursued was the overall depreciation of currency and therefore on the exchange rate. In addition to this, a lesson caught from the British experience by Lyonnet and Werner (2012) was that the "policy to increase open market purchases by central banks combined a manipulation of size and

composition of the balance sheet and … can play a role in countering adverse shocks to financial system".

In another matter, QE and forward guidance are not necessarily replacements of one another. They achieve their results by different mechanisms and serve different purposes (communication, stability, assurance), so they are "independent and complementary, reinforcing one another" (Kuttner, 2018). Their gathering made a significant impact on yields on long-term government bonds as well as decreasing corporate yields and raising stock prices, but "negative interest rates may have helped" this (Dell'Aricia *et al.*, 2018).

Finally, unconventional policies will not take the place of conventional regimes, for they can complement the latter rather than replace it. Unconventional policies are efficient only in some circumstances and settings, namely periods of financial distress, absence of deflationary pressures, and security provided by central bank reliability (Dell'Aricia *et al.*, 2018).

There is still an assessment to make towards the central bank's responsibility in the 2008 recession, for it is incomprehensible the "total passive behaviour before the build-up … and the after saviour once it burst" (Issing, 2011). The focus on price stability, a great advantage provided by inflation targeting, turned out to be a major setback to prevent financial instability and lack of growth.

Forecasts can complement monetary policy's instruments in the context of the ZLB. Spreads are not usually known for their predictive power, however, in the ZLB scenario, they perform better and can be, for instance, a leading indicator for the industrial production growth (Hannikainen, 2014). The point being that exclusive attention on interest rates and their forecasts is rather useless when aiming at price stability (Issing, 2011).

Unconventional policy recovered some elements essential to economic growth, however it seems that it did not took a far departure of the main monetary policy regimes. In fact, the Eurozone case is paradigmatic of the price stability mantra that still dominates monetary policy, for it was used as an excuse not to adopt unconventional policies. Nonetheless, monetary policy regimes and their relationship with economic growth's comparison remains a largely unexplored theme on literature, due to the focus on price stability that while attained seems to be insufficient to leave stagnation and diminutive economic growth.

2.4.The Everlasting Effects and Extent of Monetary Policy

To understand monetary policy's long-run effects, Jordá *et al.* (2020) have a deep analytic perception by linking monetary policy shocks' consequences on output and its components. This literature review while not aiming for the same, for the main concern is the study of different regimes' performance, has also an interest in the long-term results of monetary policy.

Jórda *et al.* (2020) through the isolation of exogenous shocks (in open pegs), obtained by unanticipated shifts in monetary policy in the anchor country, get a better measure of monetary policy consequences. This maintained hypothesis is called the hysteresis rule in which a system that is still holding the properties of stimuli that has long been absent, obtains this estimated responses of output and total factor productivity (TFP). The results show that capital stock is permanently lower after a temporary contracting shock, and TFP growth in its turn depends strongly on output's deviations. They also contest that frictions' type considered (usually nominal) dictate monetary policy's draft, for if by solely assuming nominal ones, "inflation targeting would be enough" (Jordá *et al.*, 2020). The hysteresis rule is a responsible way to tackle this issue for it "accommodates above inflation target until a later time to target zero output hysteresis" (Jordá *et al.*, 2020). The paper concludes that the damage to output growth by monetary policy is due to a delayed response to interest rates fluctuations, stating that short-term rates take a very long-time to achieve a steady state.

Methodologically, Jordá *et al.* (2020) use local projections to avoid bias on research, and with the recourse of the trilemma instrument. This tool states that for a country that pegs its currency to another and allows free movement of capital across borders, it loses full control over its own domestic interest rate. Through a regression of a pegging country's short-term interest rate on trilemma instrument with control country fixed effects, it is shown that when the domestic short-term interest rate grows one percent the GDP decreases very quickly and strongly. The reason for that is the sudden contraction of TFP and the build-up of the downturn of capital. The paper concludes that the hysteresis rule is a better way to achieve a stable trajectory of output growth, so there is not exactly a hint on how a monetary regime should be reformed to better respond to the economy. In fact, one of the flaws of this paper clings with the fact of seeing the decline of output as a sole consequence of the open pegs' (exchange rate targeting) carelessness with interest rate's path. Inflation targeting is just accused of being a nominal rigidities' reality (Jordá *et al.*, 2020) but

the paper does not develop on this. In fact, the hysteresis rule (the paper's contribution) can be seen as a "more careful inflation target".

This thesis' goal is not the same of Jordá *et al.* (2020) paper, however it also explores the way to address the effect of monetary policy on the economies. This thesis wants to compare the different monetary regimes' potential, so it also wants to perceive how long-run effects of policy can suit the regimes. Additionally, in what concerns the Wong and Chong (2019) paper, one possible addition to their methodology is to study different time periods in order to achieve a better understanding of the change of paradigm (regarding the predominant regime) for example before 1980s, from 1980 to 2008 (period where inflation targeting started to become the central monetary policy regime), and from 2008 onwards.

3. Empirical Approach

3.1. Data and Control Variables

The data for this thesis is from one of the International Monetary Fund (IMF) databases, the International Financial Statistics (IFS). The data collected from this source contains annual data for several variables and 126 countries. The countries were selected according to the amount of data available and their importance on the world's economy. The period of the observations goes from 1970 to 2018, although not all countries have full available data for the entire period. Hence, this thesis uses an unbalanced panel data with some gaps.

The dependent variable chosen to cover economic growth is the annual percentage growth rate of GDP per capita (based on constant local currency). Next the chosen control variables' definitions are presented and grouped in different categories for a better comprehension.

Firstly, mirroring Wong and Chong (2019), there are the variables that describe an economy's degree of openness. They are crucial to understand the correlation with the decision by policymakers of a monetary strategy, as for instance if more closed economies went for exchange rate targeting while more opened ones picked the inflation targeting path. Therefore, we have the following variables:

- *Exportations* (Exports in database) - represent a nation's trade openness, exports of goods and services (annual % growth), based on constant local currency. Exports are expected to contribute positively to growth, for their relation as pointed by Fischer (1991) is striking.
- *Portfolio investment* (same name in database) - transactions in equity and debt securities in US dollars, showing the economies' capital openness. This variable can foster growth by "increasing the liquidity of domestic capital markets and inducing greater market efficiency" (Vita and Kyaw, 2009), so it is expected to have a positive signed coefficient.

Secondly, the variables closely related to output:

- *Final consumption* (same name in database) - measured by the sum of household final consumption expenditure and government consumption expenditure, in percentage of GDP**.**
- *Household final consumption expenditure* (Householdcons in database) - a proxy for private consumption, in current US dollars.
- *Government consumption* (govfincon in database) - stands for government expenditure, in percentage of GDP. As an expense, it is theoretically considered that government expenditure is

one of the key positive elements of GDP, but as stated by Wong and Chong (2019) it is its volatility that may affect growth negatively.

● *Gross capital formation* (Gross capital in database) - acts as a proxy for investment and capital stand-in, measured in level by the sum of outlays on additions to fixed assets and net changes in the inventories' level.

● *Unemployment rate* (Unemployment in database) - share of labour force available without work, stands-in for labour. The other possible choices such as number of hours worked, were not an option in view of lack of available data for the full period analyzed and being inconsistent with some of the goals of this thesis. A higher unemployment will contribute to a lower growth rate.

Moreover, to understand monetary policy key mechanisms we have used:

● *Inflation* (same name in database) - measured by the consumer price index, is the annual percentage growth change in the cost to the average consumer of acquiring a basket of goods and services. It is very revealing of policy mechanisms' effects when studying it with the other variables such as unemployment rate or interest rate. Inflation is linked to a devaluation of income, so a higher level of inflation is expected to harm growth expectations, hence these variables will have a negative relationship as developed by Elder (2004).

● *Real effective exchange rate (REER in database)* - computed here by the nominal effective exchange rate divided by the price deflator, is a main feature in monetary strategies, most prominently in the exchange rate targeting.

● *Broad money growth* (same name in database) - the sum of currency outside of banks (annual %) serves as a proxy to money aggregates that are selected in the several forms of money growth targeting. McPhail (2000) when assessing broad money growth's importance concludes that it is of most usefulness, due to its capability to forecast inflation.

● *Real interest rate* (Real IR in database) - a lending interest rate adjusted to inflation, is a key to all the regimes studied here. Interest rate, the main instrument of monetary policy, is not responsible *per se* for growth, but its higher or lower volatility can explain monetary policy's path (Wong and Chong, 2019) and flaws.

● *Domestic credit to the private sector* (privcredit in database) – financial resources allocated to the private sector by financial corporations, in percentage of GDP. Selected to measure financial development, as explained in Levine (1997): "economic growth provides the means for the

formation of growth-promoting financial intermediaries, while the formation of financial intermediaries accelerates growth by enhancing the allocation of capital".

All variables are described in more detail in Table1.

In the first period's (1970-1980) regressions, some of the above-mentioned variables are not included due to lack of data, namely portfolio investment, private credit, real interest rate, real effective exchange rate, and the unemployment rate. Regarding the monetary strategies' dummies, in the first period inflation targeting is not considered for it only started to be applied in 1989, in New Zealand, with the Reserve Bank Act as part of a reform process (Walsh, 2009). In the other two periods the three regimes are studied with the addition of quantitative easing in the last period as a complement to the main ones.

Variables	Definitions (according to IFS)
GDP per capita growth (annual %)	Annual percentage growth rate of GDP per capita based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.
Inflation, consumer prices (annual %)	Inflation as measured by the consumer price index reflects the annual percentage change in the cost to the average consumer of acquiring a basket of goods and services that may be fixed or changed at specified intervals, such as yearly. The Laspeyres formula is generally used.
Households and NPISHs Final consumption expenditure (current US$)	Household final consumption expenditure (formerly private consumption) is the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings. It also includes payments and fees to governments to obtain permits and licenses. Here, household consumption expenditure includes the expenditures of nonprofit institutions serving households, even when reported separately by the country. Data are in current U.S. dollars.
Real interest rate (%)	Real interest rate is the lending interest rate adjusted for inflation as measured by the GDP deflator. The terms and conditions attached to lending rates differ by country, however, limiting their comparability.
Unemployment, total (% of total labor	Unemployment refers to the share of the labor force that is without work but available for and seeking employment.

force) (modeled ILO estimate)	
Real effective exchange rate index (2010 = 100)	Real effective exchange rate is the nominal effective exchange rate (a measure of the value of a currency against a weighted average of several foreign currencies) divided by a price deflator or index of costs.
Exports of goods and services (annual % growth)	Annual growth rate of exports of goods and services based on constant local currency. Aggregates are based on constant 2010 U.S. dollars.
Portfolio Investment, net (BoP, current US$)	Portfolio investment covers transactions in equity securities and debt securities. Data are in current U.S. dollars.
Broad money growth (annual %)	Sum of currency outside banks; demand deposits other than those of the central government; the time, savings, and foreign currency deposits of resident sectors other than the central government; bank and traveler's checks; and other securities such as certificates of deposit and commercial paper.
General government final consumption expenditure (% of GDP)	General government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees).
Domestic credit to private sector (% of GDP)	Refers to financial resources provided to the private sector by financial corporations, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, that establish a claim for repayment.
Gross capital formation (current LCU)	Gross capital formation (formerly gross domestic investment) consists of outlays on additions to the fixed assets of the economy plus net changes in the level of inventories.

Table 1 – List of Control Variables

3.2. The Regime Dummies and The Model

The fundamental basis for this thesis' methodology derives from Wong and Chong (2019). As expressed in the literature review, the main flaw with this paper is that it considers exchange rate targeting and inflation targeting as the sole representatives of monetary policy

regimes, even in countries whose distinctive paths get lost in translation. Some examples that corroborate this argument are the countries that always pursued money aggregates targets (Germany), the cases of some who left inflation targeting to adopt a new currency (Spain), and even the countries who changed their money aggregates' goals for inflation targeting (UK).

Therefore, this thesis while building on Wong and Chong (2019) presents three dummies for the conventional monetary policy regimes and one dummy for the unconventional regime:

- *Money growth targeting* (dummy 1)
- *Exchange rate targeting* (dummy2)
- *Inflation targeting* (dummy 3)
- *Unconventional policy: QE* (dummy 4)

The fourth dummy is used to point out the countries who adopted unconventional monetary policy, more precisely, quantitative easing (and to an extent forward guidance) after the 2008 crisis and those who did not. The allocation of these regimes to the countries follows the general information on the central banks' target rate and the IMF's list of states that adopted inflation targeting (Jahan, 2012). The cases of "hidden inflation targets" are not considered here, for it dismantles the study of money aggregates target. It is also worth mentioning that the period studied will be divided into three intervals, the first being from 1970 to 1980 (era marked by stagflation), 1981 to 2008, and 2009 to 2018 (era marked by the aftermath of the great recession and the adoption of quantitative easing). This is done in order to study the results separately, since different eras are surrounded by different economic and politic contexts.

A panel data model, more precisely an empirical dynamic growth model will be used, with the following equation for country i=1,…,n and year t=1,…,T:

$$y_{i,t} = \rho y_{i,t-1} + \beta X_{i,t} + \gamma_1 MD1_{i,t} + \gamma_2 MD2_{i,t} + \gamma_3 MD3_{i,t} + \gamma_4 MD4_{i,t} + \mu_t + \eta_i + \varepsilon_{i,t} \qquad (1)$$

Echoing Wong and Chong (2019), the dependent variable that represents economic growth is $y_{i,t}$, the GDP *per capita* growth rate, instead of output *per* worker. $X_{i,t}$ is a set of control variables. As for η_i and μ_t, they are the country-specific and time-specific effects, respectively. The MD variables are the monetary policy regimes' dummies:

$$\begin{cases} \text{MD1} = 1 \text{ ; If monetary targeting is adopted, if not} = 0 \\ \text{MD2} = 1\text{; If exchange rate targeting is adopted, if not} = 0 \\ \text{MD3} = 1\text{; If inflation targeting is adopted, if not} = 0 \\ \text{MD4} = 1\text{; If Quantitative Easing is adopted, if not} = 0 \end{cases}$$

Before moving to the estimation method, it is poignant to point out that government ideology, a dummy variable with considerable importance on Wong and Chong (2019) will not be considered here. The interference of right or leftwing policy within monetary policy and the central banks' action will only "downgrade central banks' independence legally and increase its conservatism in order to maintain the same inflationary bias and limit their degree of freedom with respect to its interest rate policy" (Belke and Potrafke, 2012). There is still no consensus on the extent of influence of ideology on monetary policy, but central banks are the prominent policymakers (Belke and Potrafke, 2012).

3.3. Regime Dummies' Distribution

The regimes' distribution in the dataset reflects the significant emergence in the last decades of IT as a main strategy to the detriment of the other two conventional regimes, especially MT. Table 2 below describes the distribution of regimes for the full-sample. ERT is the clear dominant regime throughout time, mainly due to underdeveloped nations. MT has a lesser number of followers but those that remain with it are primarily strong developed economies (Germany, Switzerland). Almost a fifth of the entire sample of countries adopted QE after the great recession.

	MT	ERT	IT	Not Available	QE
Period 1	6.1%	40.3%	-	53.6%	-
Period 2	16.9%	44.8%	11.5%	26.8%	-
Period 3	12.2%	54.4%	32.5%	0.9%	18.6%

Table 2 - Distribution of the regimes for the full-time dataset

Another approach to study the dataset interaction with monetary regimes was considering the countries' level of development. To do this, the Human Development Report published by the United Nations Development Program in 2019 was consulted. In this report, the countries are divided in four main groups: Low, Medium, High, and Very High Human Development according to their different Human Development Indexes. This index is obtained by considering the following parameters: life expectancy at birth, expected years of schooling, mean years of schooling and gross national income *per capita*. In this thesis, two large groups are going to be considered: weakly developed and strongly developed countries, the first group will comprise the Low and Medium countries in the Human Development Report, while the second will include the High and Very High developed countries.

Next is the distribution of the monetary policy regimes to the two groups of countries in the two last periods, since the first period (1970-1980) is severely limited in available data and only covers two regimes: ERT and MT.

In the strongly developed countries, as seen in Table 3, IT has gained many followers, while ERT remains an important strategy. QE was implemented by a quarter of the strongly developed countries analyzed.

	MT	ERT	IT	Not Available	QE
Period 2	15.6%	37.9%	15.8%	30.7%	-
Period 3	8.7%	48.2%	41.9%	1.2%	26.7%

Table 3 - Distribution of the regimes for the strongly developed countries

For weakly developed countries, as seen in Table 4, ERT is the main strategy with more than half of the countries in this subgroup relying on this regime. IT is the least preferred conventional regime, contrasting with the strongly developed group.

	MT	ERT	IT	Not Available	QE
Period 2	21.3%	61%	1.5%	16.2%	-
Period 3	21.6%	66.9%	11.5%	-	-

Table 4 - Distribution of the regimes for the weakly developed countries

4. Methodology

4.1. Panel Unit Root Tests

Testing the model's variables for stationarity is fundamental to decide in what grounds is the observed data going to be used, in levels or first differences. Considering that this model's data is unbalanced, the following tests were used: the Im, Pesaran, and Shin (2003) test and the Fisher-type tests using ADF and Philips-Perron tests – Maddala and Wu (1999). The null hypothesis in both cases is of non-stationarity and that all panels contain unit roots.

The Fisher-type tests have more general assumptions, without several restrictions, like the need for infinite number of groups or requiring balanced data. As for the IPS test, it is a more flexible unit root test procedure for panels (Barbieri, 2006) and, with no cross-sectional correlation in errors, it is more powerful than many tests like the Fisher-type ones.

4.2. Panel Data Model – regressions

After the panel unit root tests, a simple OLS regression will take place in order to study the significant results. This regression will help to confirm some basic economic theory assumptions and most important to perceive the difference between periods and how the control variables affect growth within those different timelines.

The variables studied are most likely to be propel to endogeneity, financial development, for example, is consensually taken in literature as "endogenous across to real growth" (Leitão, 2010). To answer this, after the OLS regression, a GMM system estimation will be used. However, unlike Wong and Chong (2019), who adopted a non-overlapping five-year interval in explanatory variables (expressed in five-year averages) in order to filter out business cycle fluctuations, there will be no need of such procedure. By applying a system GMM estimation suggested by Arellano and Bover (1995) and Blundell and Bond (1998), it will allow a better performance in simulations than a first difference GMM estimator when studying growth (Bond *et al.*, 2001). The Blundell and Bond regression that will be used features a lagged GDP dependent variable and the monetary regimes' dummies as in equation 1. This regression assumes that first differences of instrument variables are uncorrelated with fixed effects, allowing a higher efficiency.

5. Results

5.1. Panel Unit Root Tests' Results

The dependent variable and most control variables, as seen in the different tables' group B (appendices), are stationary, they reject the null hypothesis in both tests, so some panels are stationary. Gross capital formation, private credit, and household consumption are the only tested variables that were not stationary in levels, so it was necessary to calculate first differences. These three variables were successful in achieving stationarity with first differences. All the variables were tested with the two version of the Fisher-type tests (ADF and Philips-Perron). As for the IPS test, only real interest rates and portfolio investment were not tested, for insufficient time periods to compute the test. It is also worth mention that it was needed to add a trend to compute the IPS test for the broad money growth.

5.2. Static Model Results

By performing a simple OLS regression (see tables in group A in the appendix) there are some patterns emerging in the different periods analyzed. The same following variables always showed significance: inflation, exports, final consumption (except in the second period) and broad money growth. In the second period, government expenditure presented significance. In the last period, the real interest rate and the unemployment rate also present significance in the different regimes' regressions. Unexpectedly, all variables' coefficients had the same sign for all regimes in the three different periods.

Concerning the significant coefficients, some results go according to economic theory. Inflation has a permanent negative effect across periods on economic growth as does unemployment (last period). Likewise, exports have a beneficial impact on economic growth, as well as broad money growth that consistently presented one. Regarding government expenditure it presented significance in the second period, but contrarily to proposed by economic theory it had a negative effect on economic growth.

There are also other variables that reflect a paradox, namely the real interest rates. In the second period studied, positive and sometimes high interest rates had an unclear effect on GDP growth, however in the third period (after 2008), a period marked by general negative or close to zero

interest rates in the world's strongest economies, it had a negative effect. Final consumption's coefficients were negative in the first era (70s) and positive in the more recent era, as a sum of public and private consumption, probably pointing out to an appreciation of private consumption and gradual decrease in the weight of government expenditure in the general consumption.

Some variables have an apparently neutral effect on growth, namely gross capital formation or portfolio investment, however their coefficients are not significant, so these results are inconclusive. The same applies for real exchange rate and domestic credit for private sector.

Lastly, although it is premature to conclude at this stage on the best monetary regimes, inflation targeting exhibited significance in the second period and had a positive effect on GDP growth (as well as in the third period). Meanwhile, exchange rate targeting never had significance and presented negative coefficients in the regressions made. As for monetary targeting, its coefficients were positive in the first and last period but negative for the second period, probably pointing out inflation targeting's emergence

5.3. Panel Data Regressions Model (dynamic model)

5.3.1. Heteroscedasticity Test

To understand the future validity of future tests and their efficiency or lack of it, is necessary to perform a heteroscedasticity test, as we can see in table 5. The Breusch-Pagan test checks if the residuals' variance from a regression is dependent of the independent variables' values (presence of heteroscedasticity) or not.

```
Breusch-Pagan / Cook-Weisberg test for heteroskedasticity
        Ho: Constant variance
        Variables: L.GDP Inflation Finalconsumption RealIR Unemployment REER Exports Portfolioinvestmentnet Broadmoneygrowthannual
                   govfincon dprivcredit dGrosscapital

        F(12 , 1007) =     2.78
        Prob > F     =   0.0010
```

Table 5 - BP test for heteroscedasticity

In the test seen in Table 5, the null hypothesis was rejected due to the low value of the p-value. Thus, the variance is not constant, hence there is heteroscedasticity. The regressions made in the next section, which apply a system GMM estimation, will feature robust standard errors.

5.3.2. Blundell-Bond regression

By studying a simple dynamic Blundell-Bond estimation regression only with the lagged GDP dependent variable and the three monetary regimes' dummies, we find that two dummies are significant at a 5% level: monetary targeting and exchange rate targeting, while inflation targeting is at a 10% level, as we can see in table 6. Of the two significant dummies with p-values very close to zero, monetary targeting has a significant higher coefficient than the exchange rate targeting dummy. So apparently, monetary targeting is the best regime for economic growth.

```
System dynamic panel-data estimation          Number of obs      =     4,179
Group variable: ID                            Number of groups   =       125
Time variable: Year
                                              Obs per group:
                                                           min =         4
                                                           avg =    33.432
                                                           max =        47

Number of instruments =   1.2e+03             Wald chi2(5)       =     95.02
                                              Prob > chi2        =    0.0000
Two-step results
```

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.0819773	.0747304	1.10	0.273	-.0644916	.2284461
L2.	-.0618391	.0247299	-2.50	0.012	-.1103088	-.0133694
DUMMY1MON	4.281985	1.953428	2.19	0.028	.4533367	8.110634
DUMMY2ER	2.416813	.7826943	3.09	0.002	.8827603	3.950866
DUMMY3IT	1.958938	1.181157	1.66	0.097	-.3560872	4.273963

Table 6 - Blundell/Bond Estimation with Dummies

These results contradict a bit what was seen on the OLS regression. However, the latter model did not include the contribution of all available the control variables.

In the panel regression with control variables, as we can see in table 7, there was an effort only to include significant control variables and not to compromise the dummies' significance. Therefore, of the initial control variables the only ones who remain significant and did not tarnish the dummies' significance were household consumption (private consumption), government expenditure (public consumption), exports, inflation and broad money growth. In these last two variables, one lag was applied. QE wasn't included in this regression for its results were not significant.

System dynamic panel-data estimation — Number of obs = 2,728
Group variable: ID — Number of groups = 104
Time variable: Year

Obs per group:
min = 3
avg = 26.23077
max = 48

Number of instruments = 1.2e+03 — Wald chi2(8) = 102.29
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.1373902	.0333436	4.12	0.000	.0720379	.2027425
DUMMY1MON	3.472338	2.075665	1.67	0.094	-.5958903	7.540566
DUMMY2ER	2.600965	1.527706	1.70	0.089	-.3932842	5.595215
DUMMY3IT	3.653814	1.539077	2.37	0.018	.6372785	6.67035
Broadmoneygrowth						
L1.	.0019611	.0011547	1.70	0.089	-.000302	.0042241
Inflation						
L1.	-.0017642	.0007515	-2.35	0.019	-.0032372	-.0002912
Householdcons						
D1.	1.22e-11	4.08e-12	2.98	0.003	4.15e-12	2.02e-11
govfincon	-.1671491	.0799169	-2.09	0.036	-.3237833	-.0105148
Exports	.1377093	.0214336	6.42	0.000	.0957001	.1797184

Table 7 - Blundell/Bond Estimation with Control Variables and Dummies

Lagged private consumption, lagged broad money growth and exports have a positive coefficient, so they have a beneficial effect on growth (like economic theory suggests). Government expenditure and lagged inflation have the opposite, harming growth. All three monetary regimes' dummies are significant at a 10 % level and have positive coefficients. Inflation targeting presents the higher coefficient, closely followed by monetary targeting, followed by exchange rate targeting, validating what was seen in the literature regarding. To assess if the significant dummies have equal or different impact on growth, tests were conducted, as seen in table 8.

```
( 1)  DUMMY1MON - DUMMY3IT = 0

          chi2(  1) =    0.01
        Prob > chi2 =    0.9368

( 1)  DUMMY1MON - DUMMY2ER = 0
( 2)  DUMMY1MON - DUMMY3IT = 0

          chi2(  2) =    0.41
        Prob > chi2 =    0.8141
```

Table 8 - Dummies' impact on growth test

Regarding the tests featured in table 8, in the first one the null hypothesis isn't rejected, dummies 1 and 3 while significant can have the same impact on economic growth. In the second test, we also don't reject the null hypothesis, so the three conventional monetary policy dummies can have the same impact on growth. Subsequently, these tests question if the regimes are in fact different in how they can enhance economic growth. Since they were constructed with the full dataset, we can assume that it would been very difficult for the results to point to a severe difference within regimes and their impact on growth.

In the next section we extend the analysis by looking at subsamples, one based on the countries' state of development and the other on different economic periods. These are needed to help having a better and more detailed analysis of how different monetary policies boost or harm economic growth.

5.4. Specification Tests

To confirm the quality of the regression made above, some tests were conducted as seen in table 9, namely autocorrelation and overidentifying restrictions, and both validate the regression results. The Sargan test shows that the p-value is in the 100% threshold, so the instruments are valid, as for the Arellano-Bond test concerning auto-correlation of the error term there is no autocorrelation. The first lag isn't considered because the regression is a dynamic one with 1 lag in the dependent variable.

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(1175)     =  95.3615
        Prob > chi2    =   1.0000
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-4.9164	0.0000
2	-.74766	0.4547
3	.78583	0.4320
4	-.70033	0.4837

```
H0: no autocorrelation
```

Table 9 - Robustness tests for Blundell/Bond Regression with Control Variables and Dummies

5.5. Robustness Analysis

5.5.1. Different Time Periods

Here, we apply the panel data Blundell and Bond regression to different time periods subsamples, the same methodology as in the main panel data regression and using robust standard errors as well.

The first period (1970-1980) lacks enough available data to make robust conclusions on monetary regimes' impact; in addition, it only features exchange rate targeting and monetary growth targeting. The regression made within this period (see appendices – table C.1.), although showing significance in the dummy variables, does not present any substantial differences between the two regimes (the coefficients are very close). Something that is confirmed when testing the equality of the two dummies to affect economic growth, where the null hypothesis that states the two regimes have an equal impact isn't rejected (see appendices – table C.2.).

Therefore, the periods relevant in this section are the second one (1981-2008) where inflation targeting started to be adopted and the third one (2009-2018), post great recession.

In the second period panel data regression, with two lags in the dependent variable, all the dummies and most control variables are significant at a 10% level, except for broad money growth that is slightly insignificant, as seen in table 10. Monetary targeting surpasses inflation targeting, unlike the general regression (with full time data set), as the regime with the highest coefficient. Exchange rate targeting remains the regime with the lowest coefficient. Nonetheless, when assessing with tests if the regimes have difference in affecting growth, we can't reject the null hypothesis that states that their impact on growth is similar (see appendices - table C.3.). Control variables also have similar values to the ones registered in the general regression. Specification tests (Sargan and Arellano-Bond autocorrelation) validate these results (see appendices, table D1).

System dynamic panel-data estimation — Number of obs = 1,519
Group variable: ID — Number of groups = 95
Time variable: Year

Obs per group:
min = 1
avg = 15.98947
max = 28

Number of instruments = 694 — Wald chi2(8) = 43.99
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.1070227	.046523	2.30	0.021	.0158394	.1982061
DUMMY1MON	3.770951	1.948906	1.93	0.053	-.0488341	7.590736
DUMMY2ER	3.222964	1.818013	1.77	0.076	-.3402763	6.786205
DUMMY3IT	3.215264	1.836627	1.75	0.080	-.3844592	6.814988
Broadmoneygrowth						
L1.	.0022632	.0014683	1.54	0.123	-.0006146	.005141
Inflation						
L1.	-.0020892	.0009995	-2.09	0.037	-.0040482	-.0001303
Householdcons						
D1.	1.02e-11	5.04e-12	2.01	0.044	2.70e-13	2.00e-11
govfincon	-.1806791	.0910317	-1.98	0.047	-.3590979	-.0022603
Exports	.1144609	.0250987	4.56	0.000	.0652682	.1636535

Table 10 - Panel Data Regression in the Second Period (1981-2008)

In the third period (2009-2018), significance issues do not allow relevant conclusions, as we can see in table 11. While adopting the same methodology, with robust standard errors and two lags in the dependent variable, the results fail to deliver significance, either in a solely dummies regression or with control variables. However, introducing the dummy quantitative easing, a significant result is obtained. Quantitative easing does not serve as a fourth regime opposing the other three but as a stand-in for unconventional monetary policy for every country that adopted it, regardless of their main monetary regime.

System dynamic panel-data estimation — Number of obs = 1,218
Group variable: ID — Number of groups = 123
Time variable: Year

Obs per group:
min = 4
avg = 9.902439
max = 10

Number of instruments = 439 — Wald chi2(6) = 79.90
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	-.3357148	.2200765	-1.53	0.127	-.7670567	.0956272
L2.	-.2517762	.1450194	-1.74	0.083	-.5360091	.0324566
DUMMY1MON	5.25532	6.995823	0.75	0.453	-8.45624	18.96688
DUMMY2ER	3.538198	2.47114	1.43	0.152	-1.305146	8.381543
DUMMY3IT	1.919243	4.919519	0.39	0.696	-7.722837	11.56132
DUMMY4QE	-2.798341	1.705207	-1.64	0.101	-6.140485	.5438029

Table 11 - Panel Data Regression in the Third Period (2009-2018) with QE

Quantitative easing is the only dummy that presents significance and it displays a negative coefficient, in table 11. The annual GDP *per capita* growth rates in countries that adopted quantitative easing are mostly negative or very close to zero in the four years following the 2008 recession, as one would assume, but they don't present a stable growth tendency in the remaining of this period.

To obtain significance for this third period, the panel regression was readjusted, computing with the robust standard errors, one lag in the dependent variable and with the same control variables, but summing up the household consumption (private) and government consumption (public) in one: final consumption. These changes are reflected in table 12. Exchange rate targeting and inflation targeting are statistically significant, unlike monetary targeting (in this period there were few countries with this regime) and quantitative easing. As for the control variables final consumption and exports are significant. Specification tests (Sargan and Arellano-Bond autocorrelation) validate these results (see appendices, table D3).

Exchange rate targeting presents a higher coefficient than inflation targeting. Therefore, one could make the case that in the post 2008 recession, the exchange rate regime can help more economic growth, as opposed to the dominant literature view that it works as an opposite solution to inflation targeting, if one fails the other has to succeed. However, the tests computed to verify if the regimes' dummies present an equal impact on economic growth (see appendices – table C.4.) conclude that we can't reject the null hypothesis in which the dummies have the same bearing on growth.

System dynamic panel-data estimation — Number of obs = 925
Group variable: ID — Number of groups = 100
Time variable: Year

Obs per group:
min = 1
avg = 9.25
max = 10

Number of instruments = 443 — Wald chi2(9) = 119.65
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.0918752	.0478194	1.92	0.055	-.0018492	.1855996
DUMMY1MON	7.611893	5.534576	1.38	0.169	-3.235676	18.45946
DUMMY2ER	10.19809	4.41141	2.31	0.021	1.551886	18.8443
DUMMY3IT	8.169764	4.322608	1.89	0.059	-.3023929	16.64192
DUMMY4QE	-.4086094	3.780686	-0.11	0.914	-7.818618	7.001399
Broadmoneygrowth						
L1.	.0322862	.0222956	1.45	0.148	-.0114125	.0759848
Inflation						
L1.	-.0905796	.0634601	-1.43	0.153	-.2149591	.0337998
Finalconsumption	-.1051835	.0604097	-1.74	0.082	-.2235844	.0132175
Exports	.1403175	.0303489	4.62	0.000	.0808347	.1998004

Table 12 - Panel Data Regression in the Third Period (2009-2018) with Control Variables

5.5.2. Development Level

Applying the same methodology, a Blundell/Bond panel data regression with robust standard errors is presented in table 13, this time considering the level of development and splitting the dataset in tow large groups (as mentioned in section 3.2.). The same principle of including the control variables that remain significant and do not compromise the dummies' significance is kept, included as relevant in this section: exports, private consumption and government expenditure. Specification tests (Sargan and Arellano-Bond autocorrelation) validate these results (see appendices, table E1).

System dynamic panel-data estimation — Number of obs = 2,555
Group variable: ID — Number of groups = 86
Time variable: Year

Obs per group:
min = 4
avg = 29.7093
max = 48

Number of instruments = 1.2e+03 — Wald chi2(6) = 297.41
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	.1939514	.0303174	6.40	0.000	.1345303	.2533724
DUMMY1MON	4.557648	4.158195	1.10	0.273	-3.592264	12.70756
DUMMY2ER	3.538471	2.322751	1.52	0.128	-1.014037	8.090978
DUMMY3IT	4.593746	2.576207	1.78	0.075	-.4555259	9.643019
Householdcons						
D1.	8.17e-12	2.71e-12	3.01	0.003	2.85e-12	1.35e-11
govfincon	-.2310825	.1588891	-1.45	0.146	-.5424994	.0803344
Exports	.2109526	.025961	8.13	0.000	.16007	.2618351

Table 13 - Panel Data Regression in Strongly Developed Countries

The results in Table 13 target the strongly developed countries. Inflation targeting presents significance and has the higher coefficient, whereas monetary targeting remains insignificant (but then again, a minority of countries adopted this regime). All control variables are significant. These results are identical to the ones observed in Table 4 – "Blundell/Bond estimation with control variables and dummies" and the ones registered in the regression made solely in the second period (1981-2008).

Again, as seen in the regressions for the subperiods, when testing for the dummies' equal impact on economic growth (see appendices – table F.1.) we can't reject the null hypothesis that the regimes' dummies can have the same bearing on growth. However, when computing the same test for the regression but without the robust standard errors, the results indicate that we can reject the null – regimes' dummies don't have the same impact on growth (see appendices – table F.2.).

The study of weakly developed countries in a separate group, proved to be unsuccessful. In several regressions with and without control variables, conclusions lacked significance in any dummy or control variable.

5.6. Discussion and Policy Implications

Regressions' results show that in general estimations the regimes do not produce identical effects on economic growth. However, throughout this thesis most of the tests assessing if the regimes' dummies have the same impact on growth point that we can't reject the null hypothesis. Thus, the monetary policy strategies can have an equal influence in growth.

In the general regression with control variables (table 7) inflation targeting is the regime with a higher positive coefficient, closely followed by monetary targeting and then exchange rate targeting. In the sub-period: 1981-2008 regression (table 10) as similar results to the ones in the general regression, with monetary targeting and inflation targeting switching places in order of coefficient value. In the other sub-period studied: 2009-2018 (table 11), exchange rate targeting (unlike the previous regressions) is the regime with the highest coefficient.

In the subsection of more strongly developed countries, monetary targeting does not present significance, leaving inflation targeting as the regime with a higher coefficient. As for exchange rate targeting, it too has a positive coefficient but not as high as inflation targeting, nonetheless it cannot be dismissed as a regime that can propel economic growth in recent years (Kruskovic, 2020).

Discussing the regimes' adoption or rejection, there was a clear surge of inflation targeting during the 1990s over exchange rate targeting and monetary targeting, especially in more developed countries. Exchange rate targeting continues to dominate monetary policy in developing countries, although some developed countries, even in the Eurozone, still rely on this strategy. The results obtained in the dummies' impact on growth tests (appendices - group C and F) hint that there is no difference in the extent that the conventional monetary strategies can influence economic growth. This doesn't mean that the selection of the regimes by the central banks should be random or that it doesn't matter what strategy to follow. They are periodical, geographic and development wise patterns that emerge from the regressions that are pivotal to understand which regime better suits a given country.

Monetary targeting, the regime with less followers, is also the regime more difficult to label as such, for unlike inflation targeting they don't all follow the same intermediate target or goal. An argument developed by Farayibi (2017) pointed out that monetary targeting has been progressively dismissed in favor of inflation targeting due to a deteriorating relationship between the goal (price

stability or nominal income) and target (money aggregates) variables. Thus, undermining the regime's accountability and capacity to fix inflation expectations, something that was aggravated by the consequences of the great recession. On the other hand, there is also the argument discussed in the literature review, in which the demanding preconditions available only in advanced and rich economies make money targeting a very hard to practice strategy (Schmid, 1999).

Regarding exchange rate targeting, the major setback to this strategy remains the impossibility of controlling the interest rate by the central bank. For the macroeconomic trilemma implies than in conditions of free capital mobility if a central bank adopts exchange rate targeting it loses control of interest rate, with possible consequences such as a rise in money supply. However, this regime is still appealing to many central banks because it can mitigate and absorb external shocks, like changes in oil prices, through changing exchange rate target, rather than through inflation (Kruskovic, 2020).

As for inflation targeting, unlike monetary targeting, it does not depend on a relationship between money and inflation (and its stability), besides being highly transparent and easily understood by the public (Farayibi, 2017). This strategy is prominently presented as the regime with better results and suitable for different scenarios but in most cases, it was embraced in favorable macroeconomic settings with absence of supply shocks and low deficits in the most developed economies (Kruskovic, 2020).

Concerning unconventional monetary policy, only discussed in the 2009-2018 regression, gained a lot of relevance as a crucial strategy to the revival of large economies in the great recession aftermath.

Finally, another considered theme was the long-lasting effects of monetary policy on economic growth, addressing the long-run money neutrality of money, issue that is essential when assessing monetary policy's impact on growth. By looking to the regressions made and considering the time expand of the same, almost every monetary regime dummy created had significance. Jordá *et al.* (2020)'s paper consistently spoke of money non-neutrality on economic growth in the long-term by analyzing its components and monetary policy indeed has long-running effects on output, capital and total factor productivity. However, the Keynesian view is uncertain of monetary policy's role when the economy is in a liquidity trap and tackles the uncertainty within the financial markets that harms policymaking (Twinoburyo and Odhiambo, 2018). Is mainly due to the latter point, uncertainty in the markets and as the result from unexpected shocks, at last as an agent of

disturbance of future economic performance that undermines outcome's accuracy of macroeconomic policies that places greater demand on policymakers and their targets (Farayibi, 2017). For it must not be neglected that money aggregates' dynamics can magnify the effect of uncertainty on policymaking.

6. Conclusions

This dissertation aimed at discussing and studying the relationship between economic growth and monetary policy regimes and its different strategies' effects. To analyze this relationship a dynamic panel data model for the annual % of GDP *per capita* growth rate was built, with data from 126 countries during a period extending from 1970 to 2018. Three dummies were created for conventional monetary policy regimes (monetary targeting, inflation targeting and exchange rate targeting) and finally a dummy representing unconventional policy, namely QE, was also built.

In the literature there is little consensus on the relationship between economic growth and monetary policy, in part due to the small number of studies conducted. Most results are inconclusive, some conclude a slightly positive effect of monetary policy on growth like Wong and Chong (2019) with IT being the best regime assessed. Unlike these latter authors' paper there isn't a clear dropping of ERT as a rival strategy, for it too induces growth, sometimes even more than its conventional counterparts like in the most recent period studied (although this period – post 2008 wasn't covered by Wong and Chong). Another main difference to Wong and Chong (2019) is the consideration of MT as a reliable and considerably different alternative to IT.

The regressions' results show that most coefficients are significant and that most independent variables' coefficients present signs according to economic theory. For all estimations made, inflation and government expenditures had always a negative impact on GDP *per capita* annual growth rate. In contrast, broad money growth, exports and private consumption always exhibited a positive coefficient.

Regarding the regime dummies, the impact of conventional monetary policies had differences in the level of intensity but with positive coefficients. The general regression indicates IT and then MT as the higher coefficient significant dummies with a one-point difference to ERT. In the period of 1981-2008, MT and IT had slightly higher coefficients than ERT, fact that contrasts with the period after 2008 because here ERT is clearly the strategy with greater effect on growth. Unconventional monetary policy's dummy (stand-in for QE) has a negative signed coefficient and

at most cases not significant, which can be credited to the effort made by the most developed countries to cease the financial turmoil (in some cases with delay).

There is a clear dominance of IT in the recent decades, replacing ERT and MT, even though ERT remains a very important strategy. When linking monetary policy strategy with level of development, IT is the most successful strategy among developed countries. As for the underdeveloped economies the results are inconclusive for lack of significance.

The results obtained in testing the dummies' equal impact on growth suggest that there isn't any practical difference in the way the conventional regimes influence growth. Nonetheless, the patterns observed throughout the regressions link the regimes to a certain stage of development. The selection of a conventional regime must come from a comprehensive study of the country's needs and adversities that it faces, as well as an understanding of the underlying compromises each regime causes.

This research has achieved its proposed goals, nevertheless with some limitations. To study a long period as was aimed in this thesis carries some disadvantages, for the study of long-term periods with variables such as inflation can counterbalance certain components' influence and dismisses features of inflation processes as seen in Mishchenko et al. (2018). Be that as it may, this study covered a very scarce debated theme in literature, therefore it can serve as an encouragement to more research on this area.

7. Bibliography

1. Aghion, P.; Bacchetta, P.; Ranciere, R. and Rogoff, K. (2006) **"Exchange Rate Volatility and Productivity Growth: The Role of Financial Development"**. *Journal of monetary economics* 56(4), 494-513, March 2006
2. Arellano, M. and Bover, O. (1995). "**Another look at the instrumental variable estimation of error-components models**". *Journal of econometrics*, *68*(1), 29-51.
3. Barbieri, L. (2006). "**A Panel Unit Root Tests: A Review**". *Quaderni Del Dipartimento Di Scienze Economiche E Sociali, Serie Rossa: Economia – Quaderno* 43, Ottobre 2006
4. Bech, M. and Malkhozov, A. (2016) "**How have central banks implemented negative policy rates**?". *BIS Quarterly Review* March 2016
5. Belke, A. and Potrafke, N. (2012). "**Does government ideology matter in monetary policy? A panel data analysis for OECD countries**". *Journal of International Money and Finance*, *31*(5), 1126-1139.
6. Blundell, R. and Bond, S. (1998). "**Initial conditions and moment restrictions in dynamic panel data models".** *Journal of econometrics*, *87*(1), 115-143.
7. Bond, S. and Hoeffler, A. (2001). J. Temple (2001), **"GMM Estimation of Empirical Growth Models"**. *Economics group working paper*, W21.
8. Claeys, G. (2014) "**The (not so) Unconventional Monetary Policy of the European Central Bank since 2008".** *Directorate General for Internal Policies, Policy Department A: Economic and Scientific Policy*, June 2014

   Clarida, R.H. (2012) "What has -and has not- been learned about monetary policy in a low-inflation environment? A review of the 2000s". *Journal of Money, Credit and Banking,* 44, 123-140
9. De Vita, G. and Kyaw, K. S. (2009). "**Growth effects of FDI and portfolio investment flows to developing countries: a disaggregated analysis by income levels"**. *Applied economics letters*, 16(3), 277-283.
10. Dell'Ariccia, G.; Rabana, P. and Sandri, D. (2018) "**Unconventional Monetary Policies in the Euro Area, Japan and the United Kingdom**". *Journal of Economic Perspectives* 32 (4): 147-172
11. Draghi, M. (2013) "**Speech by Mario Draghi, President of the European Central bank at the Global Investment Conference in London 26 July 2012**". Via Internet am 11, 2013

12. Eichengreen, B. (2015) The Search for Europe contrasting approaches: "**Take on ECB: problem to solution**": 80-100 BBVA & Open mind

13. Elder, J. (2004). "**Another perspective on the effects of inflation uncertainty**". *Journal of Money, Credit and Banking*, 911-928.

14. Farayibi, A. (2017). "**Economic Policy in an Uncertain World: Insights into Inflation and Monetary Targeting***". Available at SSRN 3035527.*

15. Fischer, S. (1991). "**Growth, macroeconomics, and development"**. *NBER macroeconomics annual*, *6*, 329-364.

16. Friedman, M. (1968) "**The role of Monetary Policy".** *The American Economic Journal* Vol. LVIII, March 1968, Number 1

17. Gros, D. (2016) "**Ultra low or Negative Yields on Euro Area Long-Term Bonds: Causes and Implications for Monetary Policy**". *CEPS Working Documents* (426)

18. Hannikainen, J. (2015) **"Zero lower bound, unconventional monetary policy and indicator properties of interest rates spreads**". *Review of Financial Economics* 26.1 (2015): 47-54

19. Jahan, S. (2012). "**Inflation targeting: Holding the line"**. *Finance & Development.*

20. Jordá, O.; Singh, S.R. and Taylor, A.M. (2020) "**The Long-Run Effects of Monetary Policy".** Bank of San Francisco Working Paper 2020-01. Available at https://doi.org/10.24148/wp2020-01

21. Issing, O. (2011) **"Lessons from Monetary Policy: What should the consensus be?".** *CFS Working Paper*, No. 2011/13, Goethe University, Center for Financial Studies (CFS), Frankfurt a.M.

22. Krušković, B. (2020). "**Exchange Rate Targeting Versus Inflation Targeting: Empirical Analysis of the Impact on Employment and Economic Growth**". *Journal of Central Banking Theory and Practice*, 9(2), 67-85.

23. Kuttner, K.N. (2018) **"Outside the Box: Unconventional Monetary Policy in the Great Recession and Beyond".** *Journal of Economic Perspectives* 32.4: 121-46

24. Leão, E.R.; Lagoa, S.C. and Leão, P.R. (2019) "**Política Monetária e Mercados Financeiros**". 3ª Edição, Sílabo. Lisboa

25. Leitão, N. C. (2010). "**Financial development and economic growth: a panel data approach".** *Theoretical and Applied Economics,* 15-24.

26. Levine, R. (1997). "**Financial development and economic growth: Views and Agenda".** *Journal of Economic Literature*, 25, pp 688-726.

27. Lyonnet, V. and Werner, R. (2012) "**Lessons from the Bank of England on 'quantitative easing' and other 'unconventional' monetary policies".** *International Review of Financial Analysis* 25: 94-105

28. McPhail, K. (2000). **"Broad Money: A Guide for Monetary Policy"**. Bank of Canada (2000), 51-102.

29. Mishchenko, V.; Naumenkova, S.; Mishchenko, S. and Ivanov, V. (2018). "**Inflation and economic growth: The search for a compromise for the Central Bank's monetary policy**". *Banks & bank systems*, (13, Iss. 2), 153-163.

30. Mishkin, F. (2000) "**From Monetary Targeting to Inflation Targeting: Lessons from the Industrialized Countries".** *Graduate School of Business, Columbia University* and *National Bureau of Economic Research* January 2000

31. Mukherjee, S. and Bhattacharya, R. (2011) "**Inflation Targeting and Monetary Policy Transmission Mechanisms in Emerging Market Economies**". *IMF Working Paper* (Middle East and Central Asia Department) October 2011

32. Pattipeilohy, C.; van den End, J.W.; Mostafa Tabbae, J.F. and de Hann, J. (2013) "**Unconventional monetary policy of the ECB during the financial crisis: An assessment and new evidence**". *DNB Working Papers 381*, Netherlands Central Bank, Research Department

33. Schmid, P. (1999) "**Monetary Targeting in Practice: German Experience**". *CFS Working Paper series: Institut fur Kapitalmarktforschung 1999*

34. Stiglitz, J.E. (2008). "**The failure of inflation targeting**". *Project Syndicate*, 13.

35. Svensson, L. E. (2010) "**Inflation targeting**". *In Handbook of monetary economics* (Vol.3 pp.1237-1302) Elsevier

36. Twinoburyo, E. N. and Odhiambo, N. M. (2018). "**Monetary policy and economic growth: a review of international literature".** *Journal of Central Banking Theory and Practice*, 7(2), 123-137

37. Walsh, C.E. (2009) "**Inflation targeting: What have we learned?**". *International Finance* 12:2, 2009: pp.195-233

38. Werner, R.A. and Lee, K.S. (2017) "**Reconsidering Monetary Policy: An empirical examination of the relationship between interest rates and nominal GDP growth in the US, UK, Germany and Japan**". *Ecological Economics* 146, 26-34

39. Wong, K.M. and Chong, T.T.L. (2019) "**Monetary policy regimes and growth revisited from a de facto classification**". *Oxford Economic Papers* 71 (4)

40. Woodford, M. (2007) "**The case for forecast targeting as a monetary policy strategy**". *Journal of Economic perspectives*, 21(4), 3-24

41. Yoshino, N. and Taghizadeh-Hesary, F. (2014) "**3 Arrows of "Abenomics" structural reform of Japan: inflation targeting policy of the Central Bank, fiscal consolidation and growth strategy**". *ADBI Working Paper*, no 492, August 2014

42. Yoshino, N.; Taghizadeh-Hesary, F. and Shimizu, S. (2018) "**Impact of Quantitative Easing and Tax Policy on Income Inequality: Evidence from Japan".** *ADBI Working Paper*, no 891, November 2018

Online Resources:

Jahan, S. (2012). "**Inflation targeting: Holding the line"**. *Finance & Development,* accessed on 01 August 2020

https://www.imf.org/external/pubs/ft/fandd/basics/pdf/jahpan-inflation-targeting.pdf

United Nations - Human Development Report, beyond income, beyond averages, beyond today: Inequalities in human development in the 21st century published by the *United Nations Development Program in 2019*, 2019, accessed on 01 August 2020

http://hdr.undp.org/sites/default/files/hdr2019.pdf

Appendices

Group A

	(1) GDP	(2) GDP
Inflation	-0.112***	-0.111***
	(0.000)	(0.000)
Finalconsu~n	-0.0462	-0.0469
	(0.101)	(0.099)
Householdc~s	-7.27e-14	3.12e-14
	(0.961)	(0.983)
govfincon	-0.121*	-0.119*
	(0.029)	(0.031)
Exports	0.114***	0.114***
	(0.000)	(0.000)
Broadmoney~h	0.146***	0.144***
	(0.000)	(0.000)
Grosscapital	-1.62e-14	-1.51e-14
	(0.582)	(0.607)
DUMMY1MON	0.688	
	(0.443)	
period	0	0
	(.)	(.)
DUMMY2ER		-0.536
		(0.530)
_cons	5.479*	6.068*
	(0.030)	(0.012)
N	305	305
R-sq	0.316	0.315
adj. R-sq	0.297	0.297

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table A1 - First period (1970-1980) OLS regression

	(1) GDP	(2) GDP	(3) GDP
Inflation	-0.0152***	-0.0147***	-0.0151***
	(0.000)	(0.000)	(0.000)
Finalconsu~n	0.0257	0.0345*	0.0290
	(0.102)	(0.027)	(0.057)
Householdc~s	-1.63e-13	-2.57e-13	-1.61e-13
	(0.373)	(0.147)	(0.360)
RealIR	0.00998	0.0115	0.0102
	(0.109)	(0.064)	(0.097)
Unemployment	0.00309	-0.00373	-0.000968
	(0.913)	(0.896)	(0.973)
REER	-0.00807	-0.00953	-0.00743
	(0.211)	(0.135)	(0.246)
Exports	0.107***	0.103***	0.106***
	(0.000)	(0.000)	(0.000)
Portfolioi~t	8.39e-13	7.85e-14	1.25e-12
	(0.733)	(0.974)	(0.606)
Broadmoney~h	0.0146	0.0153	0.0163
	(0.087)	(0.074)	(0.056)
govfincon	-0.0809**	-0.0878**	-0.0945**
	(0.007)	(0.004)	(0.002)
privcredit	0.00279	0.00352	0.00182
	(0.426)	(0.306)	(0.604)
Grosscapital	1.54e-15	1.03e-15	9.48e-16
	(0.629)	(0.749)	(0.766)
DUMMY1MON	-0.380		
	(0.238)		
period2	0	0	0
	(.)	(.)	(.)
DUMMY2ER		-0.455	
		(0.185)	
DUMMY3IT			0.727*
			(0.019)
_cons	1.773	1.387	1.343
	(0.167)	(0.265)	(0.279)
N	527	527	527
R-sq	0.151	0.152	0.158
adj. R-sq	0.130	0.130	0.137

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table A2 - Second period (1981-2008) OLS regression

	(1) GDP	(2) GDP	(3) GDP
Inflation	-0.215***	-0.207***	-0.202***
	(0.000)	(0.000)	(0.000)
Finalconsu~n	0.0330*	0.0311*	0.0281*
	(0.025)	(0.032)	(0.050)
Householdc~s	9.30e-14	5.97e-14	5.83e-14
	(0.363)	(0.552)	(0.567)
RealIR	-0.0644**	-0.0680**	-0.0643**
	(0.002)	(0.001)	(0.002)
Unemployment	-0.0734*	-0.0732*	-0.0711*
	(0.012)	(0.012)	(0.015)
REER	0.0122	0.0155	0.0148
	(0.297)	(0.187)	(0.210)
Exports	0.0976***	0.0956***	0.0957***
	(0.000)	(0.000)	(0.000)
Portfolioi~t	-1.15e-12	-6.49e-13	-6.60e-13
	(0.634)	(0.786)	(0.784)
Broadmoney~h	0.115***	0.116***	0.115***
	(0.000)	(0.000)	(0.000)
govfincon	-0.00486	-0.00481	-0.00649
	(0.796)	(0.798)	(0.730)
privcredit	-0.00436	-0.00460	-0.00472
	(0.217)	(0.192)	(0.182)
Grosscapital	1.61e-15	8.42e-16	1.12e-15
	(0.366)	(0.641)	(0.541)
DUMMY1MON	0.645		
	(0.173)		
DUMMY4QE	-1.746*	-1.498*	-1.329
	(0.022)	(0.036)	(0.062)
period3	0	0	0
	(.)	(.)	(.)
DUMMY2ER		-0.401	
		(0.178)	
DUMMY3IT			0.133
			(0.640)
_cons	-1.326	-1.276	-1.212
	(0.405)	(0.422)	(0.454)
N	383	383	383
R-sq	0.329	0.329	0.326
adj. R-sq	0.303	0.303	0.300

p-values in parentheses
* p<0.05, ** p<0.01, *** p<0.001

Table A3 - Third period (2009-2018) OLS regression

Group B

```
Fisher-type unit-root test for GDP
Based on augmented Dickey-Fuller tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  43.43

AR parameter: Panel-specific               Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                 ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      1880.3307       0.0000
 Inverse normal            Z       -34.0227       0.0000
 Inverse logit t(629)      L*      -46.2024       0.0000
 Modified inv. chi-squared Pm       72.9106       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------


Fisher-type unit-root test for GDP
Based on Phillips-Perron tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  43.43

AR parameter:    Panel-specific            Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      2783.9651       0.0000
 Inverse normal            Z       -43.4408       0.0000
 Inverse logit t(629)      L*      -68.5722       0.0000
 Modified inv. chi-squared Pm      113.3224       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------


Im-Pesaran-Shin unit-root test for GDP
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: Some panels are stationary             Avg. number of periods =  43.43

AR parameter: Panel-specific               Asymptotics: T,N -> Infinity
Panel means:  Included                                  sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 W-t-bar            -33.5250        0.0000
------------------------------------------------------------------------------
```

Table B1- Unit Root Tests for Variable GDP

Fisher-type unit-root test for Inflation
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots — Number of panels = 125
Ha: At least one panel is stationary — Avg. number of periods = 41.60

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Not included — ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(250)	P	1345.8428	0.0000
Inverse normal	Z	-23.0396	0.0000
Inverse logit t(629)	L*	-31.7691	0.0000
Modified inv. chi-squared	Pm	49.0076	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for Inflation
Based on Phillips-Perron tests

Ho: All panels contain unit roots — Number of panels = 125
Ha: At least one panel is stationary — Avg. number of periods = 41.60

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Newey-West lags: 1 lag

		Statistic	p-value
Inverse chi-squared(250)	P	1753.1658	0.0000
Inverse normal	Z	-27.4484	0.0000
Inverse logit t(624)	L*	-42.4921	0.0000
Modified inv. chi-squared	Pm	67.2236	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Im-Pesaran-Shin unit-root test for Inflation

Ho: All panels contain unit roots — Number of panels = 125
Ha: Some panels are stationary — Avg. number of periods = 41.60

AR parameter: Panel-specific — Asymptotics: T,N -> Infinity sequentially
Panel means: Included
Time trend: Not included

ADF regressions: 1 lag

	Statistic	p-value
W-t-bar	-32.4172	0.0000

Table B2- Unit Root Tests for Variable Inflation

```
Fisher-type unit-root test for D.Householdcons
Based on augmented Dickey-Fuller tests
-------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  40.24

AR parameter: Panel-specific               Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                 ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      1584.1194       0.0000
 Inverse normal            Z       -29.2153       0.0000
 Inverse logit t(629)      L*      -38.2564       0.0000
 Modified inv. chi-squared Pm       59.6636       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for D.Householdcons
Based on Phillips-Perron tests
-------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  40.24

AR parameter:    Panel-specific            Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      2498.7626       0.0000
 Inverse normal            Z       -40.3923       0.0000
 Inverse logit t(629)      L*      -61.2258       0.0000
 Modified inv. chi-squared Pm      100.5677       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.

Im-Pesaran-Shin unit-root test for D.Householdcons
-------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: Some panels are stationary             Avg. number of periods =  40.24

AR parameter: Panel-specific               Asymptotics: T,N -> Infinity
Panel means:  Included                                  sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------------
                  Statistic      p-value
------------------------------------------------------------------------------
 W-t-bar           -27.1634        0.0000
```

Table B3 - Unit Root Tests for Variable Household Consumption (first differences)

```
Fisher-type unit-root test for RealIR
Based on augmented Dickey-Fuller tests
-------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  22.10

AR parameter: Panel-specific               Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                 ADF regressions: 1 lag
```

		Statistic	p-value
Inverse chi-squared(184)	P	897.0521	0.0000
Inverse normal	Z	-21.5316	0.0000
Inverse logit t(459)	L*	-25.5038	0.0000
Modified inv. chi-squared	Pm	37.1704	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

```
Fisher-type unit-root test for RealIR
Based on Phillips-Perron tests
-------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  22.10

AR parameter:    Panel-specific            Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
```

		Statistic	p-value
Inverse chi-squared(184)	P	2171.2967	0.0000
Inverse normal	Z	-38.8796	0.0000
Inverse logit t(464)	L*	-62.3545	0.0000
Modified inv. chi-squared	Pm	103.5950	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Table B4 - Unit Root tests for Variable Real Interest Rates

```
Fisher-type unit-root test for Unemployment
Based on augmented Dickey-Fuller tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  31.10

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P       507.0414       0.0000
 Inverse normal            Z        -8.2514       0.0000
 Inverse logit t(629)      L*       -9.3035       0.0000
 Modified inv. chi-squared Pm       11.4952       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.


Fisher-type unit-root test for Unemployment
Based on Phillips-Perron tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  31.10

AR parameter:    Panel-specific             Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P       338.0133       0.0002
 Inverse normal            Z        -2.8288       0.0023
 Inverse logit t(629)      L*       -3.5346       0.0002
 Modified inv. chi-squared Pm        3.9361       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Im-Pesaran-Shin unit-root test for Unemployment
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: Some panels are stationary              Avg. number of periods =  31.10

AR parameter: Panel-specific                Asymptotics: T,N -> Infinity
Panel means:  Included                                   sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------------
                     Statistic      p-value
------------------------------------------------------------------------------
 W-t-bar              -7.7377        0.0000
------------------------------------------------------------------------------
```

Table B5 - Unit Root Tests for Variable Unemployment

```
Fisher-type unit-root test for REER
Based on augmented Dickey-Fuller tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =     77
Ha: At least one panel is stationary       Avg. number of periods =  36.64

AR parameter: Panel-specific               Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                 ADF regressions: 1 lag
------------------------------------------------------------------------------
                                     Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(154)  P        487.4432       0.0000
 Inverse normal            Z         -9.6434       0.0000
 Inverse logit t(389)      L*       -13.1231       0.0000
 Modified inv. chi-squared Pm        18.9997       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Fisher-type unit-root test for REER
Based on Phillips-Perron tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =     77
Ha: At least one panel is stationary       Avg. number of periods =  36.64

AR parameter:    Panel-specific            Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                     Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(154)  P        356.2392       0.0000
 Inverse normal            Z         -6.7966       0.0000
 Inverse logit t(384)      L*        -8.8532       0.0000
 Modified inv. chi-squared Pm        11.5237       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Im-Pesaran-Shin unit-root test for REER
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =     77
Ha: Some panels are stationary             Avg. number of periods =  36.64

AR parameter: Panel-specific               Asymptotics: T,N -> Infinity
Panel means:  Included                                  sequentially
Time trend:   Not included

ADF regressions: 1 lags
------------------------------------------------------------------------------
                     Statistic      p-value
------------------------------------------------------------------------------
 W-t-bar             -28.0236        0.0000
------------------------------------------------------------------------------
```

Table B6 - Unit Root Tests for Variable REER

Fisher-type unit-root test for **Exports**
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots — Number of panels = 123
Ha: At least one panel is stationary — Avg. number of periods = 37.47

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Drift term: Not included — ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(246)	P	2192.6005	0.0000
Inverse normal	Z	-37.0941	0.0000
Inverse logit t(619)	L*	-54.0032	0.0000
Modified inv. chi-squared	Pm	87.7595	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **Exports**
Based on Phillips-Perron tests

Ho: All panels contain unit roots — Number of panels = 123
Ha: At least one panel is stationary — Avg. number of periods = 37.47

AR parameter: Panel-specific — Asymptotics: T -> Infinity
Panel means: Included
Time trend: Not included
Newey-West lags: 1 lag

		Statistic	p-value
Inverse chi-squared(246)	P	3490.1618	0.0000
Inverse normal	Z	-49.8682	0.0000
Inverse logit t(619)	L*	-86.4590	0.0000
Modified inv. chi-squared	Pm	146.2581	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Im-Pesaran-Shin unit-root test for **Exports**

Ho: All panels contain unit roots — Number of panels = 123
Ha: Some panels are stationary — Avg. number of periods = 37.47

AR parameter: Panel-specific — Asymptotics: T,N -> Infinity sequentially
Panel means: Included
Time trend: Not included

ADF regressions: 1 lags

	Statistic	p-value
W-t-bar	-34.3490	0.0000

Table B7 - Unit Root Tests for Variable Exports

```
Fisher-type unit-root test for Portfolioinvestmentnet
Based on augmented Dickey-Fuller tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    118
Ha: At least one panel is stationary        Avg. number of periods =  29.14

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(230)  P       804.1023       0.0000
 Inverse normal            Z       -16.5115       0.0000
 Inverse logit t(569)      L*      -19.1576       0.0000
 Modified inv. chi-squared Pm       26.7677       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Fisher-type unit-root test for Portfolioinvestmentnet
Based on Phillips-Perron tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    118
Ha: At least one panel is stationary        Avg. number of periods =  29.14

AR parameter:    Panel-specific             Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(234)  P      1550.1992       0.0000
 Inverse normal            Z       -28.3871       0.0000
 Inverse logit t(584)      L*      -39.1373       0.0000
 Modified inv. chi-squared Pm       60.8413       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------
```

Table B8 - Unit Root Tests for Variable Portfolio investment

Fisher-type unit-root test for **Broadmoneygrowthannual**
Based on augmented Dickey-Fuller tests

Ho: All panels contain unit roots — Number of panels = 107
Ha: At least one panel is stationary — Avg. number of periods = 42.58

AR parameter: **Panel-specific** — Asymptotics: T -> Infinity
Panel means: **Included**
Time trend: **Not included**
Drift term: **Not included** — ADF regressions: 1 lag

		Statistic	p-value
Inverse chi-squared(214)	P	1310.3565	0.0000
Inverse normal	Z	-25.4784	0.0000
Inverse logit t(534)	L*	-34.5768	0.0000
Modified inv. chi-squared	Pm	52.9944	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Fisher-type unit-root test for **Broadmoneygrowthannual**
Based on Phillips-Perron tests

Ho: All panels contain unit roots — Number of panels = 107
Ha: At least one panel is stationary — Avg. number of periods = 42.58

AR parameter: **Panel-specific** — Asymptotics: T -> Infinity
Panel means: **Included**
Time trend: **Not included**
Newey-West lags: 1 lag

		Statistic	p-value
Inverse chi-squared(214)	P	2521.0668	0.0000
Inverse normal	Z	-40.4683	0.0000
Inverse logit t(539)	L*	-67.0576	0.0000
Modified inv. chi-squared	Pm	111.5163	0.0000

P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.

Im-Pesaran-Shin unit-root test for **Broadmoneygrowthannual**

Ho: All panels contain unit roots — Number of panels = 107
Ha: Some panels are stationary — Avg. number of periods = 42.58

AR parameter: **Panel-specific** — Asymptotics: T,N -> Infinity sequentially
Panel means: **Included**
Time trend: **Included** — Cross-sectional means removed

ADF regressions: **No lags included**

			Fixed-N exact critical values		
	Statistic	p-value	1%	5%	10%
t-bar	-5.6745		(Not available)		
t-tilde-bar	-3.7781				
Z-t-tilde-bar	-29.8948	0.0000			

Table B9 - Unit Root Tests for Variable Broad money growth annual

```
Fisher-type unit-root test for govfincon
Based on augmented Dickey-Fuller tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  41.64

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
Inverse chi-squared(250)  P        471.9768       0.0000
Inverse normal            Z         -7.7006       0.0000
Inverse logit t(629)      L*        -8.2978       0.0000
Modified inv. chi-squared Pm         9.9271       0.0000
------------------------------------------------------------------------------
P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Fisher-type unit-root test for govfincon
Based on Phillips-Perron tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  41.64

AR parameter:    Panel-specific             Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
Inverse chi-squared(250)  P        484.5875       0.0000
Inverse normal            Z         -8.0833       0.0000
Inverse logit t(629)      L*        -8.7996       0.0000
Modified inv. chi-squared Pm        10.4911       0.0000
------------------------------------------------------------------------------
P statistic requires number of panels to be finite.
Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Im-Pesaran-Shin unit-root test for govfincon
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: Some panels are stationary              Avg. number of periods =  41.64

AR parameter: Panel-specific                Asymptotics: T,N -> Infinity
Panel means:  Included                                   sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------------
                     Statistic      p-value
------------------------------------------------------------------------------
W-t-bar               -7.2433        0.0000
------------------------------------------------------------------------------
```

Table B10 - Unit Root Tests for Variable Government Final Consumption

```
Fisher-type unit-root test for D.privcredit
Based on augmented Dickey-Fuller tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  37.17

AR parameter: Panel-specific               Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                 ADF regressions: 1 lag
------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------
 Inverse chi-squared(250)  P      1676.5490       0.0000
 Inverse normal            Z       -29.9723       0.0000
 Inverse logit t(629)      L*      -40.3947       0.0000
 Modified inv. chi-squared Pm       63.7972       0.0000
------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------

Fisher-type unit-root test for D.privcredit
Based on Phillips-Perron tests
------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: At least one panel is stationary       Avg. number of periods =  37.17

AR parameter:    Panel-specific            Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------
 Inverse chi-squared(250)  P      3034.1348       0.0000
 Inverse normal            Z       -44.5332       0.0000
 Inverse logit t(629)      L*      -74.1349       0.0000
 Modified inv. chi-squared Pm      124.5103       0.0000
------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------

Im-Pesaran-Shin unit-root test for D.privcredit
----------------------------------------------
Ho: All panels contain unit roots          Number of panels       =    125
Ha: Some panels are stationary             Avg. number of periods =  37.17

AR parameter: Panel-specific               Asymptotics: T,N -> Infinity
Panel means:  Included                                  sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------
 W-t-bar            -27.6411        0.0000
------------------------------------------------------------------------
```

Table B11 - Unit Root Tests for Variable Private Credit (first differences)

```
Fisher-type unit-root test for D.Grosscapital
Based on augmented Dickey-Fuller tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  41.38

AR parameter: Panel-specific                Asymptotics: T -> Infinity
Panel means:  Included
Time trend:   Not included
Drift term:   Not included                  ADF regressions: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      1713.5609       0.0000
 Inverse normal            Z       -28.2968       0.0000
 Inverse logit t(619)      L*      -40.6487       0.0000
 Modified inv. chi-squared Pm       65.4524       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Fisher-type unit-root test for D.Grosscapital
Based on Phillips-Perron tests
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: At least one panel is stationary        Avg. number of periods =  41.38

AR parameter:    Panel-specific             Asymptotics: T -> Infinity
Panel means:     Included
Time trend:      Not included
Newey-West lags: 1 lag
------------------------------------------------------------------------------
                                  Statistic      p-value
------------------------------------------------------------------------------
 Inverse chi-squared(250)  P      2568.5060       0.0000
 Inverse normal            Z       -39.1916       0.0000
 Inverse logit t(619)      L*      -62.7325       0.0000
 Modified inv. chi-squared Pm      103.6867       0.0000
------------------------------------------------------------------------------
 P statistic requires number of panels to be finite.
 Other statistics are suitable for finite or infinite number of panels.
------------------------------------------------------------------------------

Im-Pesaran-Shin unit-root test for D.Grosscapital
------------------------------------------------------------------------------
Ho: All panels contain unit roots           Number of panels       =    125
Ha: Some panels are stationary              Avg. number of periods =  41.38

AR parameter: Panel-specific                Asymptotics: T,N -> Infinity
Panel means:  Included                                   sequentially
Time trend:   Not included

ADF regressions: 1 lag
------------------------------------------------------------------------------
                    Statistic      p-value
------------------------------------------------------------------------------
 W-t-bar            -25.5668        0.0000
------------------------------------------------------------------------------
```

Table B12 - Unit Root Tests for Variable Gross capital formation (first differences)

Group C

System dynamic panel-data estimation — Number of obs = 291
Group variable: ID — Number of groups = 52
Time variable: Year

Obs per group:
min = 1
avg = 5.596154
max = 7

Number of instruments = 52 — Wald chi2(8) = 72.46
Prob > chi2 = 0.0000

Two-step results

GDP	Coef.	WC-Robust Std. Err.	z	P>|z|	[95% Conf.	Interval]
GDP						
L1.	-.0093499	.0655407	-0.14	0.887	-.1378073	.1191074
L2.	-.2252105	.1249149	-1.80	0.071	-.4700392	.0196182
L3.	-.1660756	.1102059	-1.51	0.132	-.3820751	.0499239
L4.	-.1969267	.188027	-1.05	0.295	-.5654529	.1715995
DUMMY1MON	14.34652	8.026549	1.79	0.074	-1.385222	30.07827
DUMMY2ER	15.74212	6.66237	2.36	0.018	2.684111	28.80012
Householdcons						
D1.	-3.69e-12	2.20e-11	-0.17	0.867	-4.68e-11	3.94e-11
govfincon	-.6132845	.3259857	-1.88	0.060	-1.252205	.0256357
Exports	.1217147	.0420773	2.89	0.004	.0392447	.2041846

Table C1 - Panel data regression for the first period (1970-1980)

```
( 1)  DUMMY1MON - DUMMY2ER = 0

          chi2(  1) =    0.12
        Prob > chi2 =    0.7293
```

Table C2 - Dummies' impact on growth test (1970-1980)

```
( 1)  DUMMY1MON - DUMMY2ER = 0
( 2)  DUMMY1MON - DUMMY3IT = 0

          chi2(  2) =    0.13
        Prob > chi2 =    0.9392


( 1)  DUMMY1MON - DUMMY3IT = 0

          chi2(  1) =    0.07
        Prob > chi2 =    0.7872
```

Table C3 - Dummies' impact on growth test (1981-2008)

```
( 1)  DUMMY1MON - DUMMY3IT = 0

          chi2(  1) =    0.02
        Prob > chi2 =    0.8946

( 1)  DUMMY2ER - DUMMY3IT = 0

          chi2(  1) =    1.00
        Prob > chi2 =    0.3174

( 1)  DUMMY1MON - DUMMY2ER = 0

          chi2(  1) =    0.41
        Prob > chi2 =    0.5229


( 1)  DUMMY1MON - DUMMY2ER = 0
( 2)  DUMMY1MON - DUMMY3IT = 0

          chi2(  2) =    1.04
        Prob > chi2 =    0.5944
```

Table C4 - Dummies' impact on growth test (2009-2018)

Group D

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(685)     =  93.51363
        Prob > chi2   =    1.0000
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-4.3023	0.0000
2	-.30087	0.7635
3	.45369	0.6501
4	-1.2031	0.2289

```
H0: no autocorrelation
```

Table D1 - Robustness tests for Blundell/Bond regression with control variables and dummies in the second period (1981-2008)

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(433)     =  117.9959
        Prob > chi2   =    1.0000
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-1.0992	0.2717
2	.84894	0.3959
3	-1.3864	0.1656
4	-1.6674	0.0954

```
   H0: no autocorrelation
```

Table D2 - Robustness tests for Blundell/Bond regression with dummies in the third period (2009-2018)

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(434)     =   93.0491
        Prob > chi2   =    1.0000
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-3.6805	0.0002
2	-.85843	0.3907
3	.6369	0.5242
4	-.11769	0.9063

```
   H0: no autocorrelation
```

Table D3 - Robustness tests for Blundell/Bond regression with dummies and control variables in the third period (2009-2018)

Group E

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(93)      =  81.84842
        Prob > chi2   =    0.7891
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-3.8876	0.0001
2	-3.0158	0.0026
3	.32654	0.7440
4	-.96545	0.3343

```
   H0: no autocorrelation
```

Table E1 - Robustness tests for Blundell/Bond regression with dummies and control variables for strongly developed countries

```
Sargan test of overidentifying restrictions
        H0: overidentifying restrictions are valid

        chi2(93)     =  31.66861
        Prob > chi2  =    1.0000
```

```
Arellano-Bond test for zero autocorrelation in first-differenced errors
```

Order	z	Prob > z
1	-3.7192	0.0002
2	-1.9243	0.0543
3	.82582	0.4089
4	.39631	0.6919

```
H0: no autocorrelation
```

Table E2 - Robustness tests for Blundell/Bond regression with dummies and control variables for weakly developed countries

Group F

```
( 1)  DUMMY1MON - DUMMY3IT = 0

           chi2(  1) =    0.00
         Prob > chi2 =    0.9878
```

```
( 1)  DUMMY1MON - DUMMY2ER = 0
( 2)  DUMMY1MON - DUMMY3IT = 0

           chi2(  2) =    0.36
         Prob > chi2 =    0.8368
```

Table F1 - Dummies' impact on growth test (Strongly developed countries)

```
( 1)  DUMMY1MON - DUMMY3IT = 0

           chi2(  1) =    4.30
         Prob > chi2 =    0.0380
```

```
( 1)  DUMMY1MON - DUMMY2ER = 0
( 2)  DUMMY1MON - DUMMY3IT = 0

           chi2(  2) =    6.33
         Prob > chi2 =    0.0423
```

Table F2 - Dummies' impact on growth test (Strongly developed countries – without robust standard errors)