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COMPARATIVE DYNAMICS WITH FISCAL DOMINANCE. EMPIRICAL EVIDENCE FROM ARGENTINA 2016-2019

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Comparative Dynamics with Fiscal Dominance. Empirical Evidence from Argentina 2016-2019

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Abstract

A DSGE (Dynamic Stochastic General Equilibrium) model is used to report the empirical behavior of the Argentine economy during the administration of the Cambiemos government coalition. Two main aspects have been taken into account: on the one hand, the debate on the economic policy of the 2016-2019 period, and on the other hand the requirement of microeconomic foundations that support the debate and the empirical results. Two alternative macro models are estimated obtaining statistically significant parameters to illuminate confusing aspects of the policy debate, and to help future research on modeling Argentina macro dynamics. The empirical results obtained for Argentina indicate that the small open economy models used in the state-space specification can also be useful for modeling other small open economies that suffer from Fiscal Dominance.

[*] The viewpoints of the author do not necessarily represent the position of the UCEMA.

1. **Introduction.**

The main macroeconomic variables of Argentina are analyzed empirically with a time series sample going from December 2015 to December 2019. A total of 49 monthly observations. The first 44 observations are used for estimation and the last 5 observations for evaluation of out of sample predictions based on the events of the economic policy of the period.

In August 2019, a regime change impacted the economy, and a comprehensive understanding of that event is part of the objective of this research. As reported by the press (El Pais August 11, 2019). The primary elections in Argentina were a *planetary exception*. All the candidates for president, a dozen, did not have rivals in the same party and it was enough to exceed 1.5% of the votes to compete in the general elections of October 2019. The contest, however, experienced as a crucial battle in the race for the presidency, almost as important as the final election. The open, simultaneous, and compulsory primaries were born of a defeat. In the 2009 legislative election, the government of Cristina Fernández de Kirchner fell in Buenos Aires to Francisco de Narváez, a virtually unknown candidate with no party structure. Narváez's candidacy arose from an agreement of leaders and not parties. Nestor Kirchner, the defeated, promoted a mechanism that unified the way of election of candidates. Due to the party crisis inherited from the 2001 debacle, a new law, with support throughout the political arc, enacted that the final decision in the primaries be taken by the voters.

In the mandatory primary of August 2019, Alberto Fernández, of the Justicialist Party (PJ) and candidate for the *Frente de Todos* coalition, with former president Cristina Fernández de Kirchner as a teammate, won a bulky victory with 47.79% of the votes on 31.80% achieved by Mauricio Macri, president-in-office of the *Propuesta Republicana* (PRO) and supported by the *Juntos por el Cambio* alliance, which was seeking re-election. The highly negative result for the ruling party, practically guaranteed an opposition victory in the general election first round. A very negative reaction from the financial markets and large national and international economic groups induced a strong devaluation of the peso and a doubling of the country risk.

As predicted in the primary, Fernández triumphed in the general election with 48.24% according to the final scrutiny, followed by Macri, who managed to pick up to 40.28% with respect to the mandatory primaries. The Constitution establishes that if a formula exceeds 45% of the affirmative votes, it is the winner. The result was the second most polarized election between two candidates of the democratic period initiated in 1983 (only surpassed by the election of that year), with Fernández and Macri hoarding together 88.52% of the positive votes. It was also the first instance in which a president in office sought re-election and was defeated.

I presented a preliminary version of this paper at an internal seminar in UCEMA on August 6, 2019 with the intention to use a DSGE model to forecast year 2020 under the assumption that the ruling party would win the election and there would not be a regime change, obviously, I was wrong. In that opportunity I received very useful comments to elaborate the present version that modifies the previous model to predict the initial impact of the primary. I have also included a second model that better represents the debate on Inflation Targeting during 2017. I am very grateful to comments received from Martín Uribe, Javier García Cicco, Laura D´Amato, Hildegart Ahumada, Juan Carlos De Pablo, Fernando Navajas, Javier Bolzico, and Miguel Angel Broda. In my effort to reconcile empirical results with economic theory I received the invaluable help of Guillermo Calvo and Pablo Guidotti. Of course the remaining errors are my sole responsibility.

2. **The Economic Policy Debate.**

In 1983 the Radical Civil Union won a Presidential Election restoring democracy in Argentina, generating positive expectations due to the non-populist democratic tradition of the Radical Party, and the novelty of having been able to defeat Justicialism. Unfortunately, the economic administration of the country ended badly. The 1989 hyperinflation precipitated the resignation of President Raúl Alfonsín to his office and the assumption of Carlos Menem (President Elected in that same year) several months in advance of the pre-established date for the change of command. I have analyzed that period in Fernandez (1991) and concluded that basing stabilization on deficit-ridden income policies was a mistake. Stabilization must start with well-known fundamental reforms in the public sector. The heritage left by Alfonsín was a hyperinflation very difficult to control, especially because it was presumed that the new administration (Justicialism) would be populist, and that it would be unfriendly to the market economy.

Presumptions were wrong. The new administration enforced deep structural reforms at the beginning of 90s, eliminating subsidized prices of public services and enacted a State Reform Law, that allowed the privatization of all public service companies (among others: railways, oil companies, telephones, ports, ships, airports, and airlines) and subsequently privatized a large part of the retirement and pension system. All these reforms produced a strong improvement in fiscal sustainability. But it was not enough. The threat of hyperinflation persisted, and a quasi-fiscal deficit mounted, in part because there was a perverse dynamic in the financial system with high interest rates accrued weekly, and eventually paid by the Central Bank by issuing money to remunerate bank reserve requirements. An aggravating factor was that the Central Bank could not lower the nominal interest rate because the dollar soared.

Economic agents realized that the mounting quasi-fiscal deficit was a signal of a future unbounded monetary expansion. Government advisors designed a Bonex Plan *reprofiling* the large short term deposits by redeeming them for dollar-denominated bonds at a ten-year term charged to the National Treasury, who would pay the bond with the surplus generated by structural reforms plus the elimination of naïve deficit ridden income policies. The threat of a future monetary expansion to cancel the debt of the Central Bank was abruptly cut off by a new law establishing the autonomy of the Central Bank, and by institutionally decoupling it from the Ministry of Economy.

An anecdotal event of those times was the instantaneous rejection of the plan when it initially went to the political authorities. They fully understood the proposal but, evaluating the potential high political cost, preferred to try something more gradual. In a very short period of time, persistent hyperinflation convinced the authorities that gradualism worsened the situation, and ended up applying the Bonex Plan. Undoubtedly, the plan worked, because it eliminated the perverse dynamics of inflation, interest rates, and monetary expansion. It is very important to note that success of the plan was possible because structural reforms had previously dismantled the chronic fiscal insolvency.

With the structural reforms already underway, a system of exchange stability was established through a Convertibility Law, setting the value of the Dollar equal to a Peso. With the horizon clear, economic operators rationally moderated their inflationary expectations, and price stability was achieved. By the end of the 1990s, the Argentine GDP measured in dollars had increased by 51%, while the total ***gross*** internal and external public debt did not exceed 40% of GDP.

Some common narratives from this period argued that the convertibility program had two weak points: one was the appreciation of the peso during the program, and the other, low government savings at the beginning of the program. Both narratives can easily be refuted with the following arguments. The first narrative of the appreciation of the peso was initially correct, but having achieved absolute stability of the peso at the end of the nineties, inflation in Argentina was negative by 2.3% annually, while annual inflation in the USA exceeded 1%. And the economy began to recover during

the second half of 1999 immediately after the external shock caused by the Brazil crisis. Estimates of the appreciation of the peso according to the IMF were 7.5%, In other words, the supposed real exchange rate appreciation was in frank decline at the annual rate of 3.3% with the economy growing at the end of the 90's. Implicit in the argument of peso revaluation was the latent recommendation to allow the exchange rate to float without taking into account that the influx of capital generated by the structural reforms of the period would cause a greater revaluation of the peso. Throughout the 1990s, except for a brief period during the Tequila crisis (1994) and the crisis in Brazil (1998), reserves grew steadily[1].

The second narrative is also wrong because it ignored the impact of the pension reform passed in 1993 that eliminated the significant future liabilities corresponding to government future payments of pensions and retirements. Obviously, the narrative mistake is to consider the reduction in the collection of social security contributions as a government reduction in savings. The correct evaluation of the fiscal impact cannot be carried out just taking the reduction of social security contributions without simultaneously discharging the present value of future expenditures[2]. As will be seen later, it is precisely the reversal in 2007 of the social security reform of the 1990s that aggravated in 2015 the fiscal problem in Argentina.

The new government that assumed at the end of 1999 promised to maintain the convertibility system but was unable to maintain the fiscal consolidation achieved. During the electoral campaign the opposition candidate promised to increase salaries for teachers, what he certainly did after assuming the presidency. That increase in salaries was extended to the national and provincial public administrations. In addition, two high-risk political decisions were made: the first was the arbitrary removal of the President of the Central Bank, and the second was to assume the debts of the provinces. The first was a sign of using the inflationary tax, which was the prelude to a return to fiscal dominance, and the second was an increase in the national debt impossible to sustain with the restricted resources of the federal government, indicating the government's lack of commitment to long-term fiscal sustainability, and a poor liquidity management. That decision marked the beginning of the collapse of the convertibility.

In the official narrative installed after the 2001 crisis, the responsibility for the fiscal disarray of 2002 and 2001 was hidden, as also was hidden the poor provision for liquidity crisis management[3] . Most of the narrative concentrated in blaming the "lack of savings" of the previous decade or the "fixed nominal exchange rate" as the main cause of the crisis, favoring the Washington new paradigm of freely "floating nominal exchange rates". It cannot be denied that other events such as sudden stops and political difficulties in the ruling coalition were added to the fiscal disarray starting in 2000. And, of course, there is nothing wrong with having a floating exchange rate system, but simply floating the exchange rate does not solve the lack of commitment to fiscal sustainability.

The celebrated basic theoretical framework of *Some Unpleasant Monetarist Arithmetic* of Sargent and Wallace of the 80s was back with the change of the millennium. But the new narrative in the economic literature, in referring to this pervasive condition, has introduced the term ***Fiscal Dominance*** which is defined as an economic condition that occurs when a deficit prone country with an unsustainable government debt cannot set conventional nominal targets. Any nominal target such

[1] Both the Tequila and Brazil crises, were managed assuring that the sound financial sector was able to stay on its feet. Insolvent banks were liquidated and banking supervision was strengthened, allowing activity to normalize in less than six months (Fernández, and Schumacher, (1998)).

[2] See Guidotti (2005) and (2006).

[3] The collective memory of the Argentines never forgot the ***corralito and corralon*** suspending the normal operation of the banks, preventing the withdrawal of deposits. Unlike what happened with the Tequila crisis - when the government made the politically cruel decision to reduce nominal wages by 15% to ensure fiscal sustainability - the 2001 measures showed a lack of commitment to honor the debt with creditors and depositors. Those were all indicators that the willingness to pay had been lost, and of course also affected the willingness to lend of creditors. (See Fernández, K., and R. Fernández, (2007), aand Guidotti (2006)).

as nominal interest rate, monetary growth, or nominal exchange rate policy; must be consistent with keeping the government from bankruptcy.

The following paragraphs taken from Edwards (2019), Sturzenegger (2019) and Di Tella (2019) summarize the events after 2001.

Edwards, (2019), describes the events after the 2001 crisis, with a government bankruptcy caused by Fiscal Dominance. "On *January 6, 2002, the Economic Emergency Law was passed by the Argentine Congress putting an end to the 1991 Convertibility Law, which had provided the legal backbone for the currency board and the one-to-one peso/dollar fixed exchange rate regime. The new legislation converted contracts that were written in dollars into depreciated pesos. In the financial sector, pesification was asymmetrical. Dollar-denominated deposits were converted into pesos at a rate of 1.4 pesos per dollar; debts were converted at the one-peso-one-dollar rate. At that time the (parallel) market value of the U.S. dollar was close to 3 pesos. Other contracts, and in particular public service prices (telephony, electricity, sewage, toll roads), which were written in U.S. dollars, were converted into pesos at the old rate of one peso per dollar. This resulted in significant losses to international companies, many of which had invested large amounts during the privatization process initiated by President Carlos Menem. In addition to converting contracts from dollars to pesos, the Kirchner government decided to restructure the external debt, which had been in arrears since late December 2001. In September 2003, the Argentine government made an offer to investors to exchange defaulted bonds for new ones. This proposal became known as the "Dubai Guidelines" and implied an average reduction of the face value of the debt of approximately 75 percent. Investors balked at the stiff losses and asked for better conditions. Negotiations ensued, and a new offer was formally made in June 2004 under the moniker of "Dubai Plus." The terms of this proposal were very similar to the original ones and implied losses (in present value terms) for bondholders of approximately 75 percent".*

Sturzenegger, (2019), presents a description of the debate on the political economy of the *Cambiemos* administration. The following paragraphs illustrate some of the main points.

Referring to the heritage left by pervious government on December 2015:

The heritage also included four years of stagnation, a large and growing budget deficit, persistent high inflation, a dual exchange rate system, utility prices that had been frozen in spite of high inflation, and lack of reliable statistics. The previous government argued it had managed to produce a strong reduction in the level of debt to GDP and particularly in the level of debt to GDP owed to market participants. Yet, we believe some methodological caveats should be made, as some of the changes in debt levels came hand in hand with changes in the assets or liabilities of the government, generating a different dynamic on government´s net worth. (Adjusted ***net*** *debt to the private sector at the end of 2015 was about 39.6% of GDP instead of 22.5% of GDP officially reported).*

Referring to Central Bank policy:

After the agreement with the holdouts the economy started experiencing a capital inflow process from two sources. One was the external financing of the budget deficit that was primarily financed abroad. The second were private sector inflows. .....The Central Bank confronted government sector indebtedness with an aggressive program of reserves accumulation, buying reserves which it sterilized by issuing peso liabilities (called Lebacs). Doing so reduced the currency mismatch of the consolidated government balance sheet, and also reduced the exchange rate appreciation resulting from the inflows, but also, in doing so, conditioned the inflation objective to an exchange rate objective.

Referring to Carry Trade and to Unpleasant Monetarist Arithmetic.

Even though the growth in Lebacs had its counterpart in the accumulation of reserves, a debate emerged regarding the growth in the balance sheet of the Central Bank. The debate heated up, particularly when the real exchange rate appreciated, as this resulted in the Central Bank paying a cost (ex post) in terms of carry, a cost that increased the bigger the reserves..... the discussion was framed as if the interest on Lebacs were a source of inflation itself...According to this view, if the

growth in the Lebacs became "money" they could trigger an increase in the inflation rate. The question boils down to whether remunerated liabilities would be paid through an increase in the price level or absorbed through the monetization of future increases in the demand for real money.
Three arguments suggest that the reduction of Central Bank liabilities needed not be done through inflation. First, that Central Banks balance sheet does not acknowledge their strongest asset: the net present value of future seigniorage. An estimate of this seigniorage by the Central Bank (BCRA, 2017) placed it at 30% of GDP, much larger than the stock of Lebacs (which reached 11% at its maximum). Second, that assuming no further purchases of reserves and using market expectations for interest rate, growth and inflation the stock of Lebacs had stabilized by the end of 2017 Finally, that the reserves themselves could be used to cancel these liabilities. For these reasons the Central Bank considered that the situation was sustainable, a view that was shared by the markets but not the majority of analysts. So the question was not so much whether Central Bank liabilities would create inflation per se, but whether the government would decide to pay them with inflation tax rather than with seigniorage.

Referring to Inflation Targeting (IT) as an anchor

Many countries experience differences relative to their targets (Colombia, for example, sustained deviations for 6 years in a row), particularly during disinflation episodes. Yet the targets operate as an expectations anchor regardless if they are achieved or not.

In the abstract:

This paper reviews the various macroeconomic stabilization programs during the Macri government between 2015 and 2019. We find that after an initial success each program was discontinued because of a distinct form of fiscal dominance: as pensions are indexed with a lag, and represent a large fraction of spending, quick disinflations jeopardize fiscal consolidation. Lack of progress in the fiscal front during the first three years of the government made these reversals unavoidable.

Di Tella (2019), commenting Sturzenegger paper argues:

Indeed, the absence of fiscal dominance is a well-known precondition for effective IT and the paper explain that the expectation was to contain it "by anticipating a path for transfers from the Central Bank to the Government. The question of how successful such "containment" was likely to be in practice in Argentina's context is moot because a series of very visible "gifts" (income tax reductions, increases in pensions, etc.) soon turned fiscal gradualism into a robust fiscal expansion that took the 2016 primary deficit to 5.4% of GDP. It is reasonable to expect that Argentines, having lived through hyperinflations and several episodes of debt default, give considerable weight to the consistency of fiscal plans in deciding whether to believe the monetary authority. Thus, Sturzenegger plan to use IT in the presence of fiscal "gradualism" seems initially risky and, by the end of 2016, extremely hard to justify.
Sturzenegger states that fiscal "gradualism" was a constraint decided by the political authority. Even if one accepts this, there are two ways to read it. One is that this reflects a "political rationale" that is exclusively attached to the fiscal deficit by some deus ex machine, and there is not much else to discuss. The second is more natural and simply assumes that Sturzenegger is referring to a broad set of political constraints facing a weak government, and he provides some hints in this direction when he explains that fiscal gradualism would help the government avoid the "stigma" of being right wing. But this opens up more questions. For example, were there any political gains when the projected fiscal adjustment of the first year turned into a strong expansion? Was there a plan to spend this political capital in ways that helped the economic program? The paper doesn't explain. The rest of the program included many non-gradual policies, such as the decision to reduce the income tax or to allow a sharp increase in regulated prices (see below). Are we supposed to view these policies as leftwing? Or is it that political constraints are irrelevant at the time of making these decisions? Political constraints in Sturzenegger world are a bit like the Cheshire cat of Alice in Wonderland: now you see them, now you don't. The decision to embrace a pure version of IT for the three periods ahead was even more surprising given the country's historical love affair with the dollar.
Macroeconomists have extensively explored the pros and cons of exchange rate-based stabilization programs, and the class of problems they address differs drastically from the class of problems discussed in models of IT. To my knowledge, work on IT does not offer answers to the central challenges addressed in the stabilization literature, including the fact that sometimes changes in the

price of the dollar represent much more than just a change in a relative price or the presence of considerable inflation inertia (through contracts or other formal and informal institutions). Sturzenegger does not really answer the critics who argued in favor of income policies or of including the dollar in the Central Bank's objective function. Of course, there are limits to what the monetary authority can achieve with very few reserves at hand, but that is a different argument. Besides, there were several episodes of forex intervention (both buying and selling) that, without some framework/guideline, appeared haphazard and one wonders how they affected credibility. And of course, it doesn't apply to the absence of income policies, another instrument successfully applied in some prior stabilization plans.

3. **Modeling the Policy Debate.**

The outcome of any important macroeconomic policy debate is the net effect of forces operating on different parts of the economy, and I will use a data-based dynamic stochastic general equilibrium model to assess the relative strength of those forces. But macroeconomic data are not sufficient for discriminating between many alternative microeconomic foundations that offer different answers to policy questions.

In the previous section I presented the textual quotation of the papers to best respect some of the many ideas under discussion. The debate is very rich in detail, exceeding the limitations imposed by the reduced form of econometric models. Therefore I will limit myself to selecting the three basic topics underlying the debate, these are: Fiscal Dominance, Inflation Targeting, and The Fiscal Theory of the Price Level.

Fiscal Dominance microeconomic foundation is the *Unpleasant Monetarist Arithmetic* of Sargent and Wallace, (1981), whose original formulation started from an overlapping generation's economy to derive a Cagan real demand for money[4] frequently used in the empirical work studying high inflation countries. With the passage of time Fiscal Dominance has evolved towards the consideration of two additional issues: one linked to the determination of the initial price level in a model where the Central Bank accommodates monetary policy to the consolidated government budget constraint, and other to initial price level determination when the Central Bank aims to control the nominal interest rate. *Unpleasant Monetarist Arithmetic* is a well know classical reference on Fiscal-Monetary Theory of Inflation, and in the Appendix I present the same formulation found in Ljungqvist and Sargent, (2018), but adapted to a small open economy.

Inflation Targeting. In a general equilibrium model based on Fiscal Dominance there is no such a thing as an independent Central Bank. The "monetary authority" is nothing more than a simple financial administrator of the national treasury. This means that all monetary issuance, called seigniorage or inflationary tax is a fiscal resource of the national treasury. It makes no sense for the Central Bank to design an anti-inflationary policy trying to align expectations by setting a target for inflation or a nominal interest rate that is inconsistent with the inflation tax required to close the consolidated fiscal accounts. The same can be said with respect to the deficit-ridden income policies that try to establish public service prices and wages agreements whose evolution will be inconsistent with the inflation required to finance the treasury.

The Fiscal Theory of the Price Level is relevant in the debate for evaluating the role of the nominal interest rate as a nominal anchor and is presented in the appendix.

The Argentine economy suffers from chronic fiscal dominance. The administration taking office on December 2015 inherited a fiscal deficit of about 6 % of gdp and ended up his administration with approximately a fiscal deficit of about 6 % of gdp. Fiscal imbalances are the main

[4] Cagan demand functions can also be derived using a model including money in the utility function (see Calvo (1996).

determinants of long run inflation. Debt accumulated by fiscal imbalances is financed by printing money or by printing debt. Eventually higher debt implies: a higher inflation tax; an implicit default by an unanticipated jump in the price level produced by a sudden monetization of the outstanding nominal debt; or an explicit default repudiating debt contracts. These are not theoretical assumptions of "monetarist" models; these are empirical facts along the history of Argentina.

The empirical DSGE models that I will present below does not address the evaluation of policies oriented to eliminate the Argentinian chronic inflation, it simply assumes that the fiscal dominance of Argentina inflation remains the same during the sample period and during the forecasting period. In this sense the equilibrium paths being evaluated are paths converging to a steady state represented by the sample means determined by fiscal dominance. Furthermore, the model assumes rational expectations meaning that economic agents know the structure of fiscal dominance and form expectations accordingly. A fundamental contrast with the view that, independently of fiscal dominance, expectations could be influenced or "aligned" announcing nominal anchors or targets such as inflation, nominal interest rate, a devaluation rate, or a rate of growth of the money supply.

In putting inflation aside, the DSGE models can address other difficulties in living with inflation, especially when politicians want to make people believe that income policies or expectations management using IT are substitutes to solving fiscal dominance. In the context of a fiscal dominance model, inconsistent nominal anchors, deficit-ridden income policies, and inconsistent inflation targeting are just temporary shocks, irrespective of any political narrative to influence expectations with the intention of controlling chronic inflation.

On certain occasions, and for a short time interval, these plans manage to distract the attention of the media and market agents. The discussion focuses on whether the anchor is well or poorly positioned based on conjectural perceptions that ignore the fundamentals of fiscal dominance. By considering the supposed stabilization strategies as simple temporary shocks, the fiscal dominance models draw on the extensive existing literature on economic programs that lack credibility. Temporary stabilization shocks can be treated in the same category as unanticipated sudden stops and short term regime shifts.

Regime shifts are frequently related to political events. During the sample period a legislative election to choose half of the Chamber of Deputies and one third of the Senate was held on October 22, 2017. The result was a victory for the ruling Cambiemos, the alliance supposedly friendly to the market economy. Cambiemos was the most voted force in 13 of the 24 districts. But contrary to market expectations, on December 2017 the Congress, with the support of Cambiemos, approved a law imposing a tax on savings yields. The potential collection of this new tax was not significant but it was a strong sign of the lack of commitment of the Executive to control public spending. The Executive could have used his veto power to prevent the enactment of the law, but that did not happen, and by February of 2018 it was evident that the President would disappoint his electorate. This event stimulated the flight of domestic savings and triggered the sudden stop of external capital, leading to the beginning of the recession.

As I mentioned at the outset, the primary election in August 11, 2019 represented an unanticipated shock. In terms of the econometric evaluation of the period these results implied an unanticipated regime shift. Political events will be marked graphically and will also be used as starting points to illustrate impulse response functions to unanticipated shocks.

4. **Description of data.**

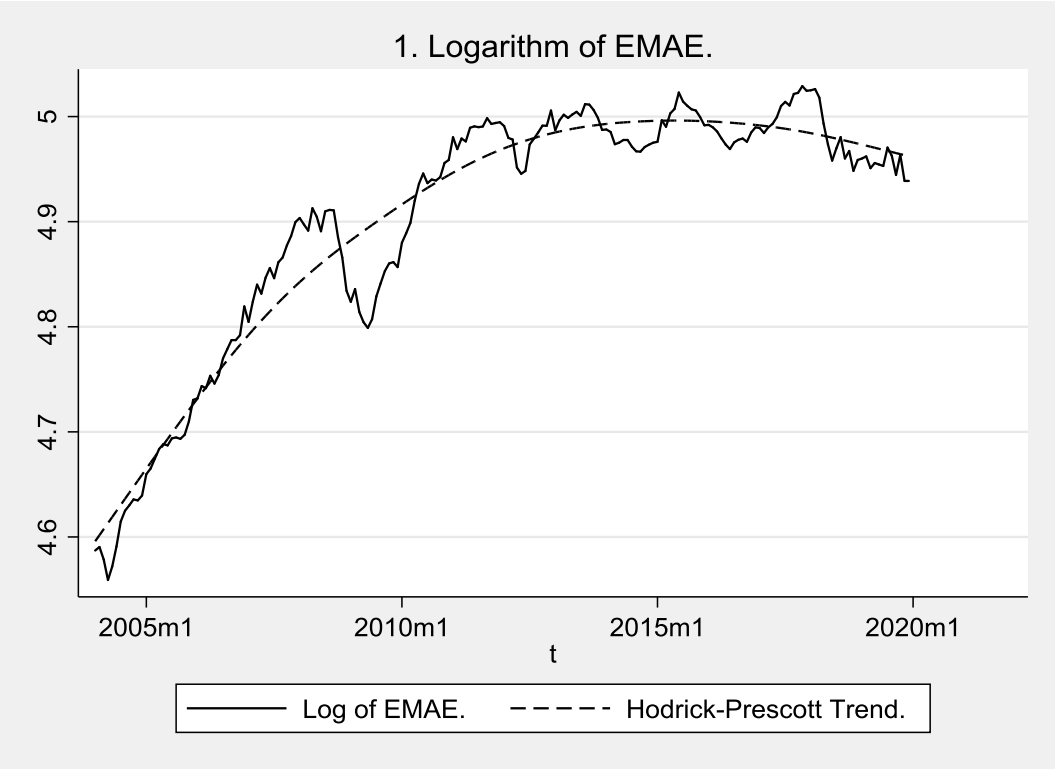
Macro data corresponding to the period December 2015 to December 2019 is used to estimate the DSGE models. In total there are 49 observations. The first 44 observations from December 2015

to July 2019 is the sample period for estimation, and the remaining 5 observations are used to evaluate out of sample forecasts and a regime shift.

Data for November and December of 2019 are preliminary estimates and will be revised at a future date, in the appendix there is a table with the actual observation used in estimations. The interest rate of USA indexed treasury bonds (originally published in FRED), as well as the rest of the historical data are collected and updated monthly in the database of the Argentine economy that is reported on the UCEMA website (https://ucema.edu.ar/).

The sample period is limited to the aforementioned dates for two reasons: first, since December 2015 the series maintain a uniform construction methodology by the normalization of statistics of INDEC and BCRA, and second, December 2019 is the last available date previous to a potential regime shift as result of the administration´s defeat in general elections.

Graph 1 displays the log of EMAE (Monthly Estimator of Economic Activity, seasonally adjusted) and a Hodrick-Prescott trend from 2005 to 2019 to illustrate the dynamic behavior of the real sector in the last 15 years. A longer time span than the sample period used in parameters estimation. EMAE series will be expressed in logarithms; using deviations from mean instead of a popular HP filter due to the possibility of introducing spurious correlations (see Hamilton (2016)).



The following table shows the descriptive statistics of the series. The mean of the log of EMAE is 4.984952 for the whole sample period (December 2015 to December 2019). For estimation, “x” is consumption gap represented by the Output Gap, that is, I am resting always 4.984952 from log of EMAE in each subsample period.

The monthly devaluation rate is represented by “e"; "p" is the monthly inflation rate; "i" is the reference nominal interest rate used by the BCRA for open market operations, "r" is the real interest rate of a representative dollar bond (the real interest rate of indexed treasury bonds (USA) plus the corresponding EMBI index of country risk); mb is the monthly rate of growth of the monetary base, and mq is the monthly rate of growth of quasi-money. Quasi-money is defined as the liabilities in pesos of the BCRA other than the monetary base, and includes interest paying peso liabilities such as:

LEBACS, LELIQS, SWAPS, and other interest paying liabilities. As interest rates are calculated by averaging daily rates on business days of each month, the average obtained in t is interpreted as a rate at the beginning of t+1.

Descriptive Statistics for the sample period December 2015 to July 2019.

Variable	Mean	Std.Dev.	Min	Max
x: Output Gap	0	.023	-.037	.044
e: % Devaluation	2.67	6.036	-4.311	27.728
p: % Inflation	2.763	1.316	.202	6.653
i: % Nominal Interest	3.194	1.284	2.063	5.982
r: % Real Interest	.48	.127	.337	.801
mb: Monetary Base	2.141	3.661	-6.546	11.18
mq: Quasi-Money	2.726	10.218	-37.4	30.773

Prior to the estimation, the means of the series are extracted, and the means will be an indication of the long run equilibrium of the system. I will return to this point after presenting the dynamic response of the variables to unexpected shocks.

Notice the proximity of the average monthly devaluation rate (2.67%) to the inflation rate (2.76%); these two variables will concentrate most of econometric research. These rates must be multiplied by 12 to obtain the nominal annual rate frequently quoted in the media. Considering a stationary state of 2.7% monthly, the corresponding average effective nominal annual rate of inflation (or devaluation) is 37.7%. Another element to pay attention to is the volatility of the devaluation rate with a standard deviation of 6 versus 1.3 in the inflation rate and 1.29 in the nominal interest rate.

As mentioned in an earlier section, part of the macroeconomic debate focused on the convenience of maintaining an inflation targeting program. The Inflation Targeting (IT) regime lasted 25 months. Started in December 2015 and was terminated in December 2017 when the authorities changed the target and lost credibility to respect new targets in the future. Notice that during the IT regime the average rate of growth of quasi-money was 5.7% monthly versus an average of 2.7% for the whole sample period.

Descriptive Statistics. Sample period December 2015 to December 2017 (IT regime)

Variable	Mean	Std.Dev.	Min	Max
x: Output Gap	.009	.018	-.016	.044
e: % Devaluation	1.1	3.062	-3.561	7.697
p: % Inflation	2.362	1.267	.202	5.201
i: % Nominal Interest	2.41	.355	2.063	3.167
r: % Real Interest	.408	.035	.337	.465
mb: Monetary Base	2.36	4.207	-6.546	11.18
mq: Quasi-Money	5.733	7.659	-5.404	30.773

The following table shows the same statistics for the last eighteen months of the estimation sample (recession period). Notice that in previous period the output gap mean was close to zero meaning that the subsample mean was not far away from the whole sample mean. During the subsample recession period the mean of "x" is negative because the log of EMAE remains below the whole sample mean most of the time. The average devaluation rate increased to 4.9% monthly, the average nominal interest rate increased to 4.3% monthly, average inflation rate increased to 3.4%, and the average rate of growth of quasi-money was a negative 1.4%, while the rate of growth of the monetary base was a positive 1.7%. This particular period illustrates the "crisis management" by part of the Central Bank

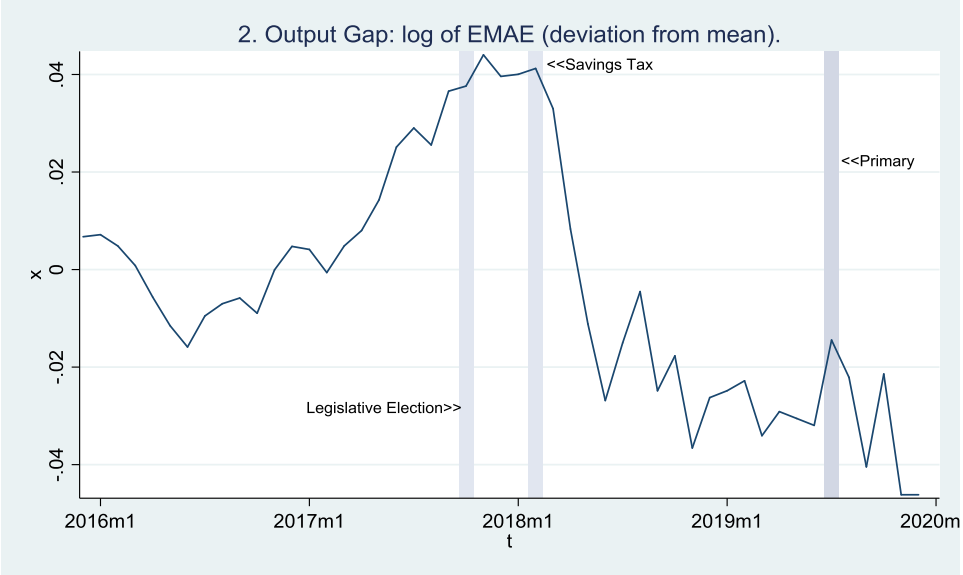
decreasing quasi-money and increasing the monetary base.

Descriptive Statistics for the (crisis) sample period February 2018 to July 2019.

Variable	Mean	Std.Dev.	Min	Max
x: Output Gap	-.015	.022	-.037	.041
e: % Devaluation	4.909	8.361	-4.311	27.728
p: % Inflation	3.376	1.193	2.075	6.653
i: % Nominal Interest	4.331	1.294	2.271	5.982
r: % Real Interest	.588	.134	.367	.801
mb: Monetary Base	1.707	2.883	-2.15	7.775
mq: Quasi-Money	-1.388	12.246	-37.4	9.75

The comparison between tables would also indicate that, if the events starting in February 2018 are interpreted as a random shock, the equilibrium paths to the steady state of the economic variables would converge to the sample means of the first table. This did not happen as will be illustrated below.

Graph 2 displays the Output Gap with the benchmarks previously described: a vertical line on October 2017, with a legislative election victory for the ruling Cambiemos alliance; a second vertical line on February 2018 signaling the start of the recessive process lasting until the end of the sampling period; and a third vertical line on August 2019 when a Primary election was held anticipating the defeat of *Juntos por el Cambio* on the October 2019 presidential election.



5. **DSGE Model: Specification and Estimation.**

The DSGE state-space specification consists of 7 control variables and 6 state variables as presented below. Control variables are denominated in the previous table of descriptive statistics. The u_{it} (i=1,…, 6) are state variables and ξ_{it} (i=1,…,6) are shocks to the state variables, the rests of the symbols are parameters.

The control equations (1) and (2) are linear approximation to the traditional IS and LM curves for a small open economy. Microeconomic foundations of these expressions can be found in the references[5], and are based on the intertemporal allocation of consumption of a representative consumer. As mentioned in the previous discussion of Fiscal Dominance, in the appendix I describe the model of Ljungqvist and Sargent, (2018), adapted to a small open economy, where the representative consumer maximizes a utility function depending on consumption and leisure restricted by a transaction technology that requires the use of a local currency. The small open economy assumption would require an additional term in (1) representing net consumption of no-residents (presumably affected by the real exchange rate). In a preliminary estimation I did not find a significant influence of the real exchange rate and decided not to include the additional term. But neglected terms, observation errors, and other neglected variables are supposedly represented by the specification of state variables and shocks terms.

Equation (3) specifies the behavior of firms. The representative firm follows a price behavior according with a new Keynesian Phillips curve with staggered prices (Calvo (1983) modified to include the explicit effect of changes in the real exchange in the state variable u_{3t} in equation (9). Changes in the real exchange rate resulted empirically relevant on the behavior of firms, but not on consumers.

Equation (4), specifies a stochastic version of the uncovered interest rate parity condition.

Equation (5) specifies the real interest rate depending exclusively on the state variable u_5 . The shock ξ_5 to state variable u_5 will represent exogenous events like a sudden stop and a jump in country risk.

Equation (6) specifies the control variable of quasi-money depending on state variable u_6. Notice that in this specification the state variable is preceded by a minus sign. This implies that a positive shock ξ_6 to u_6 would imply a decrease in quasi-money.

The Central Bank affects the monetary sector through open market operations, which are represented by the unobserved equation (13). In this way shock ξ6 implies an unexpected positive shock to the monetary base. This will be discussed in more detail in the section evaluating the Impulse Response Functions to a monetary shock. The Unobserved Equation (13) represents a departure from the usual DSGE models, but it is necessary to specify a main monetary instrument, and the subject of policy debate in Argentina. During the sampling period, about once a week the Central Bank decides the composition of their liabilities with open market operations changing the composition of its two main liabilities: monetary base and quasi-money.

Equations (8) to (12) are state-equations including a random shocks ξ_{it}, i=1,….,6).

$$x_t = -\alpha r_t + u_{1t} \quad (1)$$

$$e_t = m_{bt} - \gamma_1 x_t + \gamma_2 (i_t - i_{t-1}) + u_{2t} \quad (2)$$

$$p_t = E(p_{t+1}) + x_t + u_{3t} \quad (3)$$

$$i_t = r_t + E(e_{t+1}) + u_{4t} \quad (4)$$

$$r_t = u_{5t} \quad (5)$$

[5] Vegh(2013), Gali (2015), Uribe and Schmitt-Grohé (2017), among others, cover macro model for open economies. Calvo (2017) has a model reflecting the policy debate in Argentina, and Taylor(2019) presents a specific discussion regarding Inflation Targeting in high inflation emerging economies. An important limitation in our theoretical specification is the impossibility of differentiating the production and consumption of tradable and non-tradable goods. This information is not available in Argentina for the monthly series indicative of economic activity.

$$m_{qt} = -u_{6t} \quad (6)$$

$$u_{1,t+1} = \varphi_1 u_{1t} + \xi_{1,t+1} \quad (7)$$

$$u_{2,t+1} = \varphi_2 u_{2t} + \xi_{2,t+1} \quad (8)$$

$$u_{3,t+1} = \beta(e_t - p_t) + \varphi_3 u_{3t} + \xi_{3,t+1} \quad (9)$$

$$u_{4,t+1} = \varphi_4 u_{4t} + \xi_{4,t+1} \quad (10)$$

$$u_{5,t+1} = \varphi_5 u_{5t} + \xi_{5,t+1} \quad (11)$$

$$u_{6,t+1} = \varphi_6 u_{6t} + \xi_{6,t+1} \quad (12)$$

$$m_{bt} = -\mu m_{qt}\ , (unobserved\ equation) \quad (13)$$

Estimation results.

Two models will be studied: the first, which is presented below, and includes the estimates of the parameters of equations (1) to (13) will be called the Parity Model; and the second, to be called IT (Inflation Targeting) Model, will be presented later.

For the analysis of comparative dynamics that we will carry out in a later section, it is important to take into account the parameters that define the behavior of the state variables in response to unanticipated shocks. In particular, observe that the parameters corresponding to the control equations as well as the parameters corresponding to the state variable are all structural parameters that are significantly different from zero. Except α with a P value of 6.4%, all other parameters have P values lower than 5%. At the end of the table we observe estimate of the standard deviations of the state variables.

*Parity Model***.** Sample: December 2015 – July 2019; 44 observations ; Log likelihood = -133.80533

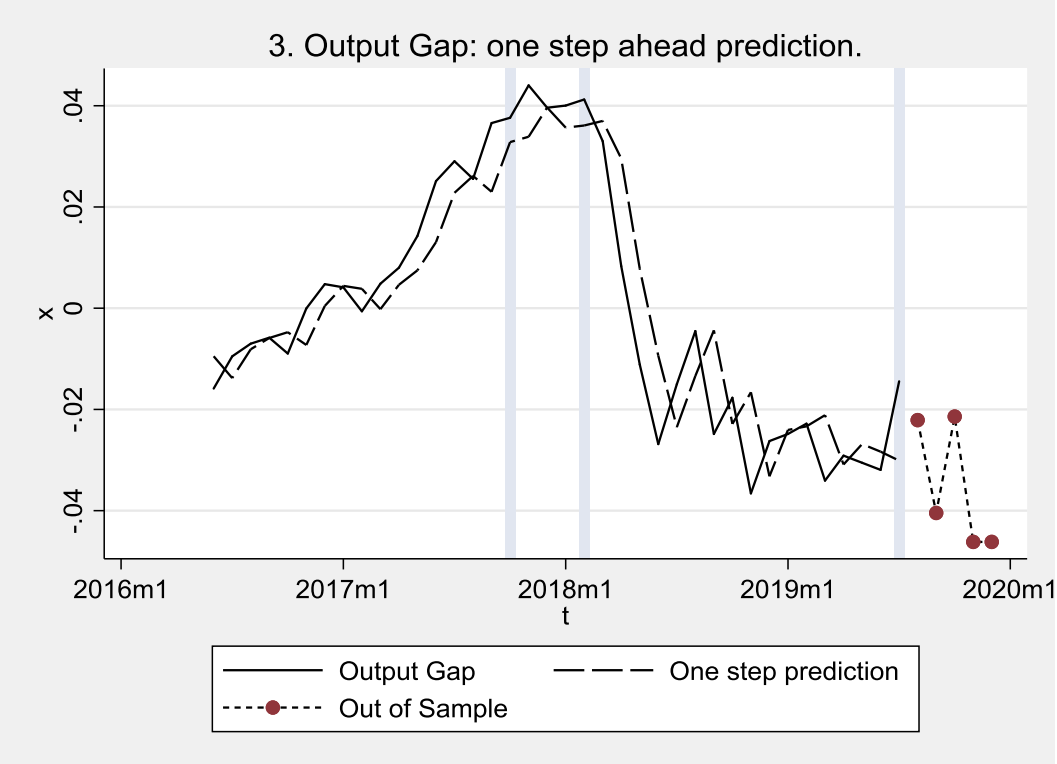
	Coef.	**Std.Err.**	**z**	**P>z**
α	0.064	0.034	1.860	0.064
γ1	32.870	12.615	2.610	0.009
γ2	7.888	1.474	5.350	0.000
μ	0.125	0.054	2.320	0.021
φ1	0.880	0.068	12.890	0.000
φ2	-0.259	0.100	-2.590	0.010
β	0.024	0.010	2.330	0.020
φ3	0.793	0.103	7.690	0.000
φ4	0.919	0.066	14.000	0.000
φ5	0.978	0.025	39.180	0.000
φ6	0.433	0.122	3.550	0.000
sd(e.u1)	0.009	0.001		
sd(e.u2)	4.641	0.532		
sd(e.u3)	0.246	0.088		
sd(e.u4)	0.576	0.190		
sd(e.u5)	0.036	0.004		
sd(e.u6)	8.738	0.940		

All the prediction and forecasts presented below are constructed with the parameters estimates of the previous table.

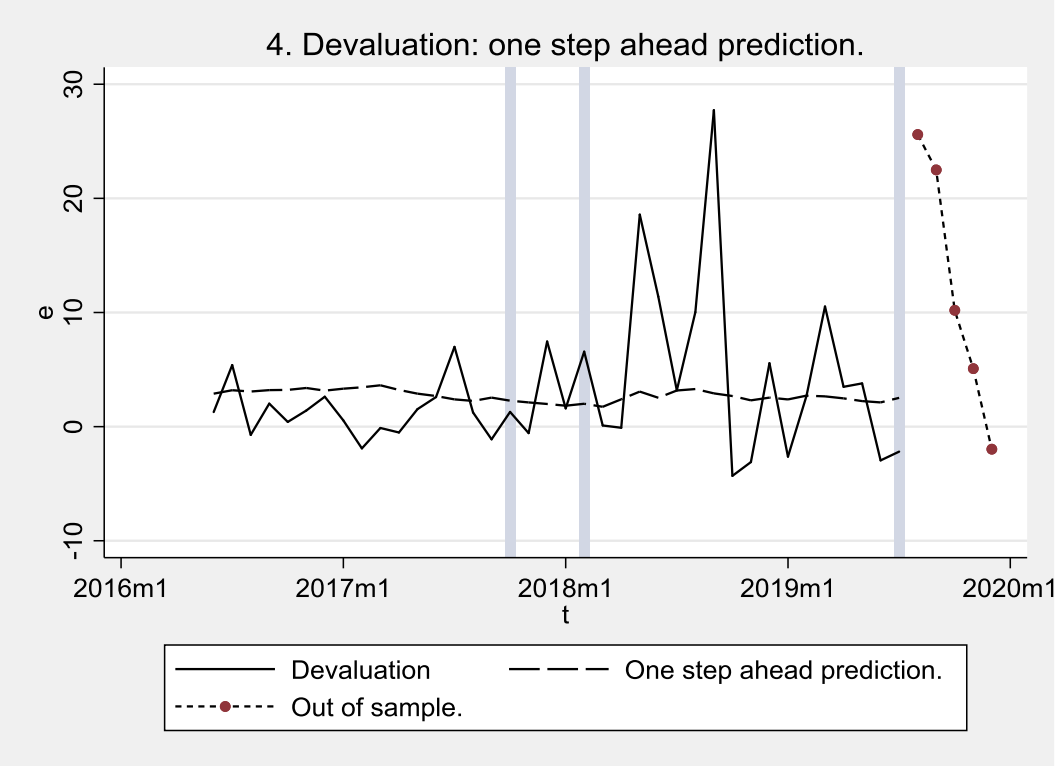
6. **Parity Model: predictions One Step ahead, Shocks, and Forecasts.**

The following three graphs show the series of output gap, devaluation, and inflation to illustrate the period under analysis. Two pieces of additional information are presented together with each series: on the one hand the observations outside the sample used in the estimation are included at the end of the series, and on the other hand, predictions one step ahead of the model are included up to July 2019. The observations outside the estimation sample correspond to the period after the primary elections that I will use to evaluate out of sample forecasts. The idea is to use these out of sample observations later to evaluate the performance of the model in the face of a regime change.

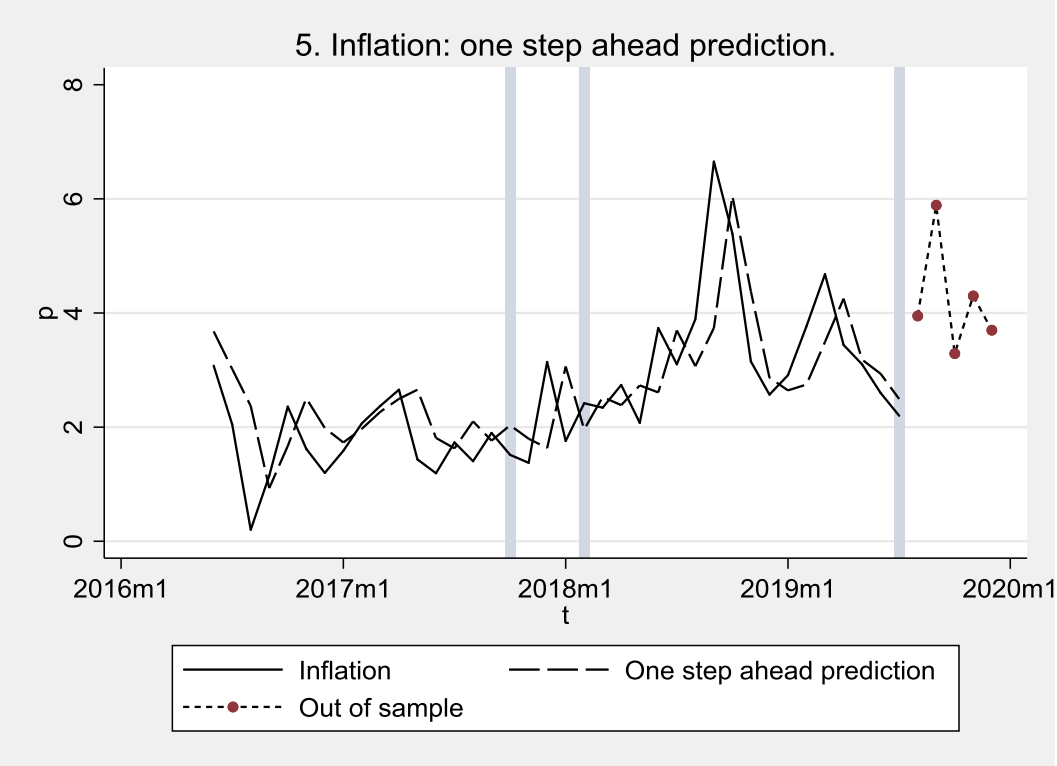
Graph 3, corresponding to the evolution of the output gap, present three reference vertical lines described in Graph 2: from left to right the first line corresponds to the mid-term legislative elections with a solid victory of the ruling party, the second line corresponds to the beginning of the recession period after the enactment of the law taxing savings, and the third line corresponds to the primary elections that pre-announced the future defeat of the ruling party. It is observed that the model accompanies the cyclic movement of the output gap but persistently stays closer to the steady state indicated by the sample mean (zero).



In Graph 4 we observe the strong volatility of the monthly rate of depreciation of the peso, and the persistence of the predictions very close to the sample mean (2.67%).



In Graph 5 we note how the inflation predictions are kept close to the observed values moving away for prolonged periods of the sample mean (2.76%)

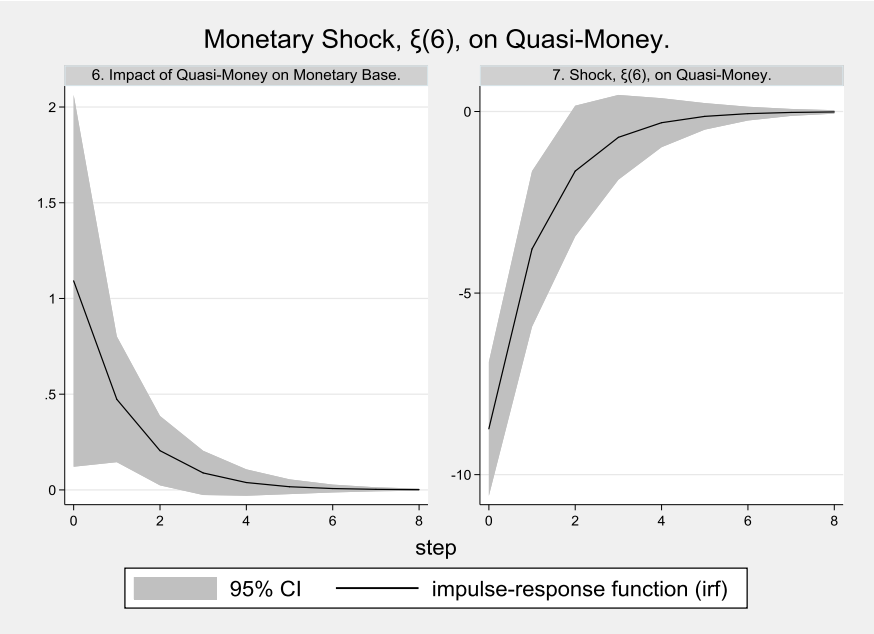


Impulse Response Functions and Unanticipated Shocks is a very useful tool of the DSGE models. Provides an opportunity to illustrate the comparative dynamics of the endogenous variables in responses to unanticipated shocks in the state variables. Unanticipated shocks are measured in term of one standard deviation. For this we use the standard deviations estimates of the state variables that are reported at the end of the previous table, for example, at the end of the estimation table the value of the sate value u_6 standard deviation is reported: sd(e.u6)= 8.738 .

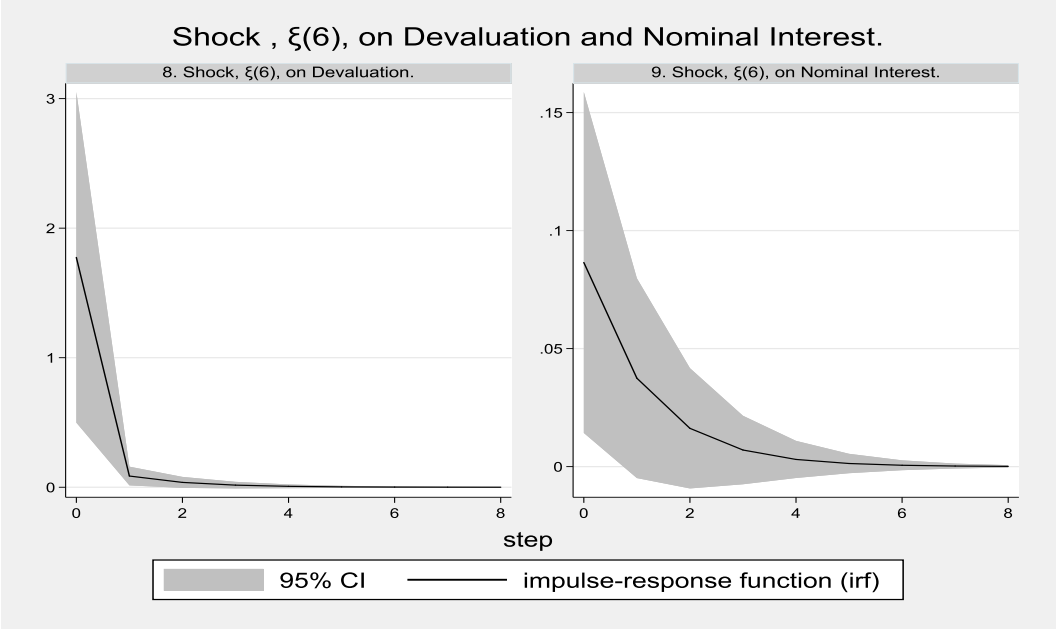
Looking at equation (12), which represents the state variable u_6, we note that there is an unanticipated stochastic error term ξ_6 affecting that state variable. On the other hand, the state variable u_6 through equation (6) dynamically affects the quasi-money variable m_{qt}. From unobserved equation (13) the quasi-money variable affects the monetary base, which in turn will transmit its influence through equation (2) on the devaluation rate *e*. The next period expected devaluation rate affects the nominal interest rate through the parity condition (4), which in turn affects the nominal interest rate, which in turn affects the devaluation rate and so on. The impulse response function is responsible for dynamically recording the successive impacts of unanticipated shocks on the other system variables. Below we show two important shocks that make up the essence of the debate on economic policy in Argentina.

Monetary Shock: ξ(6). An unanticipated monetary shock occurs when the Central Bank performs an unanticipated Open Market Operation forced by market circumstances. Faced with an unexpected liquidity crisis on the financial market, the Central Bank performs an open market operation issuing monetary base to absorb quasi-money. In this way the public and commercial banks can part with quasi-money to increase their working capital to meet their transactional needs. The next six graphs illustrate the case of an unanticipated negative shock in quasi-money. Remember that values are changes with respect to steady state equilibrium values. As the monetary mechanism is managed through open market operations, the result of an unexpected quasi-money reduction results in an unexpected increase in the monetary base.

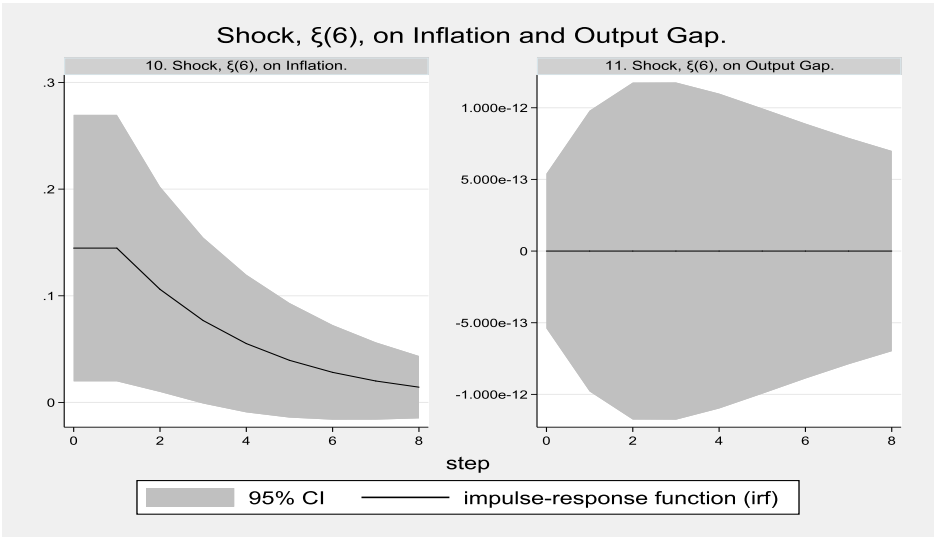
In Graph 7 we observe that a positive shock ξ(6) has a negative impact on Quasi-Money because u_6 is preceded by a negative sign in equation (6). On impact, Quasi-Money is reduced by one standard deviation (8.738). Notice in Graph 6 that the corresponding increase in the monetary base is 1.09= (-8.738)x(– 0.125) . The number 0.125 correspond to the estimated value of μ in equation (13).



In Graphs 8 and 9, as result of shock ξ(6), the nominal increase in the monetary base increases the rate of devaluation as well as the nominal interest rate. This last result occurs because the nominal growth rate of the monetary base is lower than the devaluation rate, then, the real amount of money falls. Faced with a decrease in the real amount of money, monetary equilibrium requires an increase in the nominal interest rate.

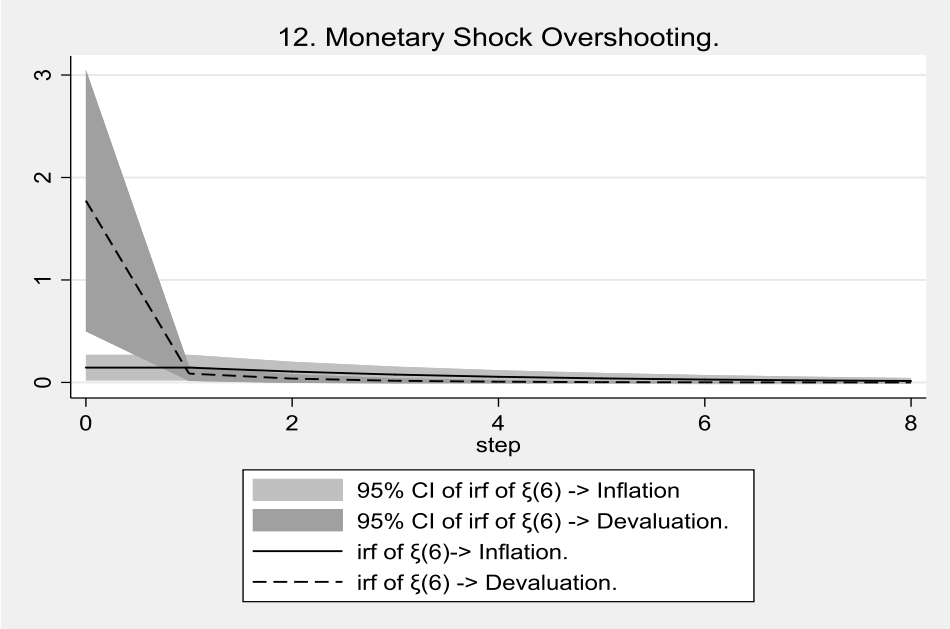


Finally, Graph 10 shows that the positive monetary shock has a positive effect on inflation, and Graph 11 shows that a monetary shock has an effect not significantly different from zero on the output gap. This last result arises from the specification of Euler's equation (1) where the output gap depends on the real interest rate which is determined externally, and is not affected by shocks in the local money market. The Cash in Advance assumption discussed in the IT model below includes the possibility that the domestic nominal rate will have an impact on the real sector.



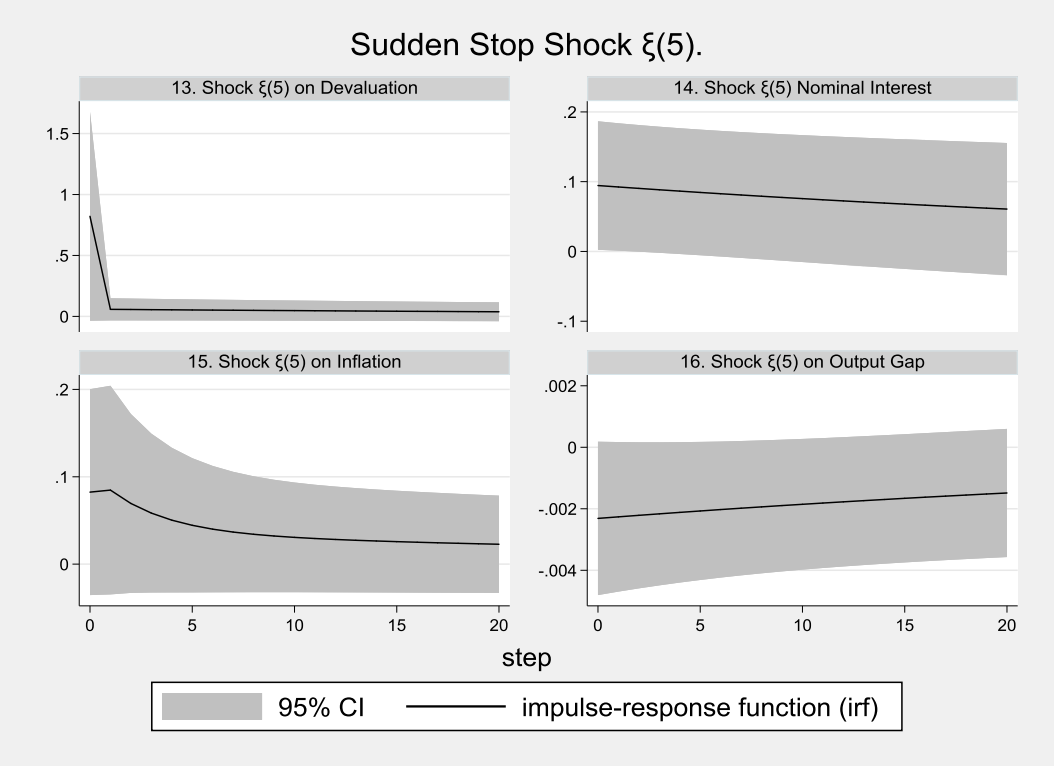
Dornbusch (1976), warned about the possibility of an overshooting on the nominal exchange rate as a result of a monetary expansion in a model with uncovered interest rate parity. In his continuous-time model the level of nominal exchange rate initially jumps to accommodate the economy in saddle path towards the steady state. On that path, the devaluation rate would be lower

than the inflation rate to recover the same initial level of the real exchange rate. Graphs 12 illustrate a similar overshooting in discrete time, but in this case, we observe that initially the devaluation rate exceeds the inflation rate, but immediately after the first period has elapsed the inflation rate exceeds the devaluation rate so that, in the long term, the same initial real exchange rate can be resumed.



Faced with the volatility of the exchange market, there have been extraordinary official interventions producing undershooting. In those situations of sudden upward changes in the level of the exchange rate, the Central Bank has carried out open market operations increasing quasi-money and contracting the monetary base with the intention of producing an appreciation of the peso. In the context of this model, it is equivalent to assuming an open market operation of opposite sign to what we have just performed, showing an inverted mirror of Graph 12 with an abrupt drop in the devaluation rate, below the inflation rate, to later reverse the trend and restore the equilibrium exchange rate.

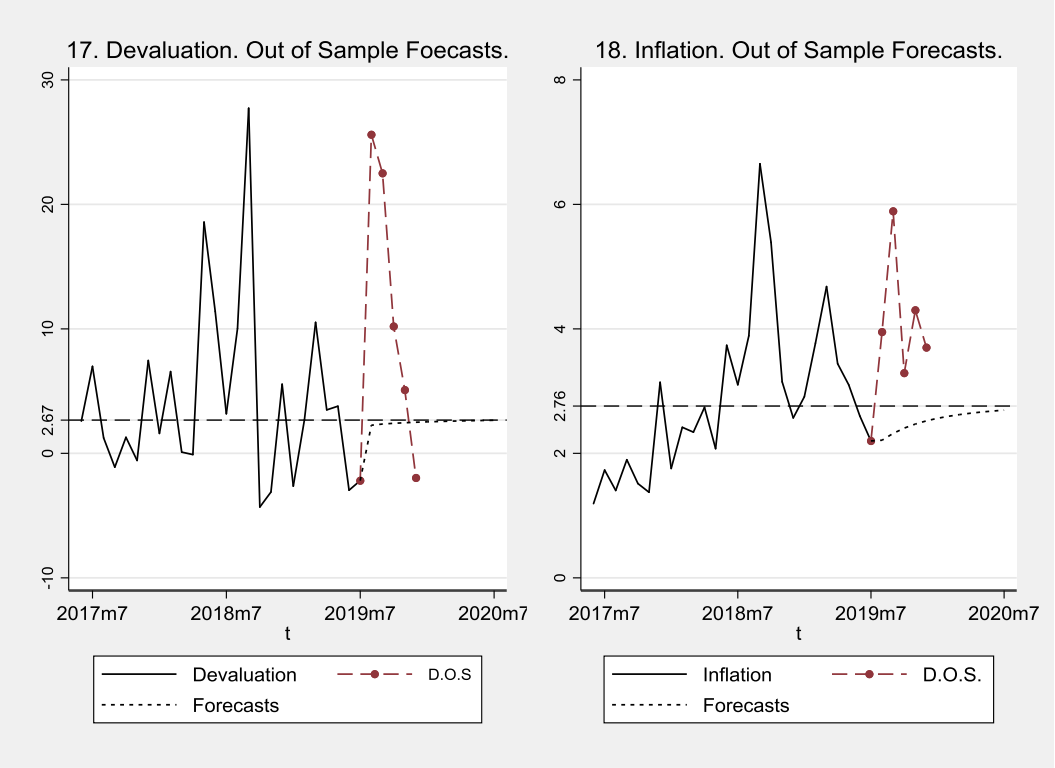
Sudden Stop Shock: ξ(5). Sudden stops are quite frequent in emerging economies and are deployed for many different reasons. In some cases it is thought that capital movements are reversed from emerging capital markets to developed capital markets in response to interest rate spreads. In other cases it is thought that the triggering factor of a sudden stop is local policy events that stimulate capital flight to foreign jurisdictions. The Graphs 13 to 16 simulate a jump-type shock in the "country risk" over the real interest rate. The size of the ξ(5) shock is equivalent to a standard deviation of u_5 . As it has been common in different theoretical and empirical specifications it is observed that sudden stop shocks: increases (Graph 13) the depreciation rate of the domestic currency; increases (Graph 14) the nominal interest rate; increases (Graph 15) the inflation rate with a brief overshooting; and decreases (Graph 16) economic activity.



A question often arises if it is possible to implement some local monetary policy to neutralize the effect of a Sudden Stop. When the nominal interest rate goes up, there are permanent claims from the private sector and the political sector to the Central Bank to do something to avoid the rate hikes. This was part of the debate at the end of 2017. We have just empirically shown that a sudden stop, ξ(5), increases the nominal interest rate. If we tried to correct this through a monetary shock, ξ(6), the nominal interest rate would go further up. With the aggravating factor that we would be left with higher inflation, greater depreciation of the currency and a fall in economic activity. Note that a monetary shock does not have any significant effect on economic activity (see Graph 11).

Out of sample forecasts. As anticipated at the beginning, the last observations of the sample, August 2019 to December 2019, were not used in the estimate with the intention of evaluating out of sample forecasts. Graphs 17 and 18 show how the DSGE model significantly underestimates events after July 2019. The DSGE model produces devaluation and inflation estimates that indicate a gradual return to the long-term equilibrium. While the observations outside the sample indicate for both variables a strong overshooting starting from August 2019. In the previous sample period there have been large overshootings but they had a brief persistence, and it is possible to consider that they were shocks that dissipated quickly without indicating the existence of an structural change in the parameters of the model.

The out of sample observation seems to belong to a different model to which the estimates were carried out. The result of the primary elections seems to represent an unanticipated change of regime. The estimated parameters producing the forecasts correspond to the old regime. The new regime may have very different parameters than those estimated with historical information.



What was observed in graphs 17 and 18 is repeated for all out-of-sample predictions of endogenous variables. An unanticipated shock is driven by the general equilibrium saddle path solution generated by the estimation process to the steady state calculated by historical data, and a regime change might produce a different steady state and parameters estimate.

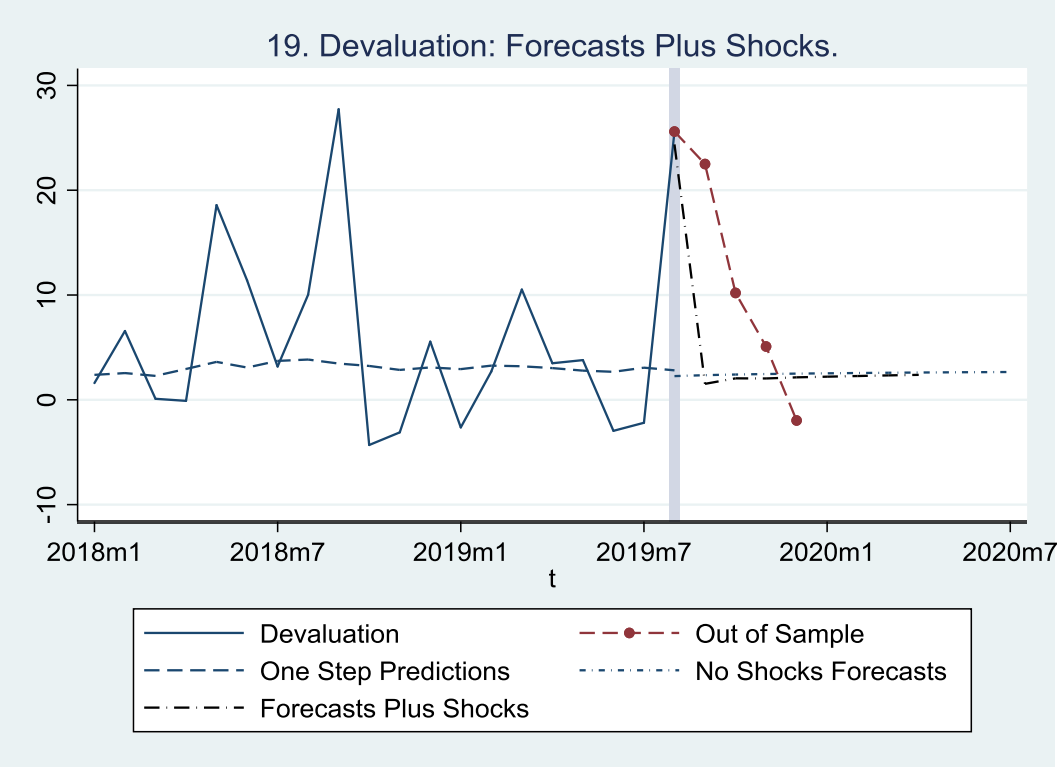
7. **A primary election and evaluating regime switching.**

If, at any given time, there is a change in expectations regarding the continuity of a regime, the parameters should be re-estimated taking into account the regime switching. The previously estimated parameters would not be structurally correct for making predictions on a sample that precisely ends with the expectation of a regime change. A regime switching analysis requires a change in the model specification to incorporate the hypothesis defining the new regimen characteristic (see Hamilton (1994) and Dejong and Dave (2011)). Undoubtedly, this is an important point for Argentina's macro econometric future research. For illustrative purposes, I will present forecasts using the parameters estimated in the sample period that ends just before the primary elections. To the forecasts I will add the data generated by IRFS corresponding to potential shocks in the event that the ruling party had an adverse result in the elections.

IRFS are normally calculated by simulating an unexpected shock of the size of one standard deviation. In our case, I will use shocks equivalent to three standard deviations to put into perspective a "tail risk" that may become a vague indicator of the future evolution of the economy in the face of an unexpected change in regime. But, as I just mentioned, what would correspond would be to reformulate the entire model in a future research. At the time of writing the last version (April 2020) of this paper it is evident that the new regime will have to focus on facing the COVID-19 crisis.

We will consider four shocks that will accumulate to forecasts in the absence of any shocks. The first shock, u_2, affects the equilibrium condition in the asset market. The second shock, u_3, corresponds to the reaction of firms in the staggered prices equation. The third shock, u_4, impacts the parity condition. And, finally, the fourth shock, u_5, would reflect a jump in country risk.

Graph 19, includes the accumulation of the four important shocks just described. It shows that the forecasts including the shocks accompany the observed strong devaluation of the peso immediately after the primary elections. But the persistence of devaluation far away of the steady state suggests the need for new structural parameters capturing the regime shift. The new administration took office in December 2019.



Graph 20 shows that the four unanticipated socks improve out-of-ample forecasts of inflation with respect to Graph 18. This good performance of the model including the four shocks suggests that the expectation of an adverse electoral result is a "tail risk" and does not imply the existence of a regime change. After a sufficient time for the effect of the shocks to be absorbed, the economy could continue to be represented by the estimated parameters.

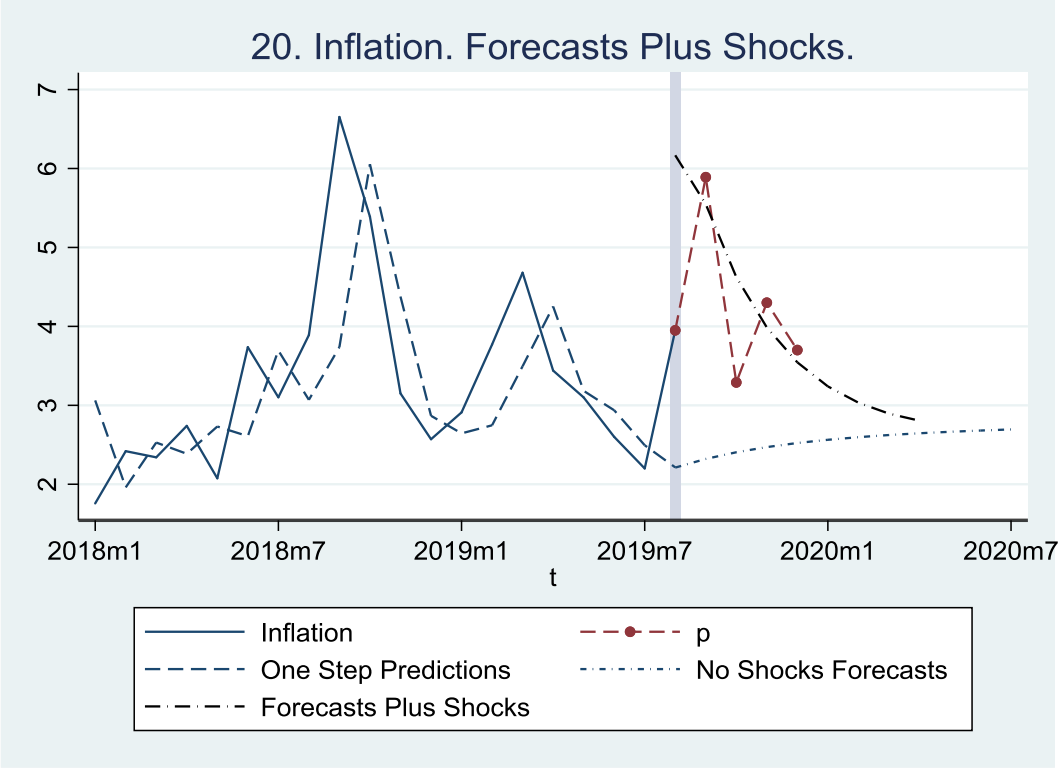
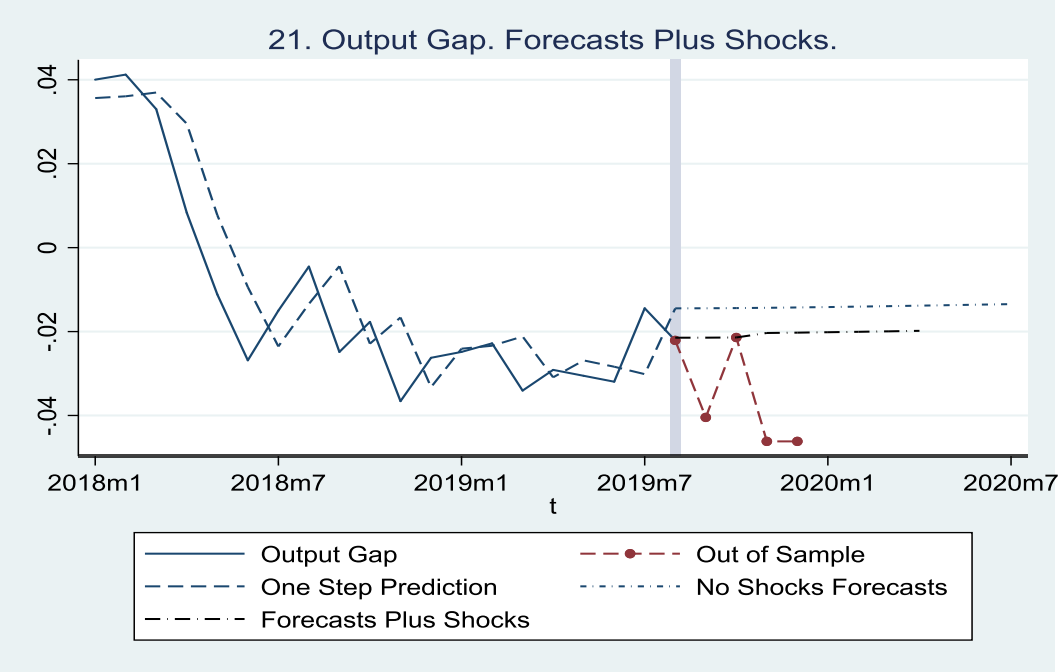


Figure 21 shows that incorporating the four unanticipated shocks improves out-of-sample predictions. However, the recessive persistence in the output gap is underestimated, again suggesting the existence of a change in regime.



The model we have just analyzed is not the only one that can be represented by the monthly time series from the period 2016 to 2019. Below I will present an empirical model that incorporates two distinctive aspects in relation to the previous model, and that have been highlighted by Calvo (2017) in the evaluation of a small open economy (with a specific reference to Argentina) that uses the nominal interest rate as an instrument in trying to stabilize an economy with chronic inflation.

8. **A DSGE IT Model.**

As mentioned above, when discussing the policy debate during 2016 and 2017 Argentina had an inflation targeting economic program where the interest rate policy followed a particular Taylor Rule. Essentially the rule consisted of announcing a target for the inflation rate and a somewhat ambiguous rule that the interest rate would increase if the observed inflation exceeded the target. In a small economy open to capital flows, to the extent that the domestic interest rate exceeds the international interest rate plus the expected devaluation rate, carry trade-type cash flows generate a quasi-fiscal cost. This was a substantial issue because the underlying problem of Fiscal Dominance did not leave room to generate greater deficits in the future. This type of problem has been extensively treated in the literature under the name of "Temporary Stabilization" or "Imperfect Credibility"[6].

In addition to the nominal interest rate, money plays an important role. Two essential functions are distinguished in the model below. The first is in the form of a cash in advance restriction and the second is the role of quasi money providing an equilibrium condition to the overall financial system.

In order to represent the cash in advance constraint, the definition of the monetary base will be used, which includes currency and unpaid reserve requirements[7]. When the cash in advance constraint is met as strict equality, the first order condition for a representative consumer optima equals the marginal utility of consumption with an expression that depends negatively on the nominal interest rate. This means that in equation (1) instead of including the real interest rate we will include the nominal interest rate.

Regarding the rest of monetary sector, equation (2) is to represent equilibrium on real quasi-money holding depending on the spread between the nominal local interest rate and the international interest rate plus the expected devaluation[8]. This spread was the subject of criticism to the Central Bank in the sense that it promoted carry trade.

Equation (4) is a special form of a Taylor Rule intending to represent the inflation targeting policy. Since the model is one of rational expectations, the target cannot be other than the steady state. Then it is assumed that the Central Bank will promote open market operations trying to raise the nominal rate of interest when the inflation observed in the previous period exceeds the steady state value.

Equation (6), which the previous *Parity Model* appeared as *not observed* equation (13), now appears as a control equation depending on the state variable u_6. Finally, the monetary base is incorporated into equation (7) depending on the state variable u_7. The rest of the equations are the same as those already presented in the *Parity Model*.

$$x_t = -\alpha i_t + u_{1t} \quad (1)$$

$$e_t = m_{qt} + \gamma(i_t - r_t - E(e_{t+1})) + u_{2t} \quad (2)$$

$$p_t = E(p_{t+1}) + x_t + u_{3t} \quad (3)$$

$$i_t = r_t + E(e_{t+1}) + \tau p_{t-1} + u_{4t} \quad (4)$$

$$r_t = u_{5t} \quad (5)$$

$$m_{qt} = -\mu m_{bt} + u_{6t} \quad (6)$$

[6] See Calvo(1986), Vegh(2013), Uribe and Schmitt-Grohé, (2017), and Fernandez (1985).

[7] In practice, a small part of the reserve requirements are allowed to be integrated with the Central Bank's remunerated liabilities. In the model specification, it is assumed that the monetary base does not receive any interest, and the opportunity cost of holding cash is the nominal interest rate.

[8] A version of equation (2), in continuous time and with perfect foresight, can be found in Calvo and Vegh (1995).

$$m_{bt} = u_{7t} \quad (7)$$

$$u_{1,t+1} = \varphi_1 u_{1t} + \xi_{1,t+1} \quad (8)$$

$$u_{2,t+1} = \varphi_2 u_{2t} + \xi_{2,t+1} \quad (9)$$

$$u_{3,t+1} = \beta(e_t - p_t) + \varphi_3 u_{3t} + \xi_{3,t+1} \quad (10)$$

$$u_{4,t+1} = \varphi_4 u_{4t} + \xi_{4,t+1} \quad (11)$$

$$u_{5,t+1} = \varphi_5 u_{5t} + \xi_{5,t+1} \quad (12)$$

$$u_{6,t+1} = \varphi_6 u_{6t} + \xi_{6,t+1} \quad (13)$$

$$u_{7,t+1} = \varphi_7 u_{7t} + \xi_{7,t+1} \quad (14)$$

IT Model. Sample: December 2015 – July 2019; 44 observations ; Log likelihood = -299.55126

	Coef.	Std.Err.	z	P>z
α	0.008	0.003	2.820	0.005
γ	0.342	0.285	1.200	0.230
τ	0.190	0.060	3.140	0.002
μ	1.608	0.345	4.670	0.000
φ1	0.838	0.074	11.380	0.000
φ2	0.009	0.009	1.020	0.307
β	0.025	0.010	2.540	0.011
φ3	0.729	0.101	7.210	0.000
φ4	0.936	0.049	18.920	0.000
φ5	0.975	0.028	34.430	0.000
φ6	0.006	0.016	0.350	0.729
φ7	0.008	0.015	0.570	0.569
sd(e.u1)	0.008	0.001		
sd(e.u2)	14.456	1.546		
sd(e.u3)	0.281	0.086		
sd(e.u4)	0.280	0.065		
sd(e.u5)	0.036	0.004		
sd(e.u6)	8.248	0.885		
sd(e.u7)	3.617	0.386		

The table with parameters estimates shows that from a total of twelve: eight parameters are significant, and four are not. Parameter γ represents the sensitivity of the amount of real quasi-money with respect to the spread. This parameter can have different interpretations according to the aggregate stochastic behavior of the quasi-money holders.

One possibility is that, in the event of an increase in the nominal interest rate, quasi-money holders unanimously interpret it as a reasonable carry trade operation and decide to increase their real quasi-money holdings. In this case we would have $\gamma < 0$ (note that the devaluation rate appears in the first member and the quasi-money growth rate in the second member). Another possibility is that in the face of expectations of the lack of consolidation of fiscal accounts, quasi-money holders interpret the Central Bank policy as attempting to prevent quasi-money holders from converting their portfolios

to dollars. But they know that Fiscal Dominance means that fiscal needs dominate Central Bankers wishes, and they would attempt to reduce their real holdings, even if nominal interest rises. In this case it could happen that $\gamma > 0$ as the table shows. It may happen that at some times the Central Bank is credible and at others times it is not. This would make the gamma parameter quite unstable and perhaps on average not significantly different from zero. The same considerations apply to the parameter φ_2 corresponding to the state variable in equation (2).

The parameter $\varphi 7$ drives the stochastic process of the rate of growth in the monetary base. An independent time series analysis of the monetary base expansion rate indicates that the stochastic process is not significantly different from a white noise[9] suggesting that $\varphi 7$ might not be different from zero. Similarly, observing that in equation (6) the parameter μ is significant, the state variable u_6, and the corresponding parameter φ_6 , may not have much relevance in explaining the behavior of the quasi-money growth rate.

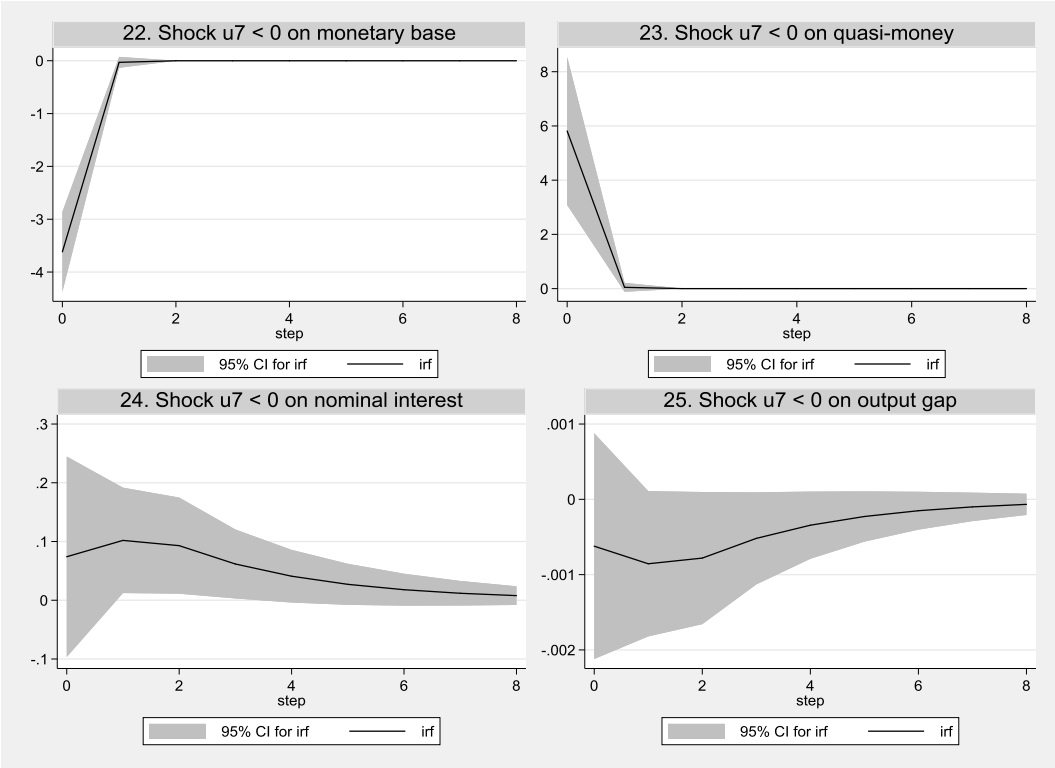
With the model's estimates, we can put into context some aspects of the debate on inflation targeting policy during 2017. Faced with a previous monetary expansion to buy the dollars that enter due to government debt, the Central Bank decides to "sterilize" (see equation (7) and (6) introducing an open market operation. A $u_7 < 0$ shock on the monetary base expanding quasi-money, as shown in graph 22 and 23. Two equations intervene in the initial impact, the first is equation (2) where devaluation rises in the same proportion, and the real amount of quasi-money would not change. However, the devaluation affects the price equation through the state variable u_3, and then with the lag of one period the Taylor Rule affects the nominal interest rate. The IRFS in Figures 24 and 25 show that the interest rate raises and economic activity (equation (1)) falls.

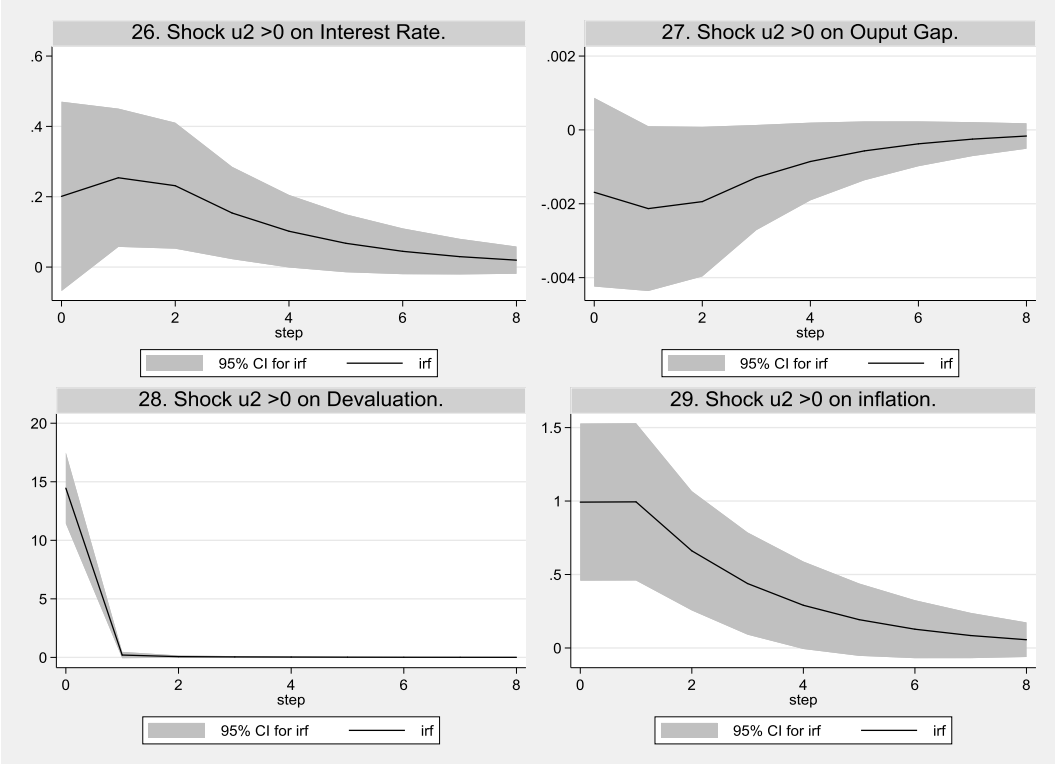
Another experiment that is very illustrative of the debate is to imagine a renewal of quasi-money. Central Bank obligations are very short-term and every week there are tenders where the holders offer different rate options at which they are willing to renew their loans. The Central Bank decides a cut rate to decide which offers to accept. It may happen that the Central Bank chooses the necessary rate so that the total offers are equal to the total maturities. Faced with a situation of unfavorable expectations, the new cut rate that matches supply to demand may be much higher than that of pre-existing contracts in the market. In this situation we would be facing an interest rate shock that does not go through an open market operation. Maturities are simply renewed at a higher interest rate and the monetary base is not affected.

Graphs 26 and 27 illustrate a positive u2 shock on the nominal interest rate and its corresponding impact on economic activity. Graphs 28 and 29 show that the rise in the nominal interest rate, far from calming expectations, produces a jump in the devaluation rate and another minor jump in the inflation rate. This experiment carried out with parameters estimated in the sample

[9] For the sample period used in the estimation a white noise Portmanteau test for the rate of growth of the monetary base gives a (Q) statistic = 37.2610 (Prob> chi2 (20) = 0.0109).

period illustrates the difficulty of devising a stabilization strategy based on an interest rate policy when there is skepticism that the target chosen for inflation is compatible with the inflationary tax necessary to close the fiscal accounts.





Conclusion.

Argentina suffers from chronic inflation. The period analyzed from December 2015 to December 2016 is one more of several episodes repeated in the history of the last decades. Beyond the different phases regarding the instruments to be used to stabilize the economy or to guide the stabilization process, the result has always been disappointing because the problem identified as Fiscal Dominance so far has not been solved, on the contrary, it has been aggravated in the last two decades.

Stabilization programs often fail because they are designed to guide the expectations of economic agents to the stabilization desires of policy makers. Some politically desirable nominal target is set, which may be the rate of devaluation or the rate of monetary expansion, and in some cases they are complemented by income policies that are supposed to coordinate the evolution of prices and wages to achieve stability with an improvement in income distribution. It is largely nothing but wishful thinking. In a very short time Fiscal Dominance renders the nominal targets inconsistent with the inflationary tax necessary to meet the government's intertemporal budget constraint.

The debate presented at the beginning plus the empirical data confirm the recurring failure in Argentina of the idea of establishing nominal targets. Therefore, the strategy followed in this work starts from the assumption that the only relevant target is the equilibrium path determined by Fiscal Dominance.

The assumption of Fiscal Dominance allows ordering the macroeconomic discussion separating two fundamental aspects. First, the steady state level of the inflation rate, the devaluation rate, or the nominal interest rate, as well as the rates of expansion of money and quasi-money respond to the intertemporal equilibrium of the government budget constraint. This is explicitly represented in the theoretical models in the “Unpleasant Monetarist Arithmetic” tradition such as the non-stochastic model presented in the appendix. In the empirical model it has its implicit representation in the sample means. Second, the stochastic characteristic of the DSGE model allows the debate to be enriched taking into account the possibility of evaluating the impact of various shocks on the variables of the model. Of particular relevance to the case of Argentina is the evaluation of some erratic policies of the Central Bank with Open Market interventions trying to neutralize what policy makers call "disruptive events in the markets". Typically these events are linked to exchange-rate changes not expected by officials.

Other frequent events are related to the domestic and external capital markets. Local investors, stockbrokers, and commercial banks operate in the domestic markets, whose decisions impact the nominal rate in pesos. In international markets, sudden stops produce real shocks on country risk and on the real international interest rate facing Argentina.

All the aforementioned shocks were evaluated with simulations represented with Impulse Response Functions. These functions allow us to discern, with empirical data, many of the aspects that have been the subject of discussions in theoretical models. A typical case is Dornbusch's hypothesis about the possibility of an overshooting on the nominal exchange rate in response to a change in monetary policy.

In a preliminary version of this work I made predictions for the year 2020 working with the hypothesis that the ruling party would win the presidential elections in December 2019. Presidents who run for elections generally win a second term. But I was wrong. In the primary elections that were held in early August, the opposition party had a resounding victory that practically ensured that the opposition would win the presidency. This really happened.

This event installed in most economic agents the conviction of a change of regime, since in the candidates' own campaign a notable contrast was reflected in the structural model that each one preferred. Estimating the DSGE model with data until July 2019 I had five out-of-sample five additional observations This event allowed me to explore the hypothesis of predicting the effect of a regime switching. I considered it as a "tail risk" simulating shocks equivalent to three standard

deviations. The results of the simulation of a potential regime switching allowed improving significantly the out-of-sample predictions of the inflation rate and the devaluation rate.

The purpose of this work was to initiate a DSGE empirical analysis of the Argentine economy with the intention of monitoring the situation with a structural model to allow comparisons with other models that I hope will emerge in the future. DSGE are a useful tool for analysis, and numerous models have already been disseminated to assess the macroeconomic situation in various countries. Most Central Banks have used this type of model to enable an orderly discussion of the main macroeconomic issues of day-to-day debate on macroeconomic policy. DSGE models are not the only models that are used, but they are often compared with other econometric techniques that are being generated along with new developments in economic theory.

Christiano, Eichenbaum, and Mathias Trabandt, (2018), have recently reviewed the potential use of DSGE models and have emphasized that the enterprise of dynamic stochastic general equilibrium modeling is an organic process that involves the constant interaction of data and theory. They think that there is a possibility to go beyond conventional rational expectations. These deviations include k-level thinking, robust control, social learning, adaptive learning, and relaxing the assumption of common knowledge. In studying the problem of Populism, a topic closely related to chronic inflation, I have relaxed the assumption of rational expectations (or perfect foresight) incorporating elements of biology Fernandez (2016), and I have also incorporated elements of political science by relaxing the assumption of common knowledge in Fernandez (2018). Those were theoretical models, but undoubtedly, DSGE models have the necessary versatility to include these topics in future empirical research.

Appendix A.

Fiscal Dominance: Unpleasant Monetarist Arithmetic in a small open economy.

Ljungqvist and Sargent, (2018), discussing Fiscal-Monetary Theories of Inflation starts with the observation that complete markets have no role for an inconvertible currency of the type printed by Central Banks. And they proceeded to alter the hypothesis of complete markets by introducing a technology for transactions that assign a positive value to an inconvertible currency in a closed economy.

Next, I will present a similar model for a small open economy receiving a flow endowment, y_t, of a tradeable good (no storable). The international price of one unit of the tradeable good is equal to one, and with E_t being the nominal exchange rate (units of domestic currency per unit of foreign currency), the *law of one price* implies $P_t=E_t$. The good can be divided between private consumption and government purchases, subject to:

$$c_t + g_t = y$$

Residents of the small open economy are legally restricted to hold foreign currency and foreign bonds. Local currency is printed by the government, and local real bonds are perfect substitutes of foreign bonds. Local real bonds can only be issued and hold by the government or by private residents. Both, residents and government, issue and accept bonds with real interest rates equal to the real interest rate prevailing in the rest of the world. Thus, *uncovered real interest rate parity* holds at all times, meaning that the real gross rate of return on one period real domestic bond is equal to the real gross rate of return to the equivalent international one period bond. This common gross rate of return, R_t, is a given and positive. And in stationary equilibrium it is assumed be equal to the inverse of the representative household´s subjective discount factor ($\beta \in (0,1)$)[10]. Furthermore it is assumed that the local nominal interest rate must be greater or equal to cero.

Household.

Preference of the household are ordered by

$$\sum_{t=0}^{\infty} \beta^t u(c_t, l_t)$$

where $c_t \geq 0$, and $l_t \geq 0$ is leisure at time *t*. Also: $u_c, u_l > 0, u_{cc}, u_{ll} < 0, u_{cl} \geq 0.$

With one unit of time per period, the household time constraint becomes

$$1 = l_t + s_t$$

where s_t is the amount of shopping time needed to purchase the level of consumption c_t.

[10] These restrictive assumptions simplify the algebra and keep the model almost identical to the corresponding closed economy model. None of these restrictions play a significant role on the specific subject of fiscal dominance here discussed.

To acquire the consumption good, the household allocates time to shopping. The amount of time s_t needed to purchase c_t is negatively related to the household's holdings of real money balances *M/E*. The specific transaction technology is

$$s_t = H(c_t, \frac{M_{t+1}^D}{E_t}) \quad (1)$$

where H, H_c, H_{cc}, $H_{M/E.M/E} \geq 0$, $H_{M/E}$, $H_{c,M/E} \leq 0$.

$M_{t+1}^D \equiv nominal\ balances\ held\ between\ t\ and\ t+1$

The representative household, given the initial stocks M_0, B_0, maximize preferences with respect to nominal money balances (M^D, for $t \geq 1$) , real one period bonds (B^D, for $t \geq 1$), consumption and leisure, subject to the transaction technology and a sequence of budget constraints

$$c_t + \frac{B_{t+1}^D}{R_t} + \frac{M_{t+1}^D}{E_t} = y - \tau_t + B_t^D + \frac{M^D}{E_t} \quad (2)$$

The households maximizes the following Lagrangian

$$\sum_{t=0}^{\infty} \beta^t \{u(c_t, l_t) + \lambda \left(y - \tau_t + B_t^D + \frac{M_t^D}{E_t} - c_t - \frac{B_{t+1}^D}{R_t} - \frac{M_{t+1}^D}{E_t} \right) + \mu_t \left[1 - l_t - H\left(c_t, \frac{M_{t+1}^D}{E_t} \right) \right] \}$$

The first-order condition with respect to c,l,B_{t+1}, M_{t+1}

$$u_c(t) - \lambda_t - \mu_t H_c(t) = 0 \quad (3)$$

$$u_l(t) - \mu_t = 0 \quad (4)$$

$$-\frac{\lambda_t}{R_t} + \beta \lambda_{t+1} = 0 \quad (5)$$

$$-\frac{\lambda_t}{E_t} - \mu_t \frac{H_{(M/E)}(t)}{E_t} + \beta \frac{\lambda_{t+1}}{E_{t+1}} = 0 \quad (6)$$

From (3) and (4),

$$\lambda_t = u_c(t) - u_l(t) H_c(t) \quad (7)$$

By substituting (7) in (5),

$$\frac{u_c(t)-u_l(t)H_c(t)}{u_c(t+1)-u_l(t+1)H_c(t+1)} = R_t\beta \qquad (8)$$

Stationary equilibrium implies that the left hand side of (8) is equal to one because the numerator is equal to denominator. This in turns implies that in stationary equilibrium $R_t=\beta^{-1}$.

Using (5) and (6)

$$\frac{R_t-R_{mt}}{R_t}\lambda_t = -\mu_t H_{\left(\frac{M}{E}\right)}(t) \qquad (10)$$

where $R_{mt} \equiv \frac{E_t}{E_{t+1}} \equiv real\ gross\ return\ on\ money\ held\ between\ t\ and\ t+1$

The left hand side of (10) is the cost (discounted at the rate R_t) of holding money. $R_t - R_{mt}$ is the nominal interest earning forgone by not holding bonds[11], and expressed in time *t* utility when multiplied by the shadow price $\boldsymbol{\lambda_t}$. Given that $H_{M/E} \leq 0$, the right hand side of (10) is the benefit of an additional unit of real money balances by savings in shopping time evaluated at the shadow price μ_t.

By substituting (4) and (7) in (10),

$$\frac{R_t-R_{mt}}{R_t}\left[\frac{u_c(t)}{u_l(t)} - H_c(t)\right] + H_{\left(\frac{M}{E}\right)}(t) = 0 \qquad (11)$$

Assuming that the household time constraint holds as an strict equality ($\mu_t > 0$), equation (11) implicitly defines a money demand function

$$\frac{M_{t+1}^D}{E_t} = F(c_t, \frac{R_{mt}}{R_t}) \qquad (12)$$

The real return on money R_{mt} must be less than or equal to the return on bonds R_t, otherwise agents would be able to make arbitrarily large profits choosing large money holdings financed by issuing private bonds[12].

Government.

The government finances the purchase of g_t subject to the sequence of budget constraints

[11] In terms of the usual denomination of variables in empirical work: denoting with ε the rate of local currency depreciation (equal to inflation) and with r the real interest rate; R_t-R_m= *(1+r)-1/(1+ε) ≈ r+ε* ≈ i ≡ the nominal interest rate.

[12] The condition $R_m \leq R$ implies (1/(1+ε))≤(1+r), or (1+i) ≡ (1+r)(1+ε) ≥ 1, that is the nominal interest rate cannot be negative. The ratio *Rmt/Rt* is equivalent to the inverse of the nominal gross interest rate 1/(1+i) implying, as usual, that the real demand for money depends negatively on the nominal interest rate.

$$g_t = \tau_t + \frac{B_{t+1}}{R_t} - B_t + \frac{M_{t+1}-M_t}{E_t} \quad (13)$$

τ_t is a lump sum tax at t. B_t is real government indebtness to the private sector, (debt denominated in time t goods), maturing at the beginning of period t. M_t is the nominal stock of currency that the government has issued as of the beginning of period t.

Equilibrium.

Given: $M_0^D = M_0 \quad B_0^D = B_0$ and the exogenous sequences g_t, τ_t, R_t ; $t \geq 0$. The endogenous sequences: c_t , t ≥ 0; and $\{M_t^D\}_{t=1}^{\infty}$, $\{B_t^D\}_{t=1}^{\infty}$, define an equilibrium when: a) for all $t \geq 1$ the household's problem is solved with $B^D=B$ and $M^D=M$; b) for all $t \geq 0$ the government's budget constraint is satisfied, and c) $c_t+g_t=y$.

Government policies distinguish *long run* (stationary equilibrium) assuming: $g_t=g$ for all $t \geq 0$; $\tau_t = \tau$ for all $t \geq 1$; and $B_t=B$ for all $t \geq 1$. *Short run* (initial date) permits $\tau_0 \neq \tau$ and $B_0 \neq B$. This particular specification allows the concept of *open market operations* which plays a crucial role in Argentina Central Bank policy during the sample period in the empirical research.

In a stationary equilibrium for all $t \geq 0$: $(E_t/E_{t+1})=R_m$; $R_t=R=\beta^{-1}$; $c_t=c$; $s_t=s$.

Then, suppressing constants, the stationary monetary equilibrium can be written as

$$\frac{M_{t+1}}{E_t} = f(R_m) \quad (14)$$

The stationary value of seigniorage per period is

$$\frac{M_{t+1}-M_t}{E_t} = \frac{M_{t+1}}{E_t} - \frac{M_t}{E_{t-1}}\frac{E_{t-1}}{E_t} = f(R_m)(1-R_m) \quad (15)$$

Using the stationary values for (13) and (15) we obtain the *stationary state government budget constraint*

$$g - \tau + \frac{B(R-1)}{R} = f(R_m)(1-R_m) \quad (16)$$

The left hand side represents the overall deficit: the first two terms is the primary deficit, and the last term represents the interest cost of debt. The right hand side is the seigniorage revenue from printing currency. $f(R_m)$ is the real monetary base of the depreciation (inflation) tax and $(1 - R_m)$ is the depreciation tax. The right hand side can also be used to illustrate de corresponding "Laffer curve" in the inflation tax with one good and one bad equilibrium. For the comparative dynamics we use the good equilibrium: given a deficit, from the two possible solutions we choose the lower inflation tax, that in this case correspond to the higher return on money.

At the *initial date t = 0*, the government budget constraint is:

$$\frac{M_0}{E_0} = f(R_m) + (\tau_0 - g) - B_0 + \frac{B}{R} \quad (17)$$

The system is recursive: (16) determines the value of R_m , and given M_0 , (17) determines E_0.

Using the *stationary state* and the *initial date* budget constraints we can describe the paradoxical effects of an open market operation. Imagine the typical situation in Argentina where the government cares about a presumably high level of the exchange rate and decides to perform an open market operation to absorb currency in circulation increasing the stock of government bonds. The open market operation consists in reducing M_1 and increasing B. Increasing B implies increasing the right hand side of the *stationary state* budget constraint $f(R_m)(1 - R_m)$. As we are working with R_m that is the inverse of the currency depreciation (= inflation) rate, the open market operation unambiguously decreases R_m increases the stationary state value of the depreciation rate[13]. Now, given that R_m decreases and B increases, the *initial date* budget constraint gives an ambiguous result on the initial level of the exchange rate. So the paradoxical result is that an open market operation increasing debt to decrease money in circulation can at best reduce temporarily the level of the exchange rate at the cost of causing a depreciation (= inflation) rate to be permanently higher. This is a specific Fiscal Dominance result known as *unpleasant monetarist arithmetic*.

The previous theoretical structure focused on describing a fiscal theory of nominal exchange rate depreciation (or inflation) and determination of the initial level of the nominal exchange rate. The government set g, τ_0, τ, and B while M_0 and B_0 are inherited from the past. Equation (16) determined the value of R_m , and (17) determined E_0. Just paying attention to (16) and (17) is possible to modify the interpretation of budget constraints to evaluate a Central Bank policy of "pegging" the nominal interest rate. In our context, the gross nominal yield "$(1+i)$" of the local real one period bond is $(1+i)=(1+r)(1+\varepsilon)$ where $r=R-1$ and $(1+\varepsilon)=E_{t+1}/E_t$. Also $R_m = 1/(1+\varepsilon)$. Then given that r is a stationary state constant, pegging i is equivalent to pegging ε. But in this case B becomes an endogenous variable depending on ε.

Now, equation (16) can be rewritten as

$$\frac{B(\varepsilon)}{R} = \frac{1}{r}\left[(\tau - g) + f\left(\frac{1}{1+\varepsilon}\right)\left(\frac{\varepsilon}{1+\varepsilon}\right)\right] \qquad (18)$$

meaning that present value of the bond is the future discounted value of the primary surplus plus the revenue from currency depreciation[14]. Notice that now the Laffer curve is expressed as a function of the nominal rate of depreciation. We assume equilibrium in the segment of the curve where increasing the rate of depreciation increases revenue, and consequently $B_\varepsilon > 0$.

A significant policy debate in Argentina 2015-2019 emerged when the Central Bank started to use the nominal interest rate as policy instrument in fighting inflation. See, for example Calvo (2017). One central point in the debate was the possibility that increasing the interest rate would lower the level of the exchange rate and presumably this would eventually help to achieve stability.

I will illustrate the comparative dynamics of the previous equilibrium where the government sets g, τ_0, τ, and B with other equilibrium where the government sets g, τ_0, τ, and $\varepsilon_1 > \varepsilon$. Rewriting (17)

[13] The result should not be confused with the conventional Laffer curve. Consider that on the x axis we are using the inverse of the currency depreciation (= inflation) rate, this implies that the good equilibrium is located where the Laffer curve has a negative slope because a higher return on money corresponds to a lower depreciation (inflation) rate.

[14] This topic is related to works related to fiscal policy and price level determination. See Woodford (1995), Sims (1994), and Auernheimer (2008), among many others.

$$\frac{M_0}{E_0} = f\left(\frac{1}{1+\varepsilon_1}\right) + (\tau_0 - g) - B_0 + \frac{B(\varepsilon_1)}{R} \qquad (19)$$

we observe that an equilibrium with pegging a higher interest rate $\varepsilon_1 > \varepsilon$ has an ambiguous effect on the initial level of the nominal exchange rate, as the first term of the right hand side tend to increase E_0 while the last term tend to decrease E_0.

Appendix B.

Data Table.

Table Description: y: EMAE index; e: % monthly rate of devaluation; p: % monthly rate of inflation; i: % monthly nominal interest rate; r: % monthly real interest rate; mb: % monthly rate of growth of the monetary base; and mq: % monthly rate of growth of quasi-money.

Table: List of Variables

t	y	e	p	i	r	mb	mq
2015m12	147.184	0.269	5.201	3.030	0.465	11.180	-5.404
2016m1	147.247	-2.924	4.165	2.618	0.453	-3.108	30.773
2016m2	146.905	7.697	3.341	2.549	0.443	-6.546	15.239
2016m3	146.316	-1.378	3.147	3.119	0.421	4.156	0.801
2016m4	145.374	-3.561	4.970	3.167	0.392	-0.776	9.319
2016m5	144.524	-2.432	4.193	3.078	0.377	0.318	9.687
2016m6	143.895	1.278	3.076	2.722	0.452	5.835	6.734
2016m7	144.813	5.394	2.047	2.527	0.438	8.605	3.811
2016m8	145.176	-0.723	0.202	2.453	0.434	0.595	9.939
2016m9	145.347	2.017	1.149	2.280	0.418	0.863	4.914
2016m10	144.893	0.415	2.359	2.229	0.381	2.032	4.053
2016m11	146.188	1.413	1.618	2.167	0.400	3.415	5.787
2016m12	146.893	2.622	1.198	2.063	0.443	9.602	-4.458
2017m1	146.801	0.539	1.586	2.063	0.447	3.528	-3.805
2017m2	146.107	-1.907	2.067	2.063	0.422	1.696	-3.945
2017m3	146.906	-0.118	2.374	2.063	0.421	-4.302	5.270
2017m4	147.371	-0.513	2.656	2.138	0.409	-0.123	15.595
2017m5	148.299	1.530	1.435	2.188	0.401	-0.750	11.622
2017m6	149.914	2.590	1.192	2.188	0.367	2.952	7.009
2017m7	150.504	6.990	1.732	2.188	0.388	5.244	2.237
2017m8	149.980	1.240	1.403	2.188	0.398	1.135	4.098
2017m9	151.643	-1.110	1.898	2.188	0.381	1.207	6.297
2017m10	151.802	1.290	1.515	2.217	0.358	1.752	5.610
2017m11	152.777	-0.570	1.375	2.379	0.337	2.081	2.924
2017m12	152.104	7.460	3.142	2.396	0.350	8.404	-0.783
2018m1	152.168	1.6	1.757	2.333	0.342	4.480	1.613
2018m2	152.351	6.570	2.419	2.271	0.367	0.198	7.507
2018m3	151.101	.1	2.341	2.271	0.396	-0.643	1.389
2018m4	147.417	-0.099	2.739	2.283	0.404	-0.231	0.221
2018m5	144.578	18.579	2.075	3.270	0.411	0.387	0.048
2018m6	142.323	11.404	3.737	3.333	0.458	4.088	-9.291
2018m7	144.018	3.178	3.102	3.333	0.507	4.243	-11.729
2018m8	145.538	10.030	3.889	3.712	0.545	7.775	-21.882
2018m9	142.608	27.728	6.653	5.021	0.636	6.150	-37.400
2018m10	143.633	-4.311	5.390	5.966	0.647	-1.470	-2.020
2018m11	140.945	-3.106	3.150	5.383	0.641	0.332	2.410
2018m12	142.409	5.556	2.570	4.946	0.631	6.410	-4.070
2019m1	142.609	-2.632	2.910	4.786	0.717	0.657	9.260
2019m2	142.900	2.703	3.770	3.964	0.650	-0.175	9.750
2019m3	141.300	10.526	4.680	5.202	0.622	-2.150	7.580
2019m4	142	3.491	3.440	5.705	0.674	0.792	4.310
2019m5	141.800	3.790	3.1	5.982	0.715	1.290	2.650
2019m6	141.600	-2.960	2.6	5.565	0.801	0.007	7.270
2019m7	144.100	-2.190	2.2	4.966	0.761	3.060	9.010
2019m8	143	25.600	3.950	5.938	0.658	-4.180	3.490
2019m9	140.400	22.500	5.890	6.959	1.310	1.280	-11.900
2019m10	143.100	10.200	3.290	5.844	1.832	3.4	-6.380
2019m11	139.600	5.090	4.3	5.333	1.761	13.900	-21.662
2019m12	139.600	-1.970	3.7	5.114	1.962	8.530	-8.640

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