

# Effects of Austerity Measures Taken in the Present Crisis

*The Oxymoron of Expansive Austerity*



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## Abstract

Eight years after all this started, I have analysed the results of the decisions and policies taken by economic authorities to achieve an idea of their effectivity. By focusing on the austerity measures implemented in the EU and the US, I have analysed if those measures helped the economy recover or just made the situation worse. Using a Neo-Classical version of Mankiw's 3-equation Model, but with some adjustments to get more realistic results, I analysed if the policy choices taken from a classic point of view could have been out bested by more Keynesian policies to bring the economy back on its feet.

Key words: Austerity, New-Keynesians, Neo-classics, Policy Measures, Economic Cycles, Financial crisis and Great Depression

## Resum

Vuit anys després que esclatés la crisi més gran des de la gran depressió, aquest treball mira enrere per observar els resultats de les solucions emprades per part de les autoritats econòmiques i així poder analitzar la seva efectivitat. Centrant-se en les polítiques de la UE i els EEUU per poder concloure si varen ser les adequades o si, d'altre banda, tan sols van empitjorar la situació econòmica. Utilitzant una versió neo-clàssica del model de Mankiw de 3 equacions, però amb ajustos que, des d'un punt de vista més keynesià, aporten més realisme al model, analitzo si amb polítiques de caire més keynesià, s'haguessin pogut millorar els resultats causats per les polítiques d'austeritat per tal de fer front a la crisi financera.

Paraules clau: Austeritat, Neo-Keynesians, Neo-clàssics, Mesures Polítiques, Cicle Econòmic I Gran Depressió

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## Introduction

Eight years after all this started, I will analyse the results of the decisions and policies made by economic authorities to achieve an idea of their effectivity. But even more importantly, I want to be able to better understand the reasons that brought them to do what they've done.

Economic austerity is defined by the Longman Dictionary as “a deliberate government policy that tries to reduce the amount of money it spends.” But reducing government expenditure could lower the absolute value of the deficit yet increase it in percentage of the GDP. So, governments instead implement a deficit-cutting policy, through lowering spending and a reducing the amount of benefits and public services provided by the government. This is usually followed by an increase in taxes to pay back creditors quicker.

My aim in this paper is to analyse the results of the Austerity measures implemented as an expansionary policy to cope with 2007/2008 Global crisis. Like most of the economic analysis, first, I need to investigate the history of what’s called: “Economics of Austerity”, because economists need to assimilate the errors and successes made in the past and adapt them for the present scenarios.

So, after broadly explaining the history of austerity, I will focus on the two most prominent perspectives today, new-Keynesianism and neo-classical monetarism and the opposing nature that these two schools have about austerity.

Furthermore, I will debate to find answers to questions like, whether austerity measures are for the top or the bottom of the economic cycle. Also, can austerity be an expansionary policy? Because if it can't be, why has the EU seen it as the best way out of this crisis? Finally, I will determine if austerity benefits anyone at all, if so, then whom?



## **Brief history of long-term debt and austerity until 2007:**

The evolution of austerity is closely related to that of the national debt and the attitudes towards it. For that reason, to understand the concept of austerity I must first explain the meaning of long-term national debt. National debt, as we know it today, has only been around for the last 300 years. It was used to pay for extraordinary expenses such as wars, due to the difficulty of raising funds through taxation. In particular, one of the first countries to use it was England when in 1694 created the Bank of England as a private institution established to provide the crown with money.

However, that was only the beginning of it. Imperial countries were expanding during the 18<sup>th</sup> century to secure new material sources and markets. The spending levels of those countries rose above their means which forced them to borrow large sums of money in order to maintain those colonies where taxation had a big social risk.

In other words, the disapproval of taxation within the colonies, the imperial countries were forced to find other ways of financing themselves. This encouraged them to explore new methods of public financing. So, during the 18<sup>th</sup> and 19<sup>th</sup> centuries, fiscal policy was about balancing the budget. Deficits could only be tolerated in extraordinary circumstances. Basically, the austerity debate was about whether to finance public spending through taxation or debt (future taxation).

From David Hume to Adam Smith or Thomas Malthus to John Stuart Mill, most of the greatest economists have published works about public debt and how to cope with it. From Smith's condemnation of public debt and his belief of how important it is to reduce it quickly, to Mill's *Principles of Political Economy (1848)*, where he defends that for under-consumption situations, some national debt can be not only desirable, but almost essential as an investment for the savings of the lower classes of the society, there are many varying perspectives within this economic spectrum.

Originally, debt was only used to finance national emergencies, such as wars. However, during the period of imperial expansion, wars were so profitable both economically and territorially. Consequently, the struggles began afterwards when the national economic activity started to stabilize and the warfare was mechanized, increasing the cost of war.

The decades between the early 1900's and the late 1920's were hectic due to the Russian Revolution and World War I and the high levels of debt on most of the participant countries. These circumstances provoked the citizen's uncertainty and distrust with those countries governments. This unrest peaked with 1929's Stock

Market Crash and the following Great Depression of the 1930's. These events made the economics of austerity even more controversial amongst the governments.

From analysing the causes of that crisis, opposing ideas emerged. On the one hand, with the conservative view, there was still the belief that the markets were perfect and the only problem and cause of the crisis was the rigidities imposed by economic authorities to the all mighty markets.

But on the other hand, with John Maynard Keynes on the front line, alternative views defended the use of national debt or deficit to stimulate the economy and increase employment in moments of recession. In other words, Keynesians focused their emphasis on relaunching the demand side to its original consumption levels.

With those new views, economics of austerity took a whole different role in politics. Authorities started to believe in Mr. Keynes's ideas to the point where intervention was practically government's duty with the objective of stabilizing the economy.

Governments based their policies mainly in Keynesian views of the economy. Austerity measures were only implemented to control the boom and the inflation. In other words, a policy to cool down the economy when it was on the top of the business cycle, but never to expand a decayed demand.

This interventionist wave lasted during nearly three thriving decades, macro-economically speaking, when the standards of living and the economic equality increased.

Nevertheless, the stagflation of the 70's (mainly caused by supply side exogenous shocks like the oil price) added to the removal of gold backing for the dollar, which resulted in the inefficiency of money supply control policies. The president of USA on the just latter mandate, Ronald Reagan, even said, "The government is the problem."

This pushed the return to the classical 'Laissez Faire' economics. This neo-liberalism put the emphasis of economic policies on consumption-based supply side economics, instead of the full employment and growth in effective demand. During this period, intervention and the government itself were considered the cause of recessions. They had, once again, blind trust for the free markets and they thought that any law or government could only break the market's harmony.

Consequently, the discussion of investor's irrationality, of bubbles or destructive speculation, had practically disappeared from academic course and the "Efficient-Market Hypothesis" had prevailed. In between the 70's and the financial crisis of 2007/8, there were few events, like 1987 stock crash, the crisis of the '.com' or the LTMC in 1999, that could have been considered as evidence of the unreliability of markets, but were far from doing that. Instead, they ignored the signs and build theoretical models on how to price a financial asset based on those idealistic premises like the Capital asset pricing model (CAPM).

The reason that those financial crises didn't cause a great depression like the one of 2007/08, is well explained in the book '*Manias, Panics and Crashes*' written by Charles P. Kindleberger and Robert Z. Aliber. They explain how there are financial crises approximately every decade, but that when it busts during the boom of the real economic cycle, the economy just slows a little and it's able to counter the shock. However, when this financial crisis 'explodes' when the economy is in a crisis itself is when we end up with a great depression.

There was a more recent telling moment in 2005, when Raghuram Rajan of University of Chicago (despite the neo-classical influence of his university), presented a paper warning that the financial system was taking on potential levels of risk. He was mocked by many economists who a few years later had to admit the economic society was in a state of 'shocked disbelief' and that the intellectual edifice had collapsed. And, since this collapse was also the collapse of real-world markets, the result was a severe recession, the worst, in many ways, since the Great Depression. (Paul Krugman, 2009)



## **Different points of view about Austerity:**

### **Classical, Neo-classical and Austrian views:**

During the short history of austerity as an economic policy, we have been able to distinguish between two main perspectives. On the one hand, we have those economists who see austerity as a deficit-cutting policy to stabilize the economy when it's at the bottom of the economic cycle. In other words, it's a solution to put the economy back on track and out of the recession while the state pays its debt.

This view was approached by Frederich Hayek, from the so-called Austrian school of economics (basically a neo-classical school). Inflation ravaged Hayek's country of Austria after World War I. This created a fear towards inflation that had a strong impact on his thoughts. As a part of the neo-classical school, he believed that free markets are perfectly capable of returning the economy to its equilibrium as soon as no rigidities in wages or prices are imposed by the government.

Following this premise, Hayek and his school believe the long-run aggregate supply curve (AS) has an inelastic nature. Therefore, they assure that if the aggregate demand curve (AD) rises faster than long-run AS, there can be a momentarily rise in real national output. However, in the long run, the level of output will return to its previous level of real GDP due to the crowding-out and the only real impact of that rise of the AD will be a higher level of inflation. This means that any attempt from the authorities to affect the level of real GDP through monetary or fiscal policy will be, at best, ineffective and with a high probability to cause inflation levels to rise.

Because of this, classical economists and successors state that an economy free from rigidities will always return to full employment on its own.

Taking into consideration the historical examples of this point of view, as Mark Blyth explains in his book *'Austerity: the history of a dangerous idea'* in 2013, we can appreciate two similar orthodox approaches to a recession:

There is the American version (or Emetic response) by Joseph Schumpeter which concludes that under the premise of a government that never intervenes with economic policies, banks are likely to have booms and busts and we should learn how to cope with them. Conversely, when banks are backed by the political authorities, they produce too much credit, which confuses entrepreneurs and investors about price signals (remember neo-classical economists believe that all economic agents are

perfectly rational in their decisions). This confusion causes them to invest in things they shouldn't which results in the production of goods that society is never going to need. Because when there is uncertainty, economic agents can't base their decisions in probabilities, they can only answer to their own instincts and expectations. Therefore, it's impossible to behave completely rationally. Then, eventually, markets end up with too much of the wrong type of investment and the slump is necessary to barf all those wrong assets to reset the clock and let the perfect markets recover on their own, returning the economy to its point of equilibrium.

There is also the British version (The Treasury view), that states that we can't do anything about unemployment. That any increase in government spending will lead to an exact amount of private investment due to a crowding-out and, therefore, have no impact on real output levels. Actually, in 1929, the Prime Minister of UK at the time, Winston Churchill said, "when the Government borrows in the money market it becomes a new competitor with industry and engrosses to itself resources which would otherwise have been employed by private enterprise, and in the process raises the rent of money to all who have need of it" (based on Say's law statements). As we can see, both views end up with the same conclusion due to their equal premises. (Blyth, 2013)

However, as the main core of this essay is to address the effects of austerity on the present crisis, the neo-classical branch that interests us the most is Milton Friedman's monetarism and its advocates. Monetarism is an economic school that emphasises the role of governments in controlling the amount of money in circulation. They believe that money supply influences national debt in the short-run and the price levels in the following economic periods. So, they believe that authorities should intervene the least in order to keep the country's price level stable.

Even though Clark Warburton was who first made a monetarist approach of business cycles, it is Milton Friedman who was credited as the 'father' of this discipline when he wrote about the quantity theory of money in 1956.

At that time, worldwide economics was ruled by the Keynesian thought of an interventionist state. It wasn't until the crisis of the 1970's, when Keynesian economics seemed unable to explain the stagflation that was caused by the exogenous oil shock of 1973 which increased unemployment and inflation simultaneously, that authorities started taking on monetarist policies. An example of that was when the US, under the mandate of Jimmy Carter's presidency, followed the assertions of Milton Friedman and Anna Schwartz in their book '*A monetary History of the United States, 1867-1960*', and

made the fight against inflation his primary objective. He restricted the money supply to tame inflation in the economy. This achieved the desired price stabilization, but at the cost of a very high unemployment level. However, we can't ignore another important idea in Milton Friedman's work, such the conclusion that if there are adaptive expectations, then the Phillips curve is accelerationist.

This was followed by the golden era of neo-classical monetarism within some of the most important economies in the world like UK (Margaret Thatcher) and US (Ronald Reagan), a tandem that marked those decades with neo-liberal policies, accomplishing great growth rates, amongst the highest in modern history.

Monetarists, like their predecessors, say that money supply control has to be accompanied by low government spending and be able to repress excessive monetary growth. In the UK, Margaret Thatcher made her intentions and ideals clear when their government slashed their spending during the late 1970's and 1980's.

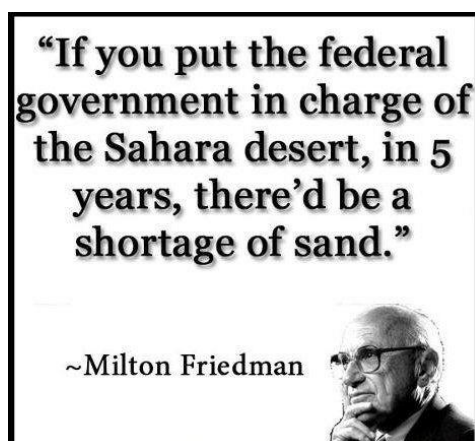
Other assumptions apart, Milton Friedman, in his monetary approach in the 1960's, theorized of the existence of a 'natural rate of unemployment' for any given economy. This concept is strictly related to the Phillips curve. The Phillips curve shows a negative relation between inflation and unemployment. This brought economists to believe that unemployment could be permanently reduced by expansive demand policies 'in exchange' for higher inflation, in other words, a trade-off between inflation and employment was possible. But Milton Friedman and Edmund Phelps proved that diminishing unemployment could only be accomplished while the wage inflation and its expectations lagged behind the actual inflation. Therefore, this drop in unemployment levels was only temporary and that, in the long-run, unemployment would go back to the rate determined by real factors independent from the inflation rate. They believed that pushing unemployment below its natural rate would only cause inflation and not permanent lower unemployment. Nevertheless, this would also depend on the kind of expectations of the economic agents.

-Today, many economists accept the assumption that there is a natural rate of unemployment and admit it can fluctuate depending on many factors. This is a matter that doesn't concern us too much as we are analysing periods of recession, where the unemployment levels are way higher than the so-called NAIRU, which for some economists is even an inconsistent concept.

So, neo-classical economists in general and monetarists in particular, see austerity as the perfect 'partner' for the authorities when the economy finds itself in a depression. In order to stabilize the price levels and cool the economic environment so the free-markets can get back to its equilibrium. They believe that active demand management (trying to increase consumption) is unnecessary and most likely to be counterproductive. They assert that short-run fiscal stimulus will have no real effect on AD and will only mean a shift in demand from investment to consumption without any effect on the level of real output.

Similar arguments can be heard today within the European Union. In the UK, former Prime Minister David Cameron and his government have clearly approached the crisis' issues under a neo-classical point of view, reiterating that austerity is needed to pay back national debt taken out by their 'Keynesian' predecessors. Following this idea, George Osborne, Chancellor of the Exchequer for Cameron's administration, raised taxes, cut public spending, and has been in the process of reducing the size of the state.

Summing up, in general, neo-classic economists want low intervention of the state, therefore, low public expenditure. In times of crisis when they raise taxes, they tend to increase indirect taxes and lower the direct ones while lowering the progressivity of those taxes. They prefer to tax the consumption and diminish the taxes on the capital and on the higher rents. Ultimately, they seek a lower fiscal progressivity and a state that represents a lower percentage of the GDP which normally results with a larger disparity of economic inequalities between the top and the bottom classes of society.



## The alternative view: Keynesians and new-Keynesians

On the other hand of mainstream economics, there are those economists who follow Keynes' work and ideas. They believe in government intervention in order to regulate or soften the business cycle. These economists, so-called Keynesians and new-Keynesians, see austerity measures from an absolute opposite perspective than Classical economists and their successors. They see austerity as an economic policy to use when the economy is on the top of its business cycle, not when it is on a recession.

'The boom, not the slump, is the right time for austerity at the treasury'

- John Maynard Keynes

Keynes and his disciples say that when countries try to cut their deficits in a slump, it generally results in a much more delayed and overall lower growth, and additionally, in most scenarios, higher debt-to-GDP ratios.

Mark Blyth, in his work, *'Austerity: The history of a dangerous idea'* explains that economic decisions should base their approaches on historical examples to point out the mistakes previously in order to improve the results in the future. He explains a few examples of large-scale deficit reduction policies taken both in a recession and an expansion of the economy. These analyses show how there has never been a country in a lack of demand crisis (low interest rates and high unemployment rates) that was able to cut its deficit through growth using austerity measures.

He states that there are only a few scenarios where countries can cut their deficit during a slump, and those are when either the interest rates and/or their exchange rates fall sharply. However, neither of these options is even possible in the European Union countries in order to fight the present crisis. Because the exchange rates are only managed by the ECB, which is led by a group of people that are too afraid of high inflation to go down that road. The interest rates were already too low to impact the economy by lowering them, practically zero since 2008 in USA and 2011 in EU. This is called by Krugman, amongst other economists, the 'zero lower bound', because the nominal rate of interest can't ever be negative, which restrains the possibilities from the central bank to be able to fight back a recession by adjusting it.

So, if Keynesians see austerity as a policy for the top of the business cycle, what do they argue is the better solution in situations where the orthodox economists would embrace austerity measures?

It's important to point out that the two main schools of thought start diverging from the very beginning, the diagnosis. Where neo-classic economists don't think there is a lack of demand, new-Keynesians assume that as a fact.

Furthermore, new-Keynesians believe that the correct response to an economic crisis caused by a lack of AD, like the one of 2007/08, is the stimulus. In other words, it's better to have an injection of money into the economy through the increase of government expenditure and never through austerity. The economist Paul Krugman is one of the greatest advocates of this belief and he's been pointing out its importance since the beginning of the crisis.

Keynesians support the idea that an economic stimulus of the right quantity and at the right moment can have a real effect on expanding the AD, therefore, increasing the level of consumption in the economy, raising the real output level.

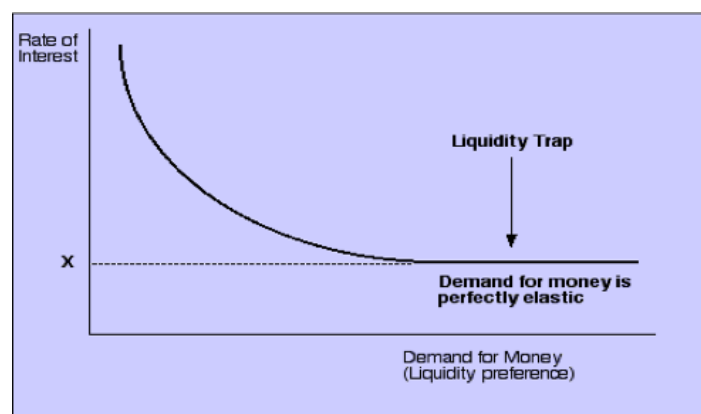
To put in a few words, Keynes suggested that, in a recession, economic authorities should maintain a low price of money for as long as needed in order to restrain savings and incentivize entrepreneurs to start new businesses and create new jobs. Also, he believed that governments should lower taxation levels on consumption so that people could spend more on goods as this would increase the total consumption of the economy. Lastly, he concluded that the state should employ the remaining jobless people to improve the national infrastructure, which in the mid-term would increase the productivity of the labour force and the economy as a whole. Keynesians argue that if some borrowing is needed in order to accomplish these goals, it's not that bad because it can be repaid as soon as the economy is back at full employment and the population can, once again, afford to pay higher taxes.

For them, it is so clear that austerity measures taken both in the UK and the EU have been a complete disaster and that the facts speak on their own. However, European leaders kept demanding more of the same, ignoring other approaches that have worked historically to get economies out of a recession like the present one, those approaches being a stimulus or investment in short-term growth in order to put people back to work as fast as possible and then focus on long-term national debt once the economy is back on its feet.

Mark Blyth, from the Keynesian point of view, also explains in his work that it doesn't make sense for everyone to cut deficit at the same time and expect to grow. He states that for some countries to be able to cut their deficit they need to increase their savings in order to increase their savings, they need to have some income from which

to save. So, if everybody is simultaneously cutting, nobody is generating that income. This is the so-called 'saving paradox' that claims that if everyone tries to increase their savings, the aggregate saving will decrease because the GDP will decrease. He shows how every country that's undergone an austerity program now has a higher debt-to-GDP ratio than when they started. This is because the size of their economies have been slashed from the moment they cut government expenditure (which in addition to the consumption, the investment and the trade balance determines the real level of national output). On the contrary, any country that hasn't cut public expenditure (that includes the US), now has proportionately less.

Keynesians argue against the belief upheld by the classical economists that all savings go straight to investment even during a recession. This is simply not true. That's because people don't want to take the risk of investing in a recession, in reality, they are moved by their fear for the future because they forget about the time series of past good periods and heavily weight the three last. So, their investment expectations (driven, as Keynes would've said, by the 'animal spirits') will stop them from automatically investing all their savings, as classic economists assume. Keynesians state that in situations like this, people prefer to be liquid instead. The main problem is that in order for someone to be liquid, somebody else has to be illiquid and this result is the liquidity trap like the one we have now. (Blyth, 2013)



As we can see, the liquidity trap is a scenario when an expansionary monetary policy has absolutely no impact on the real interest rate, therefore, it doesn't work to stimulate economic growth because the central bank can't lower that interest rate any more. That scenario only leaves the economic authorities with one viable option to fight the recession, an expansionary fiscal policy. That's exactly what Keynesian economists support.

Keynesians strongly believe in the crucial role of aggregate demand. After analysing the economic history, we are able to assure that the lack of effective demand is the key problem in deep recessions. Moving forward, they advise the countries to put the recovery of that demand, through fiscal stimulus, on the top of their priority list.

That's why Keynesians call upon central banks to buy additional national bonds from the public through its open market operations so that that fiscal expansion is backed by an expansion of the money supply that prevents the interest rates from increasing. However, that stimulus has to be big enough to bring the AD back to its equilibrium point.

Summing up, Keynesian economists deem austerity appropriate in the opposite moment (the boom) in the business cycle than the classical (the slump) in order to cool down the economy, preventing the rise of inflation. Also, Keynesians find it important to be prepared to react as quickly as possible to a shock that could cause the next recession and avoid the possibility of suffering another Great Depression. They argue that for the bottom of the economic cycle, the best solution to get the economy back on track is both an expansionary fiscal policy and to maintain the interest rates low for as long as needed. Not to worry about the national debt on the short-run, to focus on it when the society is in a full employment scenario.

'Is everybody supposed to run current account surpluses? If so, with whom-Martians? And if everybody does indeed try to run a surplus, what else can be the outcome but a permanent global depression?'

-Mark Blyth, *Austerity: The History of a Dangerous Idea*



## **Why has austerity been broadly encouraged by many governments?**

Now that I have reviewed these two main points of view on how to handle economic slumps, we can ask ourselves why most economic authorities, especially in Europe, thought slashing national expenditure and using austerity measures was a good idea?

To answer that question, we need to understand that economics, as a science, has been systematically taken over by well-founded conservative scholars. For many years, those academics have elaborated theoretical models to prove to society that government spending is intrinsically destructive. And so, as Krugman often says, we are now in the Dark Age of macroeconomics. (Krugman, 2012)

Amongst those models is the Barro-Ricardo equivalence, which says that people won't spend money when they know their government's incurring debts they'll have to pay some day. This model argues that this happens even when unemployment rates are high and reject the idea that any stimulus spending will create job at all.

Oddly enough, classical economists find this last statement more convincing than the thought that economic agents aren't consuming because they simply don't have jobs. These conservatives assure that the best way, if not the only way, to increase the growth in an economy is no other than the slash of the government's revenues by lowering taxes. This means they want a smaller government in terms of GDP.

These economists advocate supply side economics relying on the 'Laffer curve' that says that people will no longer invest, produce, or create jobs if taxes are too high. This puts fear in societies by spreading the thought that international markets would lose confidence in those governments (hence, their countries) if they don't cut spending, concluding in higher interest rates.

Politicians have been spreading the idea that austerity is mandatory in order to balance the budget and mitigate bond traders and international institutions like the IMF or the ECB, making national debt more affordable. Nevertheless, we know that public debt is determined by both government expenditure and its revenues. So, it is much easier to pay the debt when the state revenues are larger. Hence, it's better to approach austerity when the economy is in full employment and people can afford to pay higher taxes. To realize which segments of the population get more benefits from austerity measures it's worth it to review what austerity has actually been.

Austerity has meant a decrease in the government expenditure of education, health, pensions, public wages, and direct taxes (mainly to the highest fortunes) as well as an increase of indirect taxes, mostly on consumption. So, not by coincidence, the most benefited social classes happen to be the higher classes of our society. We must remember that Keynesians argue that in a financial (or banking) crisis, like the one we are analysing, they advocate for financial repression. This means, those banks that are heavily levered and filled with government bonds are then stuffed with even more of those bonds. Then, the authorities should lower the payment on the bonds and lend them to maturity and run a positive inflation. Therefore, this creates a negative real interest rate that 'cures' the national debt far better than any amount of expenditure cutting, which doesn't even work, because it's a zero sum game against itself. Proof of that is the US economy after World War II, when its liquidation tax accounted for the equivalent of 40% of the country's GDP to be paid in 10 years, and boomed at the same time. (Blyth, 2013)

Therefore, who is this bad for? This is bad for creditors at first, because the debtors can pay off their debt much cheaper, as well as for the wealthy classes who see their money being worth less for each increase in the inflation rate. I think this clears the question of who is really getting the benefits of austerity measures.

This seems to point out that the austerity agenda is merely an expression of higher-class preferences with the support of those conservative academics. In other words, what the richest 1% prefers becomes what the economic models must prove. For years, since we blindly embraced austerity as the way to put our economy back on track, it's been bad for the working class, but pretty good for the wealthy. They have seen their profits increase even when long-term unemployment was increasing rapidly. This makes me wonder if at the end of the day, economic policies are looking for the majority interests or only for that 1% on the top.

There are few heterodox economists, like Paul Krugman (economics Nobel Prize of 2008), who have the respect from the economic society and that have been far better at predicting events than just about anyone else in the field. In my opinion, governments should start listening more to these economists. But then again, it's possible that they just have different interests and preferences than the average citizen.

*'Politics determines who has the power, not who has the truth' -Paul Krugman*

## Practical approach

I got to the point in the analysis where I need to support the ideas and conclusions of the different possible solutions to our current crisis (mainly lack of demand), with economic models to be able to illustrate them.

The first concern now is the choice of the model that can show those conclusions in the most clear and accurate way. To do that, I've researched different models in economic theory. I thought the IS-LM model could allow me to illustrate the certainty of those economist solutions because great economists like Krugman have shown us that with it, we can explain most of what has happened in the present crisis. But then, I questioned my decision if whether the IS-LM model was the best choice to explain short-run fluctuations, which is the core of this essay, because I wanted to show the dynamics of the economy, therefore I needed a dynamic model. For this essay I focus on the short-run consequences of austerity measures over the concern for the longer run where in most models the economy is on its equilibrium point.

I found that in the IS-LM model, to simplify, it's assumed that both the economic environment and the macroeconomic fluctuations are fixed. I could make it dynamic, but I should assume no inflation, which doesn't work for what I want to analyse. Therefore, without that assumption, it's a static model. This means that it shows a picture of the economy at one moment in time, but it's unable to explain the effect that contemporary and temporal events have on both output and inflation levels.

At the end of the day, I found that IS-LM model wasn't accurate enough to convey the historical debate concerning the difference of sensibility in governments between changes in national output and the inflation rate. Amongst the reasons of this conclusion, there are the assumptions of a fixed money supply and fixed price level, which make it impossible to analyse inflation with it. This was of little concern in the 50's and 60's but since then; inflation has taken big importance in today's politics, so the model has a lack of realism in some aspects, even knowing that the big problem today isn't a high inflation, but a really low aggregate demand.

I needed a more realistic approach, a dynamic model that focused on the relationship between the level of output and the rate of inflation without losing the power to analyse macroeconomic fluctuations in a realistic but simple way.

After analysing many models, such as Carlin and Soskice's or Blanchard's *'The state of Macro'*, I decided to support my essay with a dynamic version of the three equation macroeconomic model IS-LM-AS that replaces the assumption that the central bank

targets the money supply with the assumption that it follows a simple interest rate rule. This is more realistic since most central banks focus on the interest rate on loans between banks in their short-run policymaking. For example, in the United States, the Federal Reserve chooses the federal funds rate to try to achieve its objectives for inflation and output, and monetary aggregates play at most a minor role in those choices. (Romer, 2000)

So the model I've used is a variant of the dynamic AD-AS model from the Mankiw's book *'Principles of Economics'* that also assumes imperfect nominal adjustment and lacks microeconomic foundations (this second part to simplify the model). But as the reader may not be familiar with the model, before analysing the consequences of exogenous shocks, I will proceed to explain the model itself.

### **Dynamic AD-AS**

As I needed, this model acknowledges that the economy is hit by many exogenous shocks (of different durations) that not only affect the equilibrium in the very short-run but also have impact on many variables like output and inflation of the later periods. So, it focuses on the responses of the national output and the inflation rate over time towards changes in the economic environment.

In some way, this model is 'made up' with the 'ingredients' that we have seen along economic history, but it's 'cooked' differently to be able to better explain the economic fluctuations that countries have. (Mankiw, 2014)

*'The important thing in science is not so much to obtain  
new facts as to discover new ways of thinking about them'*  
-Sir William Bragg

First of all, I need to explain that as this model studies the economy over time; all variables have a subscript that tells us from what period each variable is. In other words, it will be 't' if the variable is from the current period, 't+1' if it's the next, 't-1' if it's the previous and so on.

The model is built upon five basic equations that allow us to test different shocks and its consequences over time.

-The **Output level**, the demand for goods and services, is determined by equation (1):

$$Y_t = Y_t^f - \alpha(r_t - \rho) + \varepsilon_t$$

with  $\alpha, \rho > 0$

Where  $Y_t$  is the total output of goods and services,  $Y_t^f$  is the full employment level of output (long-term equilibrium level),  $r_t$  is the real interest rate,  $\alpha$  is the level of sensibility of the demand to variations of the real interest rate,  $\rho$  is the natural real interest rate (that real interest rate that if there are no shocks equals the demand for goods and services to the full employment level of output) and  $\varepsilon_t$  represents the exogenous shocks of the demand side, which is 0 on average but fluctuates over time. This last variable takes into consideration the effect on demand that irrational economic agents and fiscal policies have on the demand, such as variations on public spending or taxes.

The greatest feature that this equation shows is the negative relation between the real interest rate and the demand for goods and services. However, we can also see that it shows how the demand increases as the full employment level of output does. Therefore, as the global income rises, the demand rises within the same level as the production capacity of the economy.

-The **expected inflation**, using adaptable expectations, is shown by equation (2):

$$\pi_{t+1}^e = \pi_t \quad \text{And, consequently} \quad \pi_t^e = \pi_{t-1}$$

Where  $\pi_{t+1}^e$  represents the expected inflation of 't+1' that people have on the current period and  $\pi_t^e$  the expected inflation that people had on the previous period of the current inflation.

The assumption of adaptable expectations is crucial, because it implies that there is a Phillips curve on the short-run and, therefore, both fiscal and monetary policies can be effective in both short and long-term.

In this model, the expected inflation plays a big part on the determination of two of the equations. It's crucial in both the inflation and the real interest rate equations.

There are many theories on what determines expected inflation, but I avoided the rational expectations theories to simplify the mathematical weight of the essay. This is because adaptable expectations are able to show good implications and results in a much simpler and useful way. However, most of all, I chose these expectations

because if they would be rational, the model would solve itself any shock it may suffer. This is the neo-classical vision of perfect markets that I don't share.

So, under the assumed adaptable expectations, economic agents base their forecasts only on the previous period. Therefore, the expected value of inflation equals the inflation level of the previous period.



-The **real interest rate**, using Fisher's equation, is given by equation (3):

$$r_t = i_t - \pi_{t+1}^e$$

Where  $i_t$  represents the nominal rate of interest set by the government.

As we can see, the real interest rate ex-ante is defined by the nominal rate of interest minus the expectation of future inflation. So that even without knowing the real interest rate ex-post given by

$$r_t = i_t - \pi_{t+1}$$

I can work with the real interest rate during the current period. This is a proof of the simplicity that grants us the adaptable expectations that I have chosen.

-The **inflation level**, based on the Phillip's augmented curve, is determined by

Equation(4)

$$\pi_t = \pi_t^e + \varphi(Y_t - Y_t^f) + v_t$$

with  $\varphi > 0$

Where  $\varphi$  is the sensibility of the inflation towards changes on the output gap between real output and the full employment output level. This means that it represents both the degrees to which the marginal costs answer to the economic environment, and the

speed with which firms adjust their price levels in response towards the changes in cost structures. Here,  $v_t$ , represents the exogenous shocks of the supply side, which is 0 on average but fluctuates over time. This includes all the variables (except from the expected inflation and the sensibility to the output gap) that can have an impact on the inflation level, like the increase in basic product prices due to a producers cartel as happen with the oil during the 70's.

This equation basically shows, at first, that there is a positive relation between the expected inflation level of the current period (formed in the previous period) and the actual rate of inflation. Therefore, just the simple fact that both consumers and producers expect a higher inflation for the next period, will increase this next period's actual inflation rate. This makes sense because many firms set their prices based on their expected inflation, so, if they expect it to increase they will boost the prices of their goods and translate that into an actual inflation increase. The inverse would happen if the expected inflation decreases.

Equation (4) also shows how inflation fluctuates when it's influenced by the output gap. Therefore, if everything else remains constant and the economy is above its full employment output level, then; the firm's marginal cost increases. So, they increase their prices and inflation rises. It works the other way around as well.

Last but not least,

-The **nominal rate of interest**, a monetary policy rule (MP) influenced both by inflation and output levels, is determined by equation (5):

$$i_t = \pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f)$$

*with  $\theta_\pi, \theta_Y > 0$*

Where  $\pi_t^*$  is the target inflation fixed by the central bank and  $\theta_\pi, \theta_Y$  show the degree of response in output and inflation fluctuations depending on the central bank's preferences, respectively. So, the higher  $\theta_\pi$  is, the bigger concern for inflation deviating from its target the central bank has. Also, the higher  $\theta_Y$  is, the higher concern for output level deviating from its full employment level the central bank has.

This equation tells us how the central bank uses the monetary policy to address different scenarios. In other words, it shows how the central banks' objective nominal interest rate responds to each macroeconomic outcome.

It's important to remember that the central bank's monetary policy affects the demand for goods and services through the real interest rate, not the nominal one.

Therefore, even though the central bank only determines the nominal rate of interest, we should notice what equation (5) tells us about real interest rate. To do so, we can combine equations (2), (3) and (5) to see if this monetary policy makes sense. So, thanks to equation (2) we can reformulate equation (3) and introduce the value of  $i_t$  given by the reformulated equation (3) to equation (5) like this:

$$(2) \text{ Into } (3) \quad r_t = i_t - \pi_t \rightarrow i_t = r_t + \pi_t$$

So, if we replace this for  $i_t$  in (5) we get,

$$r_t + \pi_t = \pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^n)$$

Therefore, assuming that output equals its full employment level and inflation equals its target, then

$$r_t = \rho$$

The real interest rate equals its natural rate. This confirms that when the economy is in equilibrium, the real interest rate is set properly to try to keep it that way.

From equation (5) we can also see that the nominal interest rate (therefore the real one) has a positive relationship with both inflation and output gaps. So, when  $(\pi_t > \pi_t^*)$  or  $(Y_t > Y_t^n)$  the real interest rate increases and when  $(\pi_t < \pi_t^*)$  or  $(Y_t < Y_t^n)$  it falls.

I have to point out the fact that in order to be able to use the nominal rate of interest as a tool, the government has to commit to adjust the money supply to the level that allows that interest rate to equal its target.

This adds realism to the model because today, most central banks use the nominal rate of interest as a political tool rather than the monetary supply.

After explaining the equations of the model, I want to point out that it's a model that works to explain short-run fluctuations of the economy from a static equilibrium point. However, to analyse the long-run equilibrium, we should include the consideration that the full employment output level varies over time. This variation can be caused by the mere increase of the population that, consequently, increases the labour force. Therefore, the level of potential production rises. Most importantly, the simple fact of the investment itself is a reason to assume that the output level at full employment changes. Investment directly influences both the capacity and productivity levels of the economy, increasing its full employment output level.



Nonetheless, the focus of the essay is about the short-run fluctuations of an economy after it suffers an exogenous shock. This model works perfectly to analyse what I want to analyse.

The equations, the variables and the parameters of the model summed up are:

#### Equations

$Y_t = Y_t^f - \alpha(r_t - \rho) + \varepsilon_t$	Demand for goods and services
$\pi_{t+1}^e = \pi_t$	Adaptable expectations
$r_t = i_t - \pi_{t+1}^e$	Fisher's equation
$\pi_t = \pi_t^e + \varphi(Y_t - Y_t^f) + v_t$	Phillip's curve
$i_t = \pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f)$	Monetary policy rule

#### Endogenous variables

$Y_t$	Output
$r_t$	Real interest rate
$\pi_{t+1}^e$	Expected inflation
$\pi_t$	Inflation
$i_t$	Nominal interest rate

#### Exogenous variables

$Y_t^f$	Full employment output level
$\varepsilon_t$	Demand side shock
$v_t$	Supply side shock
$\pi_t^*$	Central bank's target inflation
Predetermined variable (exogenous at 't')	

$\pi_{t-1}$	Last period's inflation
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#### Parameters

$\alpha$	Degree of sensibility of the demand of goods and services towards the real interest
$\rho$	Natural interest rate
$\varphi$	Degree of sensibility of the inflation towards the output gap
$\theta_\pi$	Degree of sensibility of the nominal interest rate towards the inflation gap (MP)
$\theta_Y$	Degree of sensibility of the nominal interest rate towards the output gap (MP)

Note: The model is formulated with logarithms ( $\ln Y_t, \ln Y_t^f$ ), so  $\dot{Y}_t^f = 0$ , therefore, any change in  $Y_t$  will mean that the output level is above or below the equilibrium.

## Short-run fluctuations

As I want to explain the short-run consequences in the economy due to the authorities' policies, it's useful to run simulations of different possible scenarios. To do so, I must sum up the relationship between output and inflation, shown by the five equations of the dynamic AD-AS into only two equations that isolate these two variables, which are the ones that this essay focuses on.

So, with algebraic methods I have to eliminate the other endogenous variables that are the real and the nominal rates of interest, and the expected inflation.

To create the dynamic aggregate supply (DAS) curve, I just need to take equation (4) and, as I mentioned above, get rid of the expected inflation due to the adaptable expectations that I assumed. Following this, the expected inflation becomes the actual inflation of the previous period and the DAS curve becomes the following:

$$\pi_t = \pi_{t-1} + \varphi(Y_t - Y_t^f) + v_t$$

This equation shows the short-term positive relationship between the output level and the inflation level, which means that if all three exogenous variables for the current period ( $\pi_{t-1}$ ,  $Y_t^f$  and  $v_t$ ) remain constant; the inflation will rise as the output rises.

However, when any of those exogenous variables changes, the DAS shifts upwards or downwards. The consequences of those shifts will result in different outcomes for the economy, but to explain them, we need to know the other equation.

The other equation that will determine the short-run equilibrium of the economy is the dynamic aggregate demand (DAD) curve. DAD's equation is a little bit more complex and I need to combine four of the main equations of the model to be able to eliminate all the endogenous variables, except the output and the inflation levels.

First, I replace  $r_t$  from equation (1) with its value in equation (3) to eliminate the real interest rate,

$$Y_t = Y_t^f - \alpha(i_t - \pi_{t+1}^e - \rho) + \varepsilon_t$$

Then, we substitute  $i_t$  from this equation for its value in equation (5) in order to eliminate it,

$$Y_t = Y_t^f - \alpha(\pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f) - \pi_{t+1}^e - \rho) + \varepsilon_t$$

Now, I only need to remove the expected inflation from the equation. I'll do so by replacing it using the adaptable expectations like this,

$$Y_t = Y_t^f - \alpha(\pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f) - \pi_t - \rho) + \varepsilon_t$$

This equation only has two endogenous variables, as I wanted, but to make it clearer, I will simplify it and the result will be the following:

First, I eliminate the variables that cancel themselves out,

$$Y_t = Y_t^f - \alpha \left( \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f) \right) + \varepsilon_t$$

Then I isolate the output level  $Y_t$ ,

$$Y_t = Y_t^f - (\pi_t - \pi_t^*) \left[ \frac{\alpha\theta_\pi}{(1 + \alpha\theta_Y)} \right] + \varepsilon_t \left[ \frac{1}{(1 + \alpha\theta_Y)} \right]$$

This is what I will call DAD's equation. It shows the negative relationship between the demand for goods and services and the inflation in the short-run, given the exogenous values of  $Y_t^f$ ,  $\pi_t^*$  and  $\varepsilon_t$ . It also determines that the output level will equal its full employment when the actual inflation equals its target and there are no shocks on the demand side.

DAD's curve's negative slope is explained by the central bank's policy. When inflation rises, the central bank increases the nominal rate of interest in a bigger scale than the rise of inflation (following its rule from equation (5)); therefore, the real interest rate rises with it. This increase of the real rate induces a reduction of the demand for goods and services, which explains the negative slope of DAD's curve.

DAD's curve also shifts if any of its exogenous variables change for any reason. In particular, DAD's curve shifts in response to changes in both fiscal and monetary policies implemented by the Government.

Like I said above, the exogenous variable  $\varepsilon_t$  reflects the variations of both government spending and taxes. So, any fiscal policy that results in an increase of the demand for goods and services will mean a positive value of  $\varepsilon_t$  and, consequently, DAD's curve will shift right. Furthermore, any fiscal policy that results in a decrease of the demand for goods and services will mean a negative value of  $\varepsilon_t$  and, consequently, DAD's curve will shift left.

Regarding the monetary policy, it influences the DAD's curve through the target inflation fixed by the central bank. In fact, it has a positive relation with the output level. This is because the central bank increases its target inflation through an expansive monetary policy by reducing the nominal rate of interest. This lowers the real interest rate, resulting in an increase of the demand and, therefore, the

consumption level. This mechanism shifts the DAD's curve right. DAD's curve shifts left when the central bank lowers its target inflation due to the same mechanism.

At last, I can determine the short-run equilibrium of the economy given by the dynamic AD-AS model. This equilibrium will be the point of intersection of the DAD and the DAS curves.

$$Y_t = Y_t^f - (\pi_t - \pi_t^*) \left[ \frac{\alpha \theta_\pi}{(1 + \alpha \theta_Y)} \right] + \varepsilon_t \left[ \frac{1}{(1 + \alpha \theta_Y)} \right] \quad (DAD)$$

$$\pi_t = \pi_{t-1} + \varphi(Y_t - Y_t^f) + v_t \quad (DAS)$$

For any period of time 't' and given the five exogenous variables at that point ( $Y_t^f, \pi_t^*, \varepsilon_t, \pi_{t-1}$  and  $v_t$ ), the model will determine the two endogenous variables, the output and the inflation. It's important to remember that this equilibrium can be below the economy's long-run solution, above it or on it.

One of the most important features of the dynamic AD-AS model in order to explain the consequences of an exogenous shock, such as government policies, is the interconnectivity between successive periods. This is because the model determines the inflation level at 't' as an endogenous variable, but it uses this inflation as an exogenous variable to determine the inflation level at 't+1'. Therefore, an exogenous shock at 't' doesn't only affect the equilibrium on that period, it also affects the later ones, allowing us to see the duration of the effect of a shock until the economy reaches its equilibrium.

## Simulations of the model

In the simulations I will maintain the parameters  $(\alpha, \rho, \varphi, \theta_\pi, \theta_Y)$  always fixed and see what happens to the endogenous variables when I change the value of the exogenous ones.

For all simulations the parameters of the model will be fixed as:

$$\alpha = 0,5$$

$$\rho = 2$$

$$\varphi = 0,5$$

$$\theta_\pi = 0,5$$

$$\theta_Y = 0,5$$

Also, for all simulations, the full employment output level will be  $Y_t^f = 100$  in order to use variables in terms of percentages of the output level or GDP.

### Model without restrictions

I will analyse how the model behaves, without any restriction, to negative shocks of different magnitude on the demand side and the consequent policies implemented. It's important to remember that demand side shocks are represented by  $\varepsilon_t$ .

In the first scenario the economy suffers a small initial shock of -2% on the demand with  $\pi_t^* = 2$ .

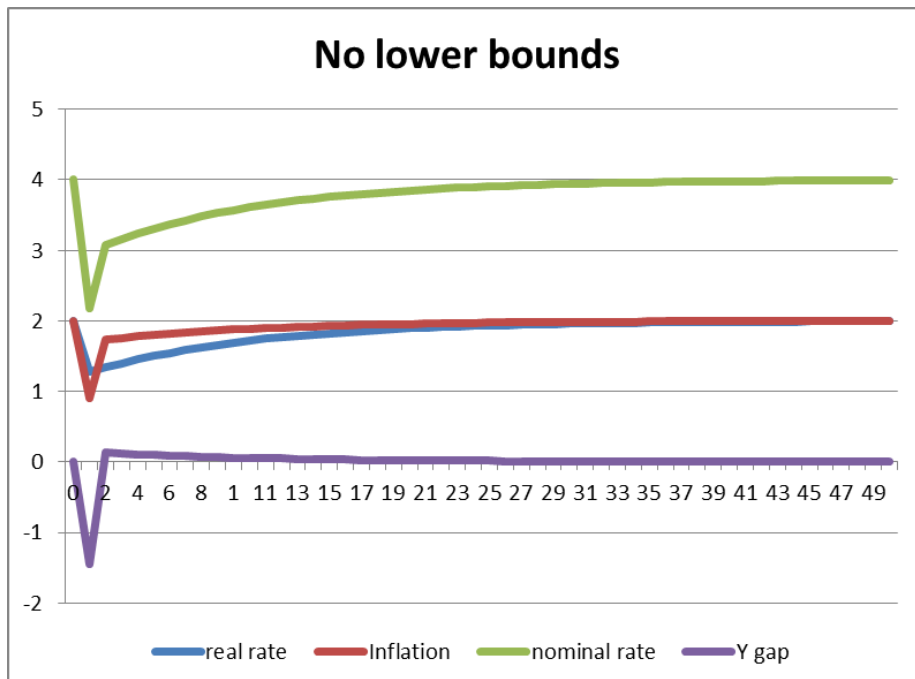


Figure 1: Response to a shock on demand of -2%

As we can see in figure 1, a demand shock of the -2% is not big enough to put this economy in a depression, because the monetary policy can lower the nominal rate of interest to decrease the real interest rate and put the economy back at its full employment level in only one period.

However, when the initial shock is relatively bigger, for example, if the economy is hit by a shock on demand of -5% and assuming the same targeted inflation,  $\pi_t^* = 2$

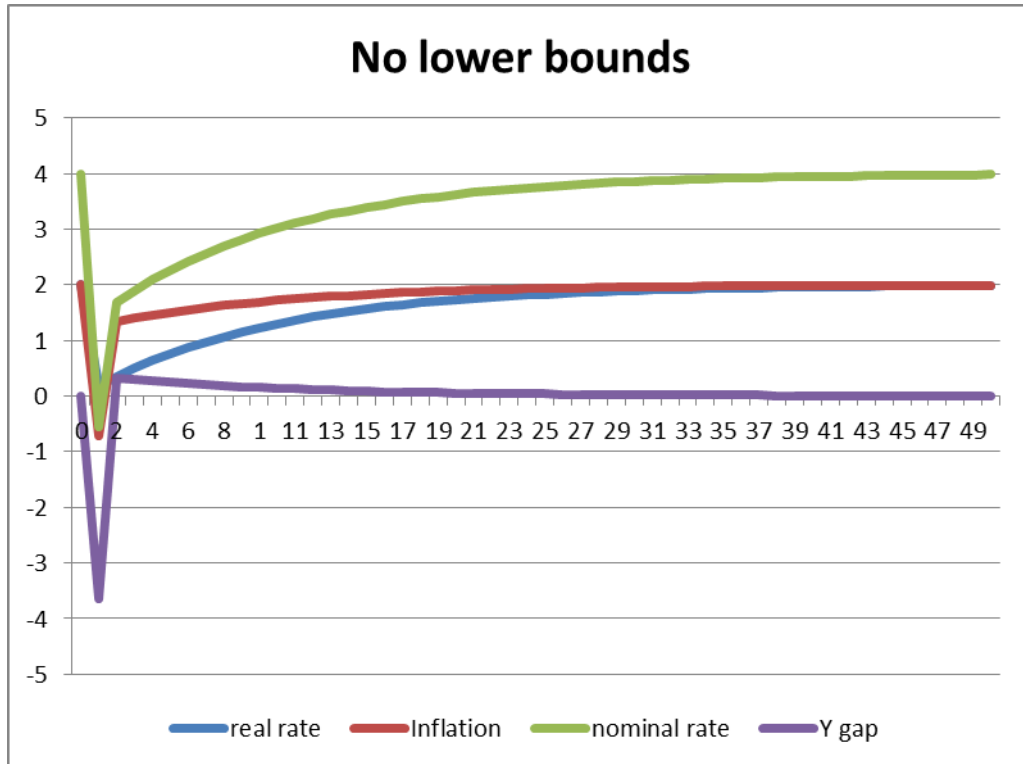


Figure 2: Response to a shock on demand of -5%

In figure 2 we can appreciate that in order to bring the economy back to its potential level, the model sets a negative nominal rate of interest and is able to achieve the recovery in no more than one period. Nonetheless, in the real economy, this wouldn't be possible because of the zero lower bound that, as I explained, stops the nominal interest rate from taking negative values below the cost of keeping money safe. In a neo-classical mind set, this wouldn't be a problem because they assume a perfect flexibility of prices, but from a Keynesian point of view, this starts to point out that this model without restrictions doesn't show how the real economy reacts.

Anyway, I need more proof of this, so I need different simulations. That's why the next simulation shows a similar situation to the one in EU on the present crisis. Here, the economy also suffers an initial demand shock of -5%, but it also suffers a consistent shock of -2% for the latter 4 periods due to the austerity measures implemented which slashes the size of the economy in order to pay back the debt, as it has happened in the EU since 2008. I also maintain the target inflation on a 2%.

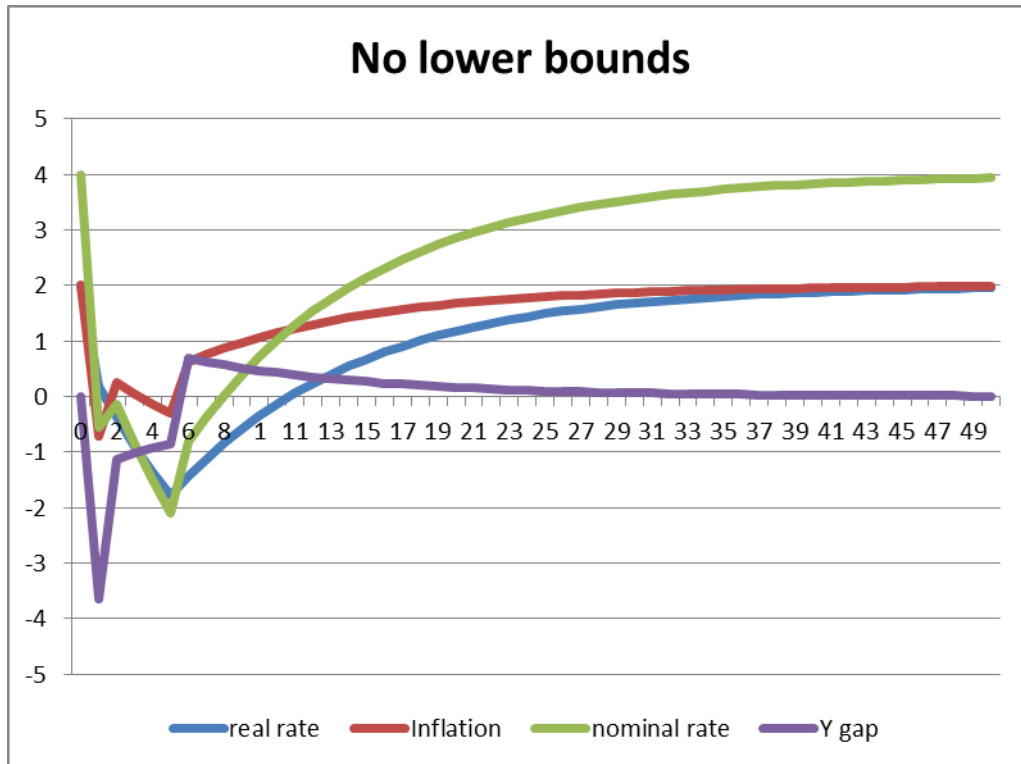


Figure 3: Response to an initial shock on demand of -5% and -2% during 4 periods.

As we can see in figure 3, the model needs to put the nominal rate of interest in negative values during no less than 7 periods and still needs 6 to bring the economy back to its full employment level. This figure allows us to say that even with perfect flexibility of prices and no zero lower bound, the austerity measures that cause this demand shock of -2% which are persistent during 4 periods after the initial shock, do more harm than good to the economy. They only delay the recovery of the economy in order to prevent the inflation level from increasing even a little bit.

However, if the central bank sets a higher target inflation, for example,  $\pi_t^* = 5$  instead of  $\pi_t^* = 2$  (all other variables constant), the results are quite different.

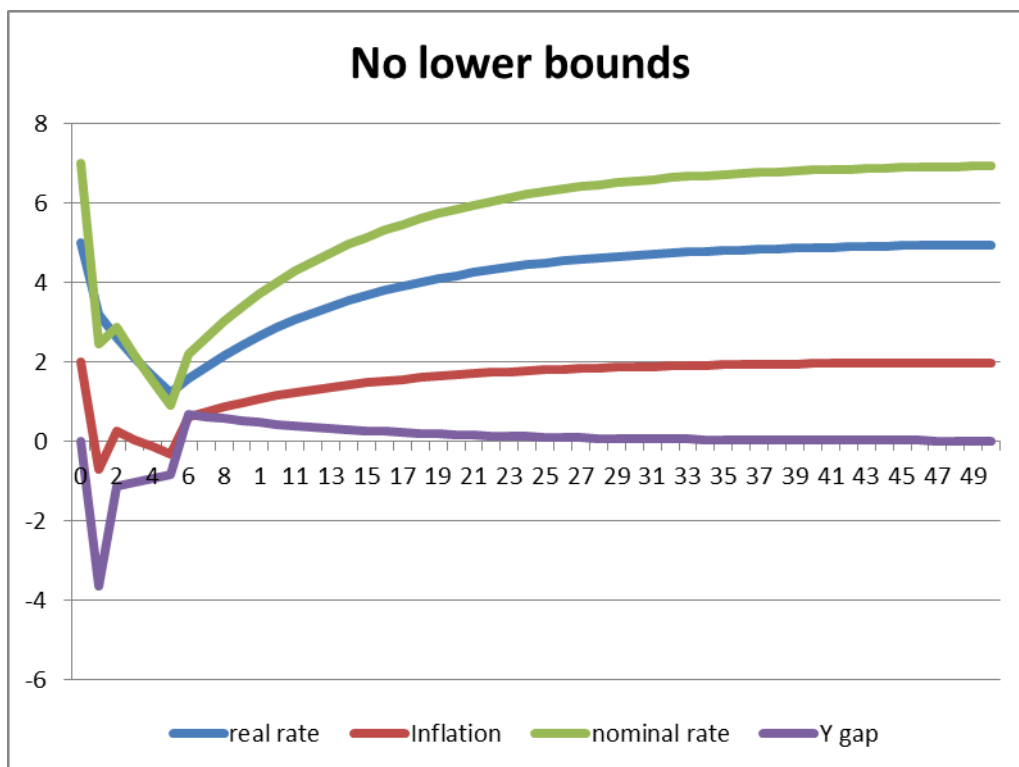


Figure 4: Response to the same scenario of figure 3, but with  $\pi_t^* = 5$

Even though the simulation in figure 4 also takes the economy 6 periods to get back at its full employment output level, we can observe that in this case, the nominal rate of interest doesn't take negative values and, therefore, it's a much more realistic picture of the recovery of the economy after a relatively big and negative demand shock. So, just by increasing the target inflation rate of the central bank, the monetary policy helps the economy recover much better than austerity measures.

However, this result partially derives from the special structure of expectations in the model (adaptable expectations). The modification of the inflation target by the central bank changes the expectations of future inflation on economic agents in only one period. Nonetheless, in the real world, when the economy is in a depression, it's very difficult to raise inflation expectations because people realize the lack of demand and no one expects prices to increase. This increase in inflation expectations can take a long time when the economy is in a depression. Therefore, this solution of increasing the central bank's inflation target is a mid-term policy (if the economy is in a depression) that provides a larger range of action to monetary policy. However, it can be useless in the short-term.

To finish with the simulations without restrictions, I want to show how the economy reacts to a really big demand shock of -20% that, in the real world, would result on the collapse of the economy.



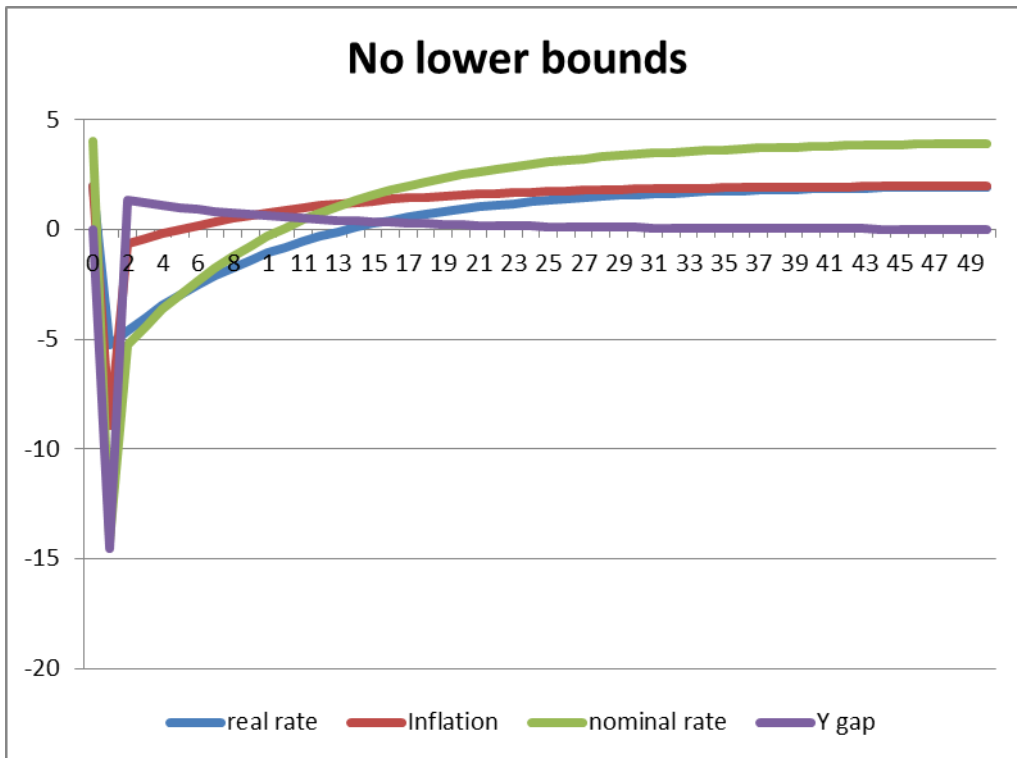


Figure 5: Response to a shock on demand of -20%

In figure 5 we can see how the model without restrictions is able to counter any negative shock of demand. This is because the monetary policy rule can fully adjust the nominal interest rate. This adjustment can be as negative as it needs to be in order to counter the initial shock and recover the economy. However, as we know, this is impossible. Therefore, I made some adjustments to the model in order to show a more realistic picture of the economy.

## Adjustments to have more realistic simulations

As I have concluded from the simulations from the model, I saw that the model was adjusting all negative demand shocks very quickly. In other words, the model was showing that economies can recover from shocks almost without going through a period of crisis. Therefore, this would mean that the neo-classic economists were right all along with their assumption of the perfect markets of which I'm trying to deny. However, as I pointed out, the model had full freedom to adjust the economy in order to recover very quickly and there were two aspects that seemed unreal.

The first aspect was that the model would put the economy rapidly in deflation levels, which we know it's not possible from just observing past economic crises. Here is where neo-classics would state that all prices are perfectly flexible, therefore, they can increase or decrease on the same speed because there are no rigidities. However, I introduced a more Keynesian perspective. I incorporated a maximum level of deflation to the model, because as Keynesians assume, I agree that prices are not perfectly flexible and that wages are difficult to bring down. Therefore, for each simulation I assume a maximum decrease in the price levels, so it's closer to the real scenario.

I did this by introducing to the equation (4):

$$\pi_t = \pi_t^e + \varphi(Y_t - Y_t^f) + v_t$$

with  $\varphi > 0$

The following condition,

$$\pi_t = \text{Max}[\text{Deflatmax}, (\pi_t^e + \varphi(Y_t - Y_t^f) + v_t)]$$

Therefore, the deflation can't be lower than what I set up as a maximum deflation, for each simulation.

The second aspect emerges when a relatively big and negative shock hits the AD, like the one that caused the present crisis. In this situation, as the optimal solution would be a negative real interest rate, the monetary policy rule calculates a negative nominal interest rate. However, as I mentioned before in this essay, there is something called the 'lower bound' that shows the impossibility of a negative nominal rate of interest (the real limit is the cost of holding money which is in between -0,25% and -0,5%). Therefore, I had to include a condition in the equation (5) to stop the model from calculating a negative nominal interest rate, because it just can't happen.

I did this by introducing to the equation (5):

$$i_t = \pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f)$$

*with  $\theta_\pi, \theta_Y > 0$*

The following condition,

$$i_t = \max[\text{imin}, (\pi_t + \rho + \theta_\pi(\pi_t - \pi_t^*) + \theta_Y(Y_t - Y_t^f))]$$

Therefore, there can't be nominal rates of interest smaller than the one set by the cost of holding money, as explained above.

So, with the maximum level of deflation and the 'lower bound', I was able to show how after a relatively big and negative exogenous shock of the AD, the recovery of the economy was much slower than if I had assumed perfect flexibility as the classic economists do. In some cases, a really negative shock of demand can even collapse the whole economy. We can corroborate the slow recovery with the depression we have been stuck in since 2007.

To be able to represent those restrictions in graphics which can show the differences between the neo-classical version of the model without restrictions and the Keynesian version that applies the maximum deflation and the lower bound, it is necessary to solve the model and express it in its reduced form where the endogenous variables only depend on the exogenous or predetermined variables.

From the results I obtained the five equations of the model without restrictions only depending on the exogenous variables and the previous inflation level.

$$Y_t = \frac{\varepsilon_t + Y_t^f + \alpha(-\mu - \pi_{t-1}\theta_\pi + \pi_t^*\theta_\pi - \theta_\pi v_t + \varphi\theta_\pi Y_t^f + \theta_Y Y_t^f)}{1 + \alpha(\varphi\theta_\pi + \theta_Y)}$$

$$\pi_{t+1}^e = \frac{\varepsilon_t\varphi + \pi_{t-1} + v_t + \alpha(-\mu\varphi + \varphi\pi_t^*\theta_\pi + \theta_Y(\pi_{t-1} + v_t))}{1 + \alpha(\varphi\theta_\pi + \theta_Y)}$$

$$r_t = \frac{(\mu + \rho + \varepsilon_t\varphi\theta_\pi + \pi_{t-1}\theta_\pi - \pi_t^*\theta_\pi + \alpha\varphi\rho\theta_\pi + \varepsilon_t\theta_Y + \alpha\rho\theta_Y + \theta_\pi v_t)}{(1 + \alpha\varphi\theta_\pi + \alpha\theta_Y)}$$

$$\pi_t = \frac{\varepsilon_t\varphi + \pi_{t-1} + v_t + \alpha(-\mu\varphi + \varphi\pi_t^*\theta_\pi + \theta_Y(\pi_{t-1} + v_t))}{1 + \alpha(\varphi\theta_\pi + \theta_Y)}$$

$$i_t = \frac{(\mu - \alpha\mu\varphi + \pi_{t-1} + \rho + \pi_{t-1}\theta_\pi - \pi_t^*\theta_\pi + \alpha\varphi\pi_t^*\theta_\pi + \alpha\varphi\rho\theta_\pi + \alpha\pi_{t-1}\theta_Y + \alpha\rho\theta_Y + \varepsilon_t(\varphi + \varphi\theta_\pi + \theta_Y) + v_t + \theta_\pi v_t + \alpha\theta_Y v_t)}{1 + \alpha(\varphi\theta_\pi + \theta_Y)}$$

To analyse the stability of this model it's necessary to realize that the only variable that is taken from the previous period is  $\pi_{t-1}$ . Therefore, the dynamism of the model comes from the inflation equation, because it is the only variable that depends on its previous value. The equilibrium of  $\pi_t$  depends on the following equation:

$$\pi_t = \frac{(A) + \pi_{t-1} + \alpha\pi_{t-1}\theta_Y}{1 + \alpha\varphi\theta_\pi + \alpha\theta_Y}$$

Where (A) are constant parameters that don't affect the stability of the model. Therefore, the dynamic equilibrium depends on this characteristic equation:

$$\pi_t = \frac{1 + \alpha\theta_Y}{1 + \alpha(\varphi\theta_\pi + \theta_Y)}\pi_{t-1}$$

And its stability depends on whether the expression  $\frac{1 + \alpha\theta_Y}{1 + \alpha\varphi\theta_\pi + \alpha\theta_Y}$  in absolute value is bigger than 1 (Instable) or smaller than 1 (stable). We know that both  $\varphi$  and  $\theta_\pi > 0$ , therefore, the denominator is bigger than the numerator and the dynamic equation converges monotonously to the equilibrium.

However, when we introduce the lower bound, the model changes and we need to analyse its stability again. In theory, the lower bound should be 0, but as keeping money safe has a cost, it can go down to -0,25% or even -0,5% as it's happening in the EU and Japan (the ECB charges 0,3% in the excess bank's deposits). Therefore, instead

of using a lower bound of 0 we use the lower bound as another parameter in order to be able to change it if we want.

As the nominal interest rate is now a parameter ( $i_t = imin$ ), we only need 4 equations to run the simulations and these are the following:

$$Y_t = -\frac{\varepsilon_t + Y_t^f + \alpha(-imin + \pi_{t-1} + \rho + v_t - \varphi Y_t^f)}{-1 + \alpha\varphi}$$

$$\pi_{t+1}^e = \frac{\varepsilon_t\varphi + \pi_{t-1} + \alpha\varphi(-imin + \rho) + v_t}{1 - \alpha\varphi}$$

$$r_t = \frac{-imin + \varepsilon_t\varphi + \pi_{t-1} + \alpha\varphi\rho + v_t}{-1 + \alpha\varphi}$$

$$\pi_t = \frac{\varepsilon_t\varphi + \pi_{t-1} + \alpha\varphi(-imin + \rho) + v_t}{1 - \alpha\varphi}$$

In this case, the expression that determines the stability of the model is:

$$\pi_t = \frac{(B) + \pi_{t-1}}{1 + \alpha\varphi}$$

Where (B) are also the constant parameters that don't affect the stability of the model. Therefore, the characteristic equation in this case is:

$$\pi_t = \frac{1}{1 + \alpha\varphi} \pi_{t-1}$$

We know that both  $\alpha$  and  $\varphi > 0$  and  $(1 - \alpha\varphi) < 1$ . Therefore, the model will be stable if and only if  $\alpha\varphi > 2$ , because  $\left|\frac{1}{1+\alpha\varphi}\right| < 1$ , but if  $\alpha\varphi < 2$  the model will be unstable, because  $\left|\frac{1}{1+\alpha\varphi}\right| > 1$ . In other words, for normal values of  $\alpha$  and  $\varphi$  the model will be unstable when hit by a negative enough shock of demand and the economy won't be able to return to the equilibrium point.

### Model with the lower bound and the maximum deflation

To illustrate the different results of the model with the adjustments, I have done the same simulations that I did for the model without restrictions, but using this modification of the model, with restrictions.

In this case, in addition to the target inflation, initially set at 2%, there is a lower bound for the nominal rate of interest of -0,5% (I'm assuming this is the cost of holding money) and a maximum deflation of 3% unless I state otherwise for a specific simulation.

Therefore, In the case of an initial shock on demand of -2%

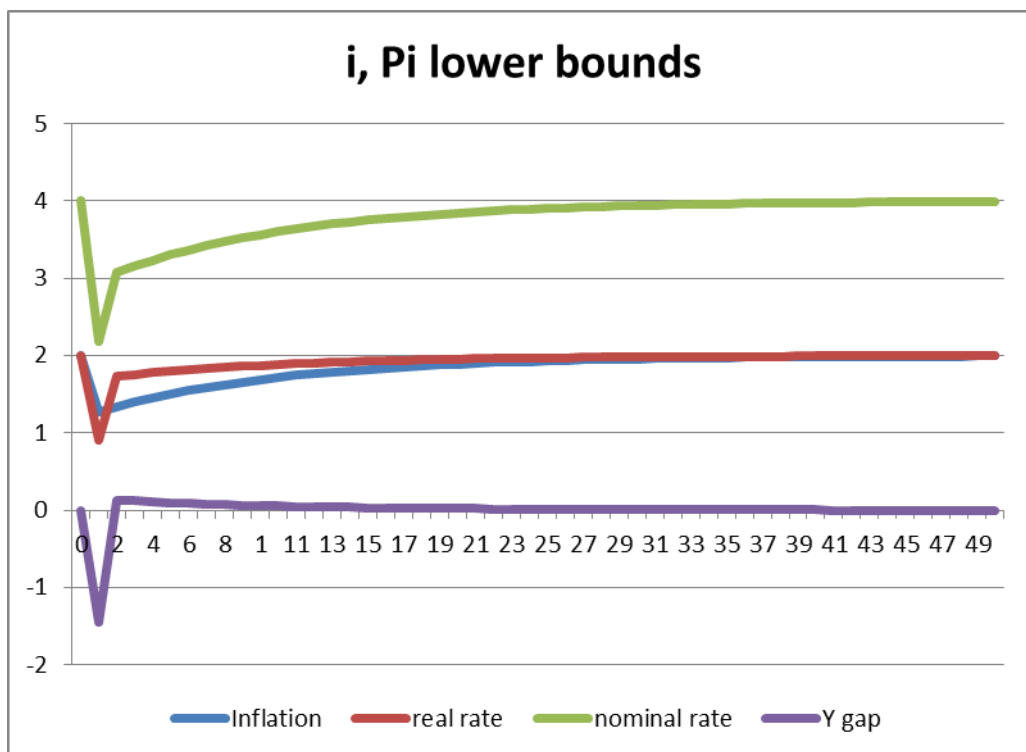


Figure 6: Response to a shock on demand of -2%

In figure 6, as the shock on demand isn't big enough, the model behaves exactly the same way as it does without restrictions, because the restrictions don't apply. Therefore we can't take conclusions out of this simulation.

However, when we increase the initial shock on demand to -5%, maintaining the other variables fixed.

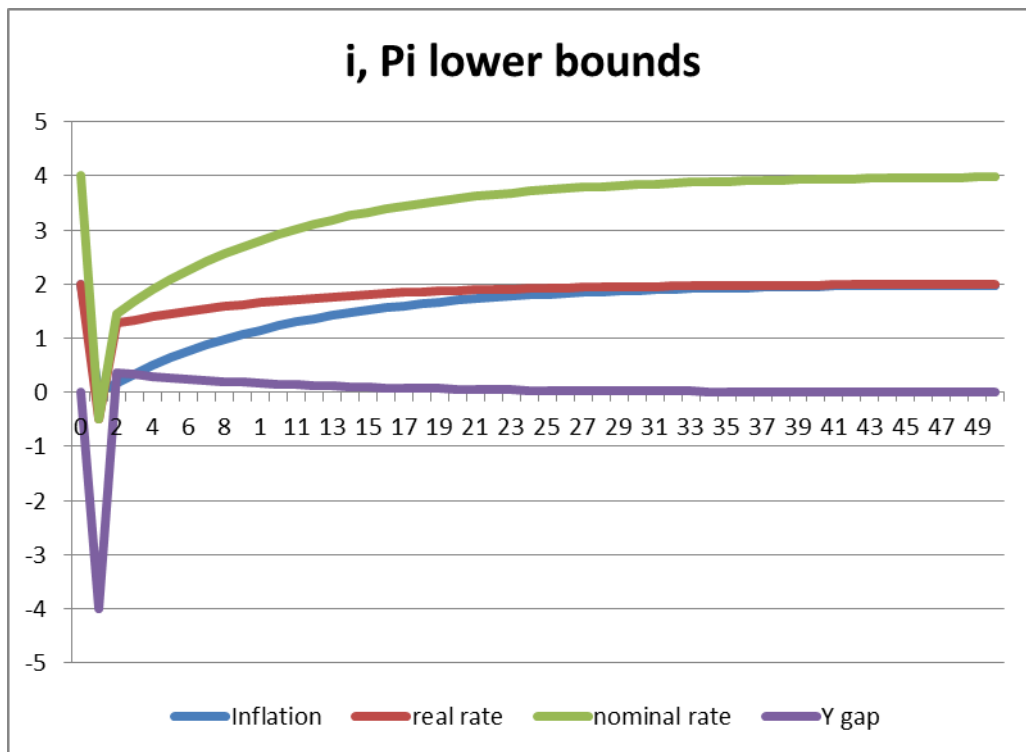


Figure 7: Response to a shock on demand of -5%

In figure 7, we can see that as the nominal rate of interest can only adjust until it reaches its minimum of -0,5%, the economy takes a little bit longer to recover from the shock. Nevertheless, the difference is not big enough to take conclusions out of it.

However, when I introduce the consistent shocks on demand of the -2% during 4 periods, caused by the austerity measures implemented, the results allow us to take more interesting conclusions.

Therefore, in a situation with the same shocks as in figure 3, the adjusted model shows significantly different results.

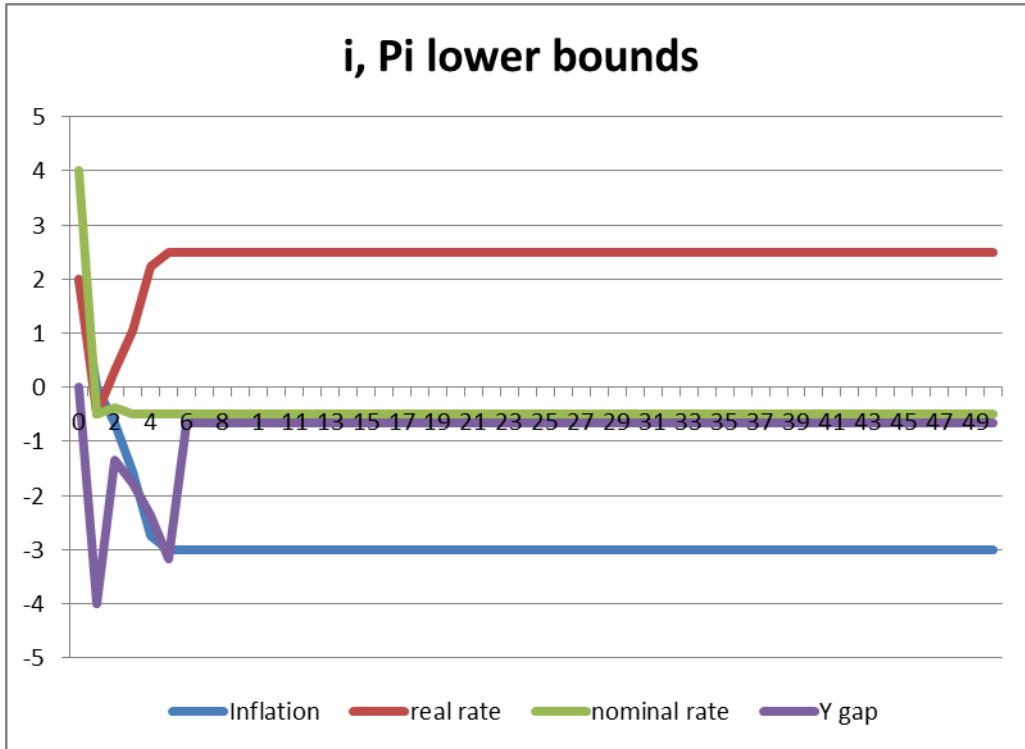


Figure 8: Response to an initial shock on demand of -5% and -2% during 4 periods.

From figure 8, we can conclude that, with the restrictions I included, the economy is not able to recover from the continuous shocks and gets stuck in a depression indefinitely. We can notice that the economy doesn't fall in a deflationist spiral because I have set a maximum level of deflation of 3%.



However, if I maintain all other parameters fixed, but increase this maximum to a 100%, the economy keeps falling until it collapses. In this situation, production breaks down to 0 and the unemployment rises to a 100% as the next figure shows.

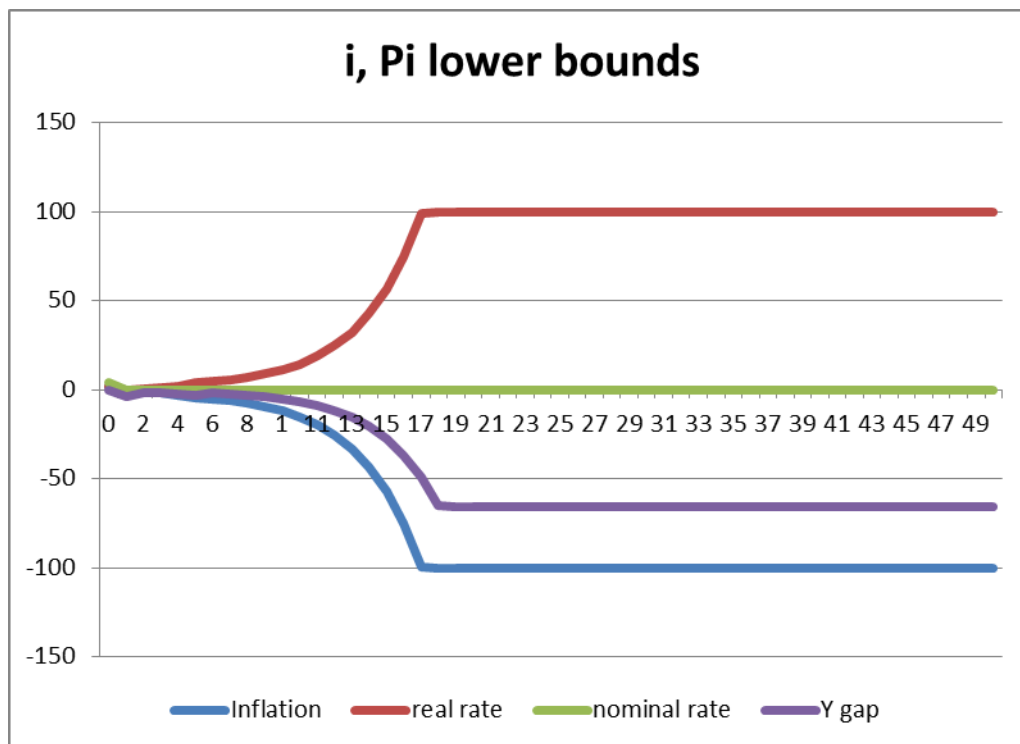


Figure 9: Response to an initial shock on demand of -5% and -2% during 4 periods with a maximum deflation level of 100%

From analysing figure 9, it's clear that austerity policies don't work when the intention is to bring the economy out of a depression caused by a negative shock of demand.

Under these circumstances, the only solution left to reactivate the economy and bring it back to its full employment output level is to use fiscal policy and introduce an economic stimulus big enough to incentivate consumption and create jobs to cope with the high levels of unemployment.

To prove this, the following simulation introduces a positive shock of demand that represents that particular stimulus which can be a sole 'big enough' stimulus or persistent stimuli through several consecutive periods.

Therefore, taking as a starting point, an economy that has suffered an initial shock of -5% and has undergone austerity programs that caused shocks of -2% during the latter 4 period:

If economic authorities choose to implement only one big stimulus of 5% of the demand.

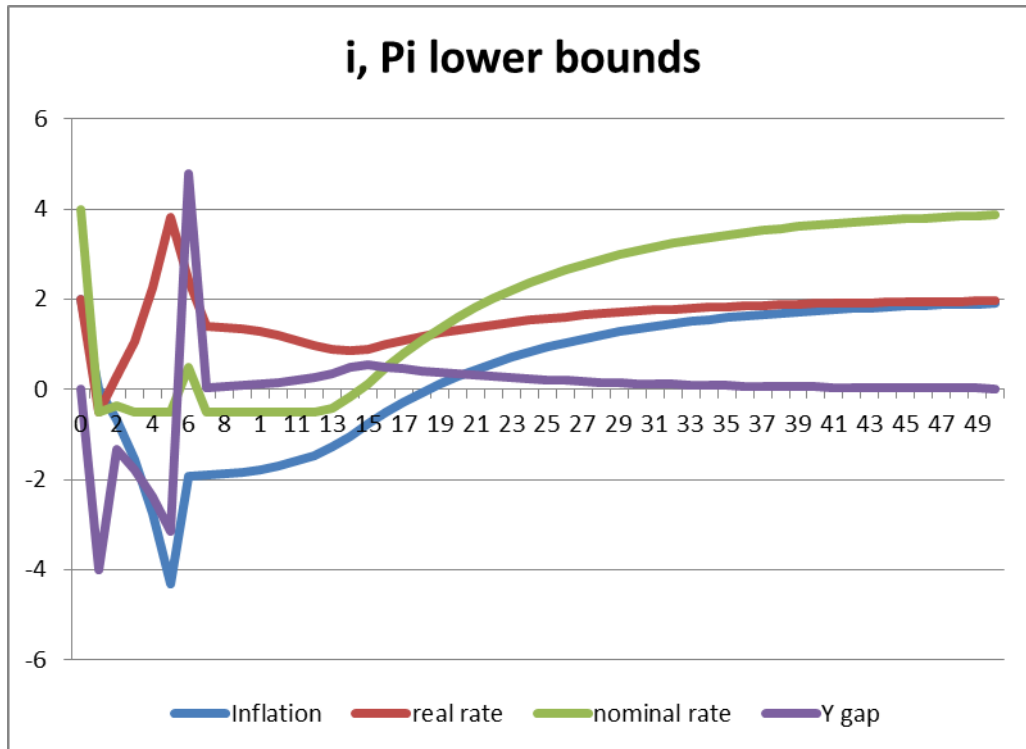


Figure 10: Response to an initial shock on demand of -5% and -2% during 4 periods with a stimulus of 5% right after

In figure 10 we observe that the economy is able to reactivate its demand that, consequently, is able to take the economy out of the depression as soon as the nominal rate of interest stays at its lowest possible value for several periods.

On the other hand, if the economic authorities prefer to cope with this issue with consecutive stimuli of smaller magnitude, for example, positive shocks on demand of 2% during 4 periods, using the same parameters,

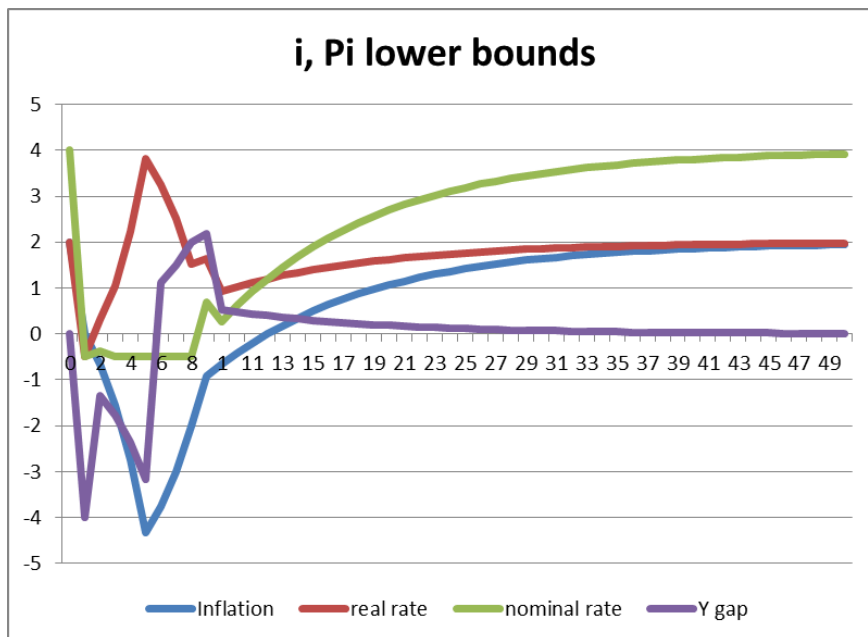


Figure 11: Response to an initial shock on demand of -5% and -2% during 4 periods with consistent shock of 2% during the next 4 periods

In figure 11, we appreciate that the economy is also able to return to its equilibrium. However, this case is more likely to happen because it requires less economic effort from an economy that finds itself in a depression, therefore it's more realistic.

However, another solution would be to increase the target inflation, fixed by the central bank, in order to give more leeway to economic authorities.

Therefore, if the target inflation is increased to 5%, maintaining the other variables fixed and using the same starting point as in figures 10 and 11,

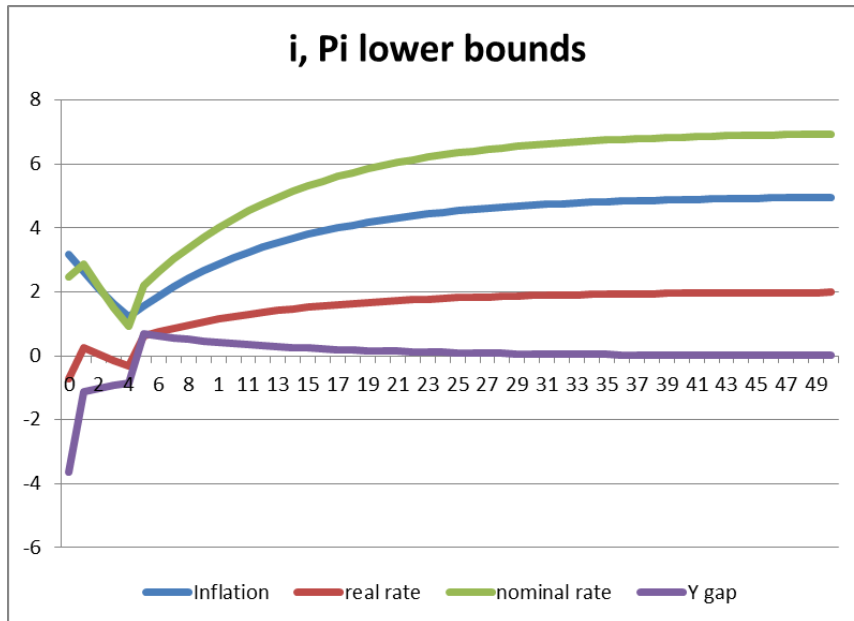


Figure 12: Response to an initial shock on demand of -5% and -2% during 4 periods by increasing the target inflation to 5%

In the last Figure (12), we can see how no stimulus is needed to bring back the economy to the equilibrium because this larger inflation target allows the necessary adjustments in order to put the economy back on its feet. Although, this only happens if we assume that the credibility of the central bank is absolute and, therefore, economic agents adapt their expectations of future inflation to the change in target inflation instantly. However, in real life it may be necessary to inject the economy with some stimuli to make sure that happens and it would be a mid-term solution, as I explained before.

In any case, the conclusion is the same. If the ECB wouldn't have been so afraid of inflation and would have fixed higher targets of inflation, at the beginning of the crisis, in order to increase its leeway in addition to implementing significant stimuli, this depression could've been softened and, today, we would probably be in a much better scenario than the one we are now.

## Conclusions

It's important to remember, once more, that when confronting a crisis like the one the world's economy is still suffering, the two mainstream perspectives diverge from the very beginning. The new-Keynesians attribute the cause to a lack of effective demand where the neo-classic economists don't accept that this lack exists and, therefore, it doesn't need to be rebooted to bring the economy back on track.

From that very first assumption, the path of action of these two schools results with different solutions to the, apparently, same issue.

Neo-classic economists think that the solution is, when the economy finds itself in a depression with the output level way below its level of full employment in addition to high levels of national debt, to implement measures that will cut the deficit of the country and reset the confidence of the mighty markets on that country's stability. This usually means implementing austerity measures that slash government expenditure, which is normally followed by an increase of taxation (mostly on indirect taxes), in order to increment the government's revenues and be able to pay the debt as soon as possible.

In other words, they seem to ignore the fact that the economy is in a deep demand side depression and the levels of employment and consumption are significantly low. Their only concern is the stability of prices (hence, lowest inflation possible) and the elimination of any restriction that the markets may have in order to let the system adjust by itself.

On the opposite perspective, Keynesians think that the solution, when the economy is in a great depression, is to do what is necessary to incentivize the contracted demand by all means. To do so, they are willing to postpone the payment of the national debt and incur more debt if it's needed in order to increase the government expenditure through expansive fiscal policies and create jobs (mainly in infrastructure because it increases the productivity on the mid-term) to put the unemployed population back to work as soon as possible. They support this statement by assuring that when the population is back to work, the consumption level of the economy will rise. Therefore, the AD will reactivate, bringing the economy back to the full employment equilibrium and then, it will be the time to increase taxes (government's revenues) and reduce the national spending in order to pay back the debt incurred during the period of crisis.

After analysing the results of the simulations of Mankiw's 3-equation model, without restrictions and the one with my adjustments, it's clear that austerity measures, in a depression like the current one, only worsen the situation for the majority of the population, except for those who benefit from the low inflation rates.

Therefore, I can say that my conclusion agrees with the Keynesian thought that austerity is a policy to implement when the economy is at its boom and never when it's stuck in a depression, because it will only delay the recovery of the economy.

To answer the initial questions of this essay, I am sure that austerity can't be an expansionary policy because it slashes the size of the economy that undertakes it, so, it can never have expansionary results.

Then, why has the EU forced its integrant countries to implement austerity measures? In my opinion, the only answer to this question is that there is a difference of preferences between the ruling 1% and the majority of the population. This is because the top classes of society benefit from low inflation rates so their money doesn't devalue too fast and the markets are more stable. However, on the contrary, the other 99%'s preferences would be for the economic authorities to invest in 'big enough' stimuli to boost the demand and lower the high unemployment rates (even more so in the periphery countries).

The results derivative from the model's simulations, allow me to say that if the ECB would have reacted at the beginning of this crisis, without hesitation or biased fear towards inflation, by increasing its target inflation rate in addition to stimuli in form of government spending on job creation instead of bailing out the whole banking system, this crisis likely could have been overcome much more rapidly than this long process of recovery that we are living now.

However, when I think about whom this path of action benefits the most and I compare it with who makes the decisions of implementing such policies, it doesn't shock me to find out that they are the same people. Our society is ruled by a small percentage of the population, which also happens to be that class of people with the most distant interests from the average citizen. Therefore, I'm not surprised when more often than not, the policies implemented by our governments end up harming the biggest percentage of our society.



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