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Donato Masciandaro

MACROECONOMIC IDEAS, BUSINESS CYCLES AND ECONOMIC POLICIES: ONE SIZE DOESN'T FIT ALL - A PRIMER

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Abstract

The lecture notes describe different views in macroeconomics – i.e. how to explain the business cycle and to design economic policy - using a modified workhorse AS AD model, in order to include in the simplest way uncertainty, expectations and the role of banking and finance. The bottom line is to show pedagogically that one size - i.e. a unique economic mainstream – doesn't fit all – i.e. cannot explain different national and historical business cycles. Therefore it is necessary to know more than one macroeconomic views, and history, politics and empirics matters in disentangling the pros and cons of each of them.

Donato Masciandaro[♠]

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[♠] Department of Economics and Baffi Carefin Centre, Bocconi University and SUERF. Most of articles that are quoted in the references can be downloaded for free from ssrn.com. Errors of this paper are my responsibility, while for improvements I owe many debts to score of students, whose insightful comments and reactions have played a crucial role in shaping this draft year after year.

1. INTRODUCTION

The lecture notes describe different views in macroeconomics – i.e. how to explain the business cycle and to design economic policy - using the same modified AS AD model. The bottom line is to show in the simplest way that one size - i.e. a unique economic mainstream – doesn't fit all – i.e. cannot explain different business cycles[1]. Therefore it is necessary to know more than one macroeconomic views, and history matters in disentangling the pros and cons of each of them. The notes are organized as follows. Section Two introduces the necessary definitions and classifications. From Section Three to Section Five different macroeconomic views are discussed. Section Six speculates on a specific issue, i.e. different macroeconomic views on central banking, monetary policy and banking policy. The references are in Section Seven.

2. THE BASIC MODEL

We will consider an open economy with perfect capital mobility and flexible exchange rates [2] and with different degrees of imperfections, in the real and in the monetary and financial markets, as well as in the labour markets, in a medium term perspective , i.e. inflation, output and employment can change, while the capital stock is fixed[3].

All the variables are flows, which are expressed as rates of change (positive or negative). Uncertainty is present, both in the supply and in the demand. Let us specify the key features of the aggregate supply side and the aggregate demand side.

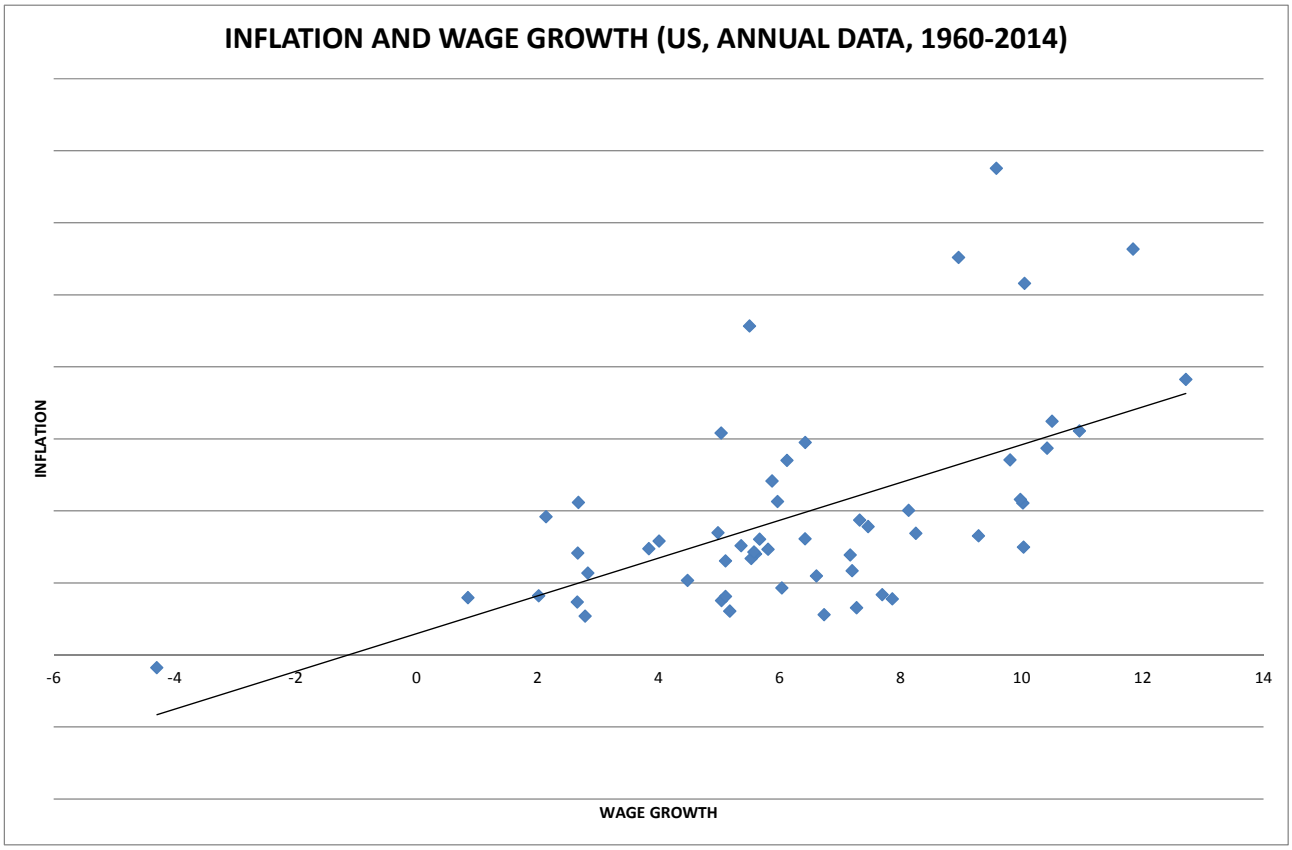
[1] The notes endorse the perspective to reconsider the macro principles after the Great Crisis - see Blinder 2010, Kenny and Morgan 2011 . On the dispute Saltwater View versus Freshwater View see Hall 1976, Blanchard 2008, Chari et al. 2008, Onder and Tervio 2014, Wren-Lewis and Moreira 2016; see also a masterpiece, i.e. Leijonhfuvud 1973. On the state of macroeconomics before the Great Crisis see Mankiw 2006, Uhlig 2011 and Fair 2012. At the same time the notes share the perspective that the aim of a macroeconomic view is to find out a reasonable trade- off between internal consistency – i.e. to be micro founded – and external consistency – i.e. to be empirically confirmed; on this point see Fair 2012 and Wren – Lewis 2016. For the sake of simplicity and given the space constraint for each macroeconomic view the notes does not discuss the internal and external consistency of each macroeconomic view, using the usual trick, i.e. by reference as much as possible to scientific articles that explore the micro foundations and/or the empirical relevance of the issues in discussion.

[2] We exploit the well-known trilemma (free capital flows, exchange rate regime and monetary policy autonomy); in general on trilemmas in open macroeconomics see Bordo and James 2015.

[3] The conceptual approach is the same of Clarida et al. 1999. See also Brunnemeir and Sannikov 2016, where financial frictions are endogenously included in a continuos time framework and used for positive and normative evaluations.

2.1 Supply Side

The supply side – i.e. the AS curve – is basically the standard inflation equation based on the mark- up approach, which is augmented using a cost push factor – see below – in order to consider the role of uncertainty, i.e. in the medium run inflation and wage growth are associated (see below):



Bottom line: in general the inflation rate is associated with three different drivers: the market of inputs, which means labour markets, given that the capital is fixed; the market of outputs, considering the level of competition in the markets of goods and services; uncertainty, i.e. the random component that can affect the firm cost profile[4].

Therefore the inflation path is associated with three components: costs (wages); firms' market power in the overall economy; random shocks :

$$\pi = \omega + (\frac{M_t - M_{t-1}}{M_{t-1}}) + u \qquad (1)$$

[4] In general, as in Clarida et al. 1999, the random component – i.e. uncertainty – captures anything else – "cost push" - that may affect firm costs. Other micro foundations: with a population of risk adverse individuals, each of them is both price maker and price taker; with uncertainty his/her expectations of higher prices as price taker motivate higher price setting as price maker, given their expected utility; the overall macro effect will be higher inflation. On the first steps of the expected utility in economic thought see Moscati 2016. On the relationship between asset price inflation and uncertainty see Berardi 2015; On top of that: Inflation can be positively and negatively associated with financial frictions, see Gilchrist and Zakrajsek 2015; we could capture this effect in the simplest way adding our liquidity shock parameter l , which is present in the aggregate demand dynamics (see below) also in the aggregate supply.

Where π= rate of inflation; ω = wage growth; M_i = macro mark- up level in a given year *i* and *u* = uncertainty distribution, , i.e. the distribution of random shocks, that can assume positive or negative values and it is normally distributed with zero average and finite variance[5]. Uncertainty produces more inflation, assuming that the agents are risk adverse[6].

Starting from the markets for goods and services, given a macroeconomic index of the mark up, normalizing it respect to its minimum level - different from zero being in the real markets - we can say that $M_i \geq 1$, where in the situation more close to perfect competition it will be: $M_i = 1$

We can write:

$$\frac{M_t - M_{t-1}}{M_{t-1}} = \frac{M_t}{M_{t.-1}} - 1 = (\mu - 1)$$

The parameter μ - i.e. the ratio of the mark- up levels between two subsequent years - represents our aggregate ***rent factor***. Higher levels of the rent factor mean that in the economy the competition is decreasing; the opposite is true when the rent factor decreases[7]. When the level of competition is stable:

$M_{t-1} = M_t$

$\mu = 1$

It is worth noting that stable and perfect competition is a sufficient condition to have μ=1. In this case, given uncertainty, inflation will be associated only with costs:

$\pi = \omega + u$

Therefore, given the level of competition – which depends on the antitrust policies, other things being equal – and uncertainty, inflation will be associated with the labour market conditions[8].

-) Labour market:

[5] The use of the normal distribution is a standard assumption in macroeconomics to capture random phenomena, for example the deviations of aggregate economic variables – such as GDP growth or inflation - from their trends. Other assumptions can be made; recently for example, Acemoglou et al. 2012 claimed that the distribution of GDP growth rate in the US and many OECD countries do not follow the normal distribution.

[6] We assume that the price makers change their decisions depending on uncertainty, i.e. shocks; other things being equal – including menu costs and observations costs - the price dynamics depend on the shock volatility; see for example Alvarez et al. 2010, p.14. One more assumption is that uncertainty increases asymmetric information, which helps the price setters in defending/augmenting their rent positions.On the positive relationships between long run inflation and (policy) uncertainty via expectations see Istrefi and Piloiu 2014. On the relationship between uncertainty and growth – that we find out in equilibrium - see Bloom e al. 2014. Uncertainty can be associated with the role of institutions and culture in shaping economic growth; on institutions and growth see Acemoglu et al. 2000 and 2012; on culture and institutions see Tabellini 2007; on the role of institutions – property rights - and growth in Adam Smith see Irwin 2014. Considering organize crime a bad by-product of weak institutions, it is also possible to explore the relationships between crime and growth: See Pinotti 2014.

[7] In general on the relationships between macroeconomics and regulation in the markets for goods, services and labour as well, see Blanchard and Giavazzi 2000.

[8] We can assume that the elasticity between inflation and wage growth can be different from one – i.e. $\pi = \partial\omega$ with $\partial > 0$ - without any loss of generality. Putting together equations (1), (2) and (3), we can find out the well- known relationship between inflation and unemployment rate (Phillips curve). Blanchard et al. 2015 estimate the slope of the Phillips curve, finding an increasing trend from 1961 to 1976, a declining trend up to 1993, and then the coefficient remained constant up to 2014.

In the labour market the market clearing price is associated with the employment situation, given the role of the institutional factors, i.e. the wage growth is associated with the employment growth (see below):

Putting in in another way:

$$\Delta labourprice = bn \qquad (2)$$

Where *n* is the employment growth and a parameter b captures the role of the labour market institutions[9]. Frictions in the labour market produce asymmetries in the relationships between wages and employment growth. We assume that perfect flexibility means that the price elasticity is equal to one in the relationships between wages and employment. Under a different perspective, we are assuming that without frictions the labour market dynamics are likely to be more stable – i.e. the movements of the two key variables are perfectly symmetric.

Therefore we can assume through normalization respect to the unitary elasticity that $b \geq 1$, calling it the ***rigidity factor***: lower values of *b* mean higher flexibility of the labour market clearing price, given that its changes are symmetrically associated with the evolution of the employment growth. Higher levels of changes in employment are associated with higher changes in labour prices, and vice versa – i.e. the micro explanation is that the substitution effect dominates while the macro explanation is that the bargaining power effect matters.

[9] For a survey on wage setting in macroeconomic models see Taylor 2016.

The flexibility of the labour market can depend on different institutional and policy drivers, including the labour contract policy, or the taxation policy on the production factors. Any reform which increases the association between labour price and employment triggers higher levels of flexibility. When b=1 the labour market enjoys the perfect flexibility status[10].

How the pricing is defined in the labor markets? The wage contracts are signed in nominal terms, but we assume that the workers take into account their expectations on future inflation. Therefore:

$$w - \pi^e = bn$$

-) Expectations

The existence of uncertainty implies that the expectations of the agents matter. Following the standard macroeconomic hypothesis we assume that all agents share the same information, i.e. all players share the same "state of mind" on how the economic system works. Then we can use three different assumptions on expectations[11].

First of all, the expectations can be *rational*, i.e. the agents cannot be systematically surprised. The agents know how the economic system works time to time, i.e. their expectations are fully endogenous, i.e.:

$$\pi^e = \pi$$

Secondly, the expectations can be *imperfect*, i.e. the agents can be systematically surprised. The agents ignore how the economic system works time to time, i.e. their expectations are fully exogenous, i.e. based on beliefs (*belief expectations*)[12]:

$$\pi^e = \hat{\pi}$$

Finally, the expectations can be *imperfectly rational*, i.e. the agents can be only temporarily/partially surprised. The agents learn how the economic system works time to time, i.e. their expectations are only temporarily/partially exogenous (with $0<\lambda<1$)[13]:

$$\pi^e = \lambda\pi + (1-\lambda)\hat{\pi}$$

[10] In general, before normalization, $b_i > 0$. The normalized b in absolute value is equal to : $b = (1 - b_i) + 1 \geq 1$. On top of that, in order to capture specific asymmetries – two ways asymmetry and/or downward and upward asymmetry - it is sufficient to add in the dynamics of wages an autonomous driver, which can be deterministic or random, i.e. . $\Delta labourprice = B + bn$; on the empirics see Villavicencio and Saglio 2013, that estimate the relationships between nominal wage growth and unemployment growth, taking into account also the role of the inflation expectations and labour productivity. The downward flexibility ranges from 0.45 (normalized value, i.e. difference from one, plus one= 1.55) to 0.05 (normalized value = 1.95), while the upward flexibility ranges from 0.20 (normalized value=1.80) to 0.01 (normalized value=1.99).

[11] Alternatively it can be assumed that the knowledge is not commonly distributed, i.e. coordination failures can occur; see Angeletos and Liang 2016 .

[12] The belief expectations assumption is the simplest way to capture the original Keynesian intuition that expectations are crucial, but totally unpredictable (*animal spirits*). See Farmer and Platonov 2016.

[13] Empirically the case of imperfect rational expectations can be captured assuming that the inflation can depend on both past inflation and inflation expectations; see for example Blanchard et al. 2015.

For the sake of simplicity we will use the first two (opposite) assumptions. The labour market clearing price can be time to time different, depending on the macroeconomic view which has been adopted (see below).

All in all, the labour market price depends on the rate of the employment growth, which can be defined taking into account the features of the aggregate production function.

-) Production Function:

The output growth depends on both employment growth and capital growth (à la Cobb Douglas)[14]:

$$y = \alpha n + \beta k$$

It is worth noting that the standard production function doesn't include the role of finance: the productive agents hold the productive capital, and in any case it has been assumed that they can issue claims to less productive agents; in other words, the capital (wealth) distribution doesn't matter[15].

With *k=0* – i.e. medium run horizon - the key relationship between output and employment is identified (α= productivity factor). Therefore the relationship between employment growth and output growth becomes (with ε=1/α) [16] :

$$n = \varepsilon y \qquad (3)$$

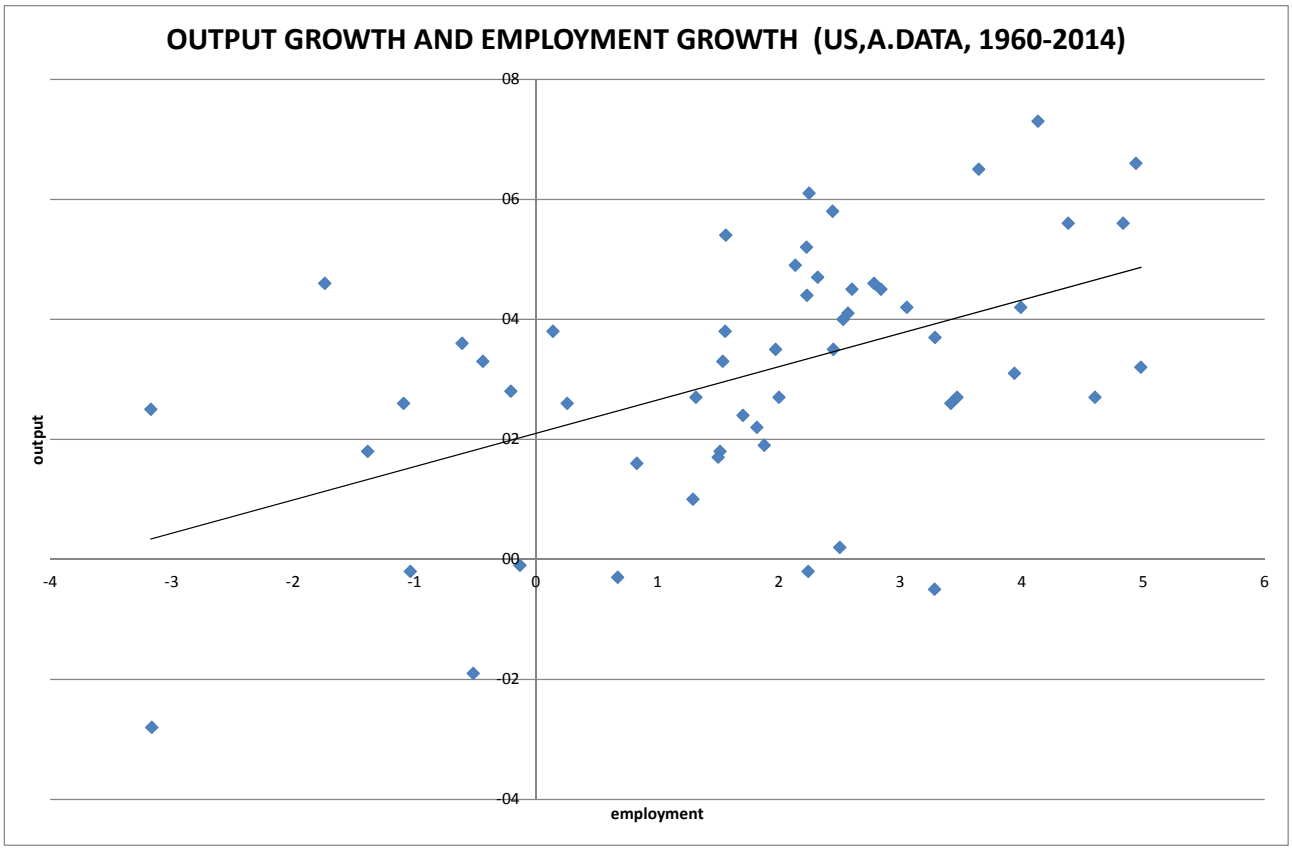
The parameter ε represents the role of technological obsolescence and lack of innovation. We can call it the ***inefficiency factor***: lower values of ε mean higher efficiency in the production of goods and services. Equation (3) summarizes the meaning of the well- known Okun law[17] – i.e. the relationship between (un)employment rate and output growth, i.e. (see below):

[14] The expression can be easily derived from the usual Cobb Douglas $Y = AL^{\alpha}K^{\beta}$ - where Y= output level, A=total productivity; α,β=marginal productivities, L,K= input stocks – assuming constant technology – A for simplicity is normalized to 1 – and that for every variable it is true that its log represents its growth, i.e. $\log Y = \log A + \alpha \log L + \beta \log K$; therefore $y = \alpha n + \beta k$. The log of the levels is used to capture the growth of the GDP for example in Blanchard et al. 2015. Assuming constant technology means that empirically the behaviour of the total productivity can be considered a residual - i.e. the output growth not explained by growth in inputs of labour and capital – that primarily reflects innovation; see Byrne et al. 2016.

[15] On the role of financial frictions in macroeconomics see Brunnermeir et al. 2012. The role of financial frictions in influencing investments and production has been highlighted in the literature regarding the financial accelerator. See note 16.

[16] Alternatively in a long run perspective we can assume that the human capital is constant, in this case the output growth depends on the capital marginal productivity, which is positive but decreasing. Therefore the demand for capital – i.e. the demand for saving $I = I(r)$ – is negatively associated with the real return (interest rate) r, while the supply for saving $S = S(r)$ is positively sloped.

[17] Regarding the Okun's relationship see Dixon et al. 2016.



Equation (2) becomes:

$$\varpi = b\varepsilon y + \pi^e$$

*) The supply side equation defines the well-known relationship between inflation and output :

$$\pi = (\mu - 1) + b\varepsilon y + \pi^e + u$$

$$y = \frac{(\pi - \pi^e) + 1 - (\mu + u)}{b\varepsilon}$$

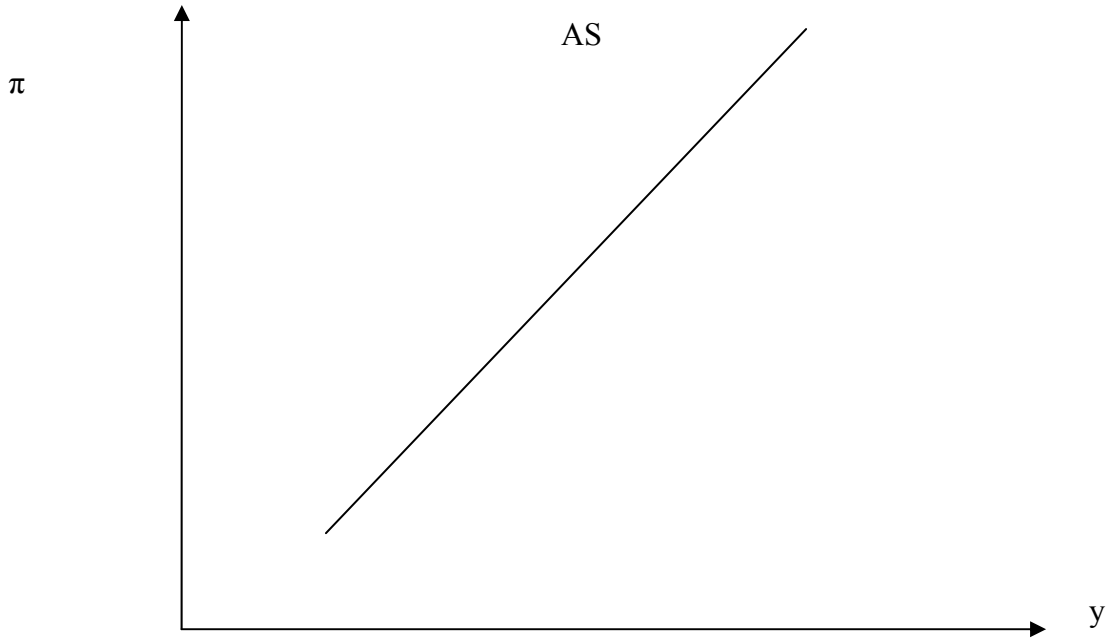
Note that:

$$y > 0 iff \pi + 1 > \pi^e + \mu + u$$

I.e. the Firm Efficiency Condition holds; putting in another way the necessary condition for having positive output growth is that the behavior of the firm is consistent with the standard micro optimization assumptions: prices are at least equal to costs, both effective and expected ones.

Given the uncertainty, the output growth is related to the mark up factor (less competition in the markets of goods and services means less output); the rigidity factor (less flexibility in the labor markets means less output) ; the inefficiency factor (less productivity means less output); the inflation (more output means more employment which is associated with higher wages that, given the mark up mechanism, trigger inflation); the inflation expectations (higher inflation expectations reduce the expected real wage, the employment growth and consequently the output growth).

Graphically:



2.2 Demand side

In general in the standard aggregate demand growth – i.e. the AD curve – two components has been identified. The real markets component, which represents the demand for goods and services independently associated with consumption, investment and trade choices – i.e. usually the exogenous part of the IS curve – while the monetary markets component summarizes the demand which is influenced from the monetary conditions – i.e. usually driven by the LM curve.

More precisely we assume that in an open economy, other than the exogenous factors, the demand for goods and services is associated with the interest rate level. The interest rate level can influence the aggregate demand through two channels:

a) Changes in the demand of private investment is associated with changes in the price of money – i.e. the nominal interest rate – that modifies the real interest rate;

b) Changes in the trade balance are inversely associated with the nominal exchange rate via the real exchange rate: the trade balance increases when the nominal exchange rate depreciates[18]; the opposite is true when the nominal exchange rate appreciates[19].

[18] Gopinath 2015 shows that the sensitivity to exchange rate fluctuations can depend on the nature of the currency, i.e. the sensitivity i slow when the country issues a reserve currency (dollar).

[19] In general the trade balance *nx* is inversely associated with the real exchange rate ε; the real exchange rate is directly associated with the nominal exchange rate *e* – foreign currency units for one domestic currency unit - and inversely associated with the difference between foreign and domestic inflation.

With perfect capital mobility and perfect flexible exchange rates the nominal exchange rate depends on the level of the interest rates: higher interest rates increase the capital inflows and consequently the exchange rate appreciates[20]; the opposite is true with lower interest rates.

It is worth noting that the effects of the two channels drive the aggregate demand in the same direction. For example, a monetary expansion – i.e. lower interest rates – increases both the private investment and the trade balance.

Summing up: on the one side we can identify a "real" component – i.e. all the exogenous drivers of aggregate demand changes, as the autonomous demand for consumption, the autonomous demand for investment, the autonomous fiscal policy decisions, the autonomous trade balance decisions, etc. – and on the other side a "monetary" component – i.e. all the drivers which depends on the interest rate dynamics.

We assume that the interest rates are controlled by the central bank (see below). If the demand for money is stable, interest rate policies are associated with quantitative policies[21]; therefore the effects of the interest rate changes can be proxied by changes in the real money supply, and the monetary policy action can be used for aggregate demand stabilization purposes.

Further we assume that the central bank sets just one interest rate, and that the path of the other interest rates, including their term structure, change consequently[22]. Finally it is worth remembering that it can be advocated also a monetary rule under which the money growth is targeted[23].

Obviously also the inflation rate matters; changes in inflation produce changes in the opposite direction in the real growth of money; the more is true that this chain more than proportionally changes

[20] In the standard macro models capital inflows are contractionary via currency appreciation; Blanchard et al. 2015 included in the analysis bonds and non- bonds, highlighting the possible expansionary effect of the association between capital inflows and credit booms, potentially offsetting the contractionary effect.

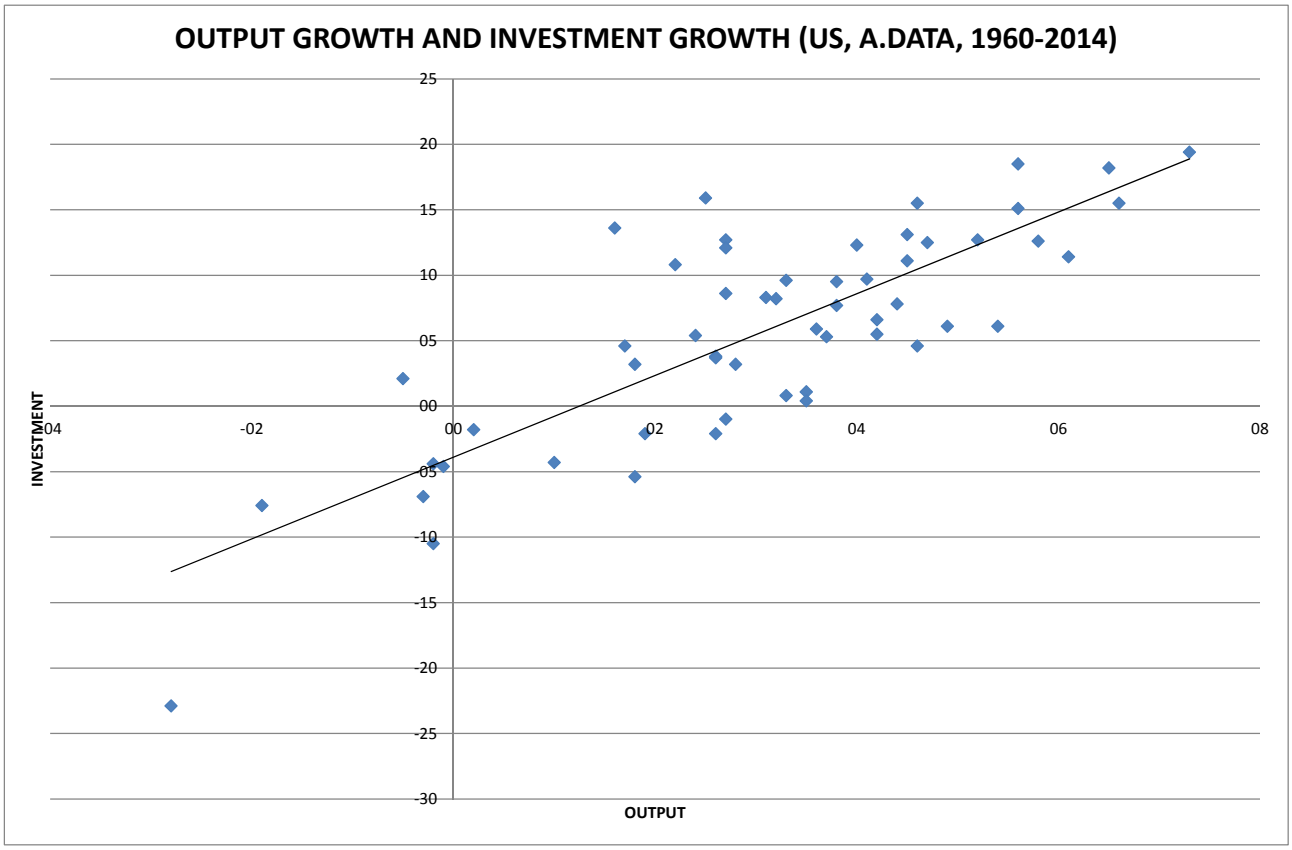
[21] The more common interest rate policy is the Taylor Rule; see Taylor 1993 for the US and Gerlach and Schnabel 1999 for the EMU; in general see Woodford 2001. For the interest rate rules before the Taylor rule see the quotation in Fair 2012. Given the existence of macro targets - inflation rate and output growth - the Taylor Rule is based on the assumption that without short run shocks the nominal interest rate is equal to the sum of the real interest rate with the inflation rate – a natural interest rate à la *Wicksell*, i.e. a rate at which the output growth equals its potential, without neither inflationary nor deflationary risks. In turn the real rate of interest is defined in a medium term perspective by real drivers, i.e. the rate of saving (inter-temporal saving rate) and the rate of investment (capital marginal productivity). But short run shocks can occur, hitting the inflation rate – higher risks of today inflation/deflation – and/or the output growth – higher risks of tomorrow inflation/deflation . Therefore the interest rate policy takes in account the shocks, reacting in a consistent way and considering which is the relative importance of the inflation and output growth discrepancies. On the relationship between the Fed policy before the Great Crisis and the Taylor rule see Taylor 2009 and Bernanke 2010. On the relationships between central banking and the Taylor rule see Walsh 2015; regarding specifically the central bank independence (CBI) see Maslowska 2011b. After the Great Crisis, on the relationship between the Taylor Rule and financial stability see Woodford 2012, Verona et al. 2014, Vredin 2015, Laseen et al. 2015, Nakata and Schmidt 2016. The Taylor Rule can be considered a policy rule to implement the inflation targeting strategy; see Vredin 2015. On the pros in having a monetary rule see Taylor 1998. On Taylor Rule and macro prudential policy see Bianchi and Mendoza 2015. On Taylor Rule and monetary policy inertia see Stein and Sunderam 2015. On the nominal GDP targeting see Garin et al. 2015, Hendrickson and Beckworth 2016. On the legislative proposal requiring the FED to report its Taylor rule see Dudley 2015 Yellen 2015a and 2015b, Taylor 2015. On the difference between rule-based (Taylor rules) and goal based (inflation targeting) monetary policies see Walsh 2015. On the role of transparency in influencing the monetary policy effectiveness see Geraats 2013. On Taylor Rule in African countries see Goncalves 2015. On Taylor Rule in Russia see Korhonen and Nuutilainen 2016.

[22] On the monetary policy frameworks and central bank operations in the advanced economies before the Crisis see BIS 2009.

[23] The more common money growth policy is the Friedman Rule; see Dellas and Tavlas 2016, Lothian and Tavlas 2016.

the nominal interest rate, the more it will be true that inflation will be negatively associated with the aggregate demand[24].

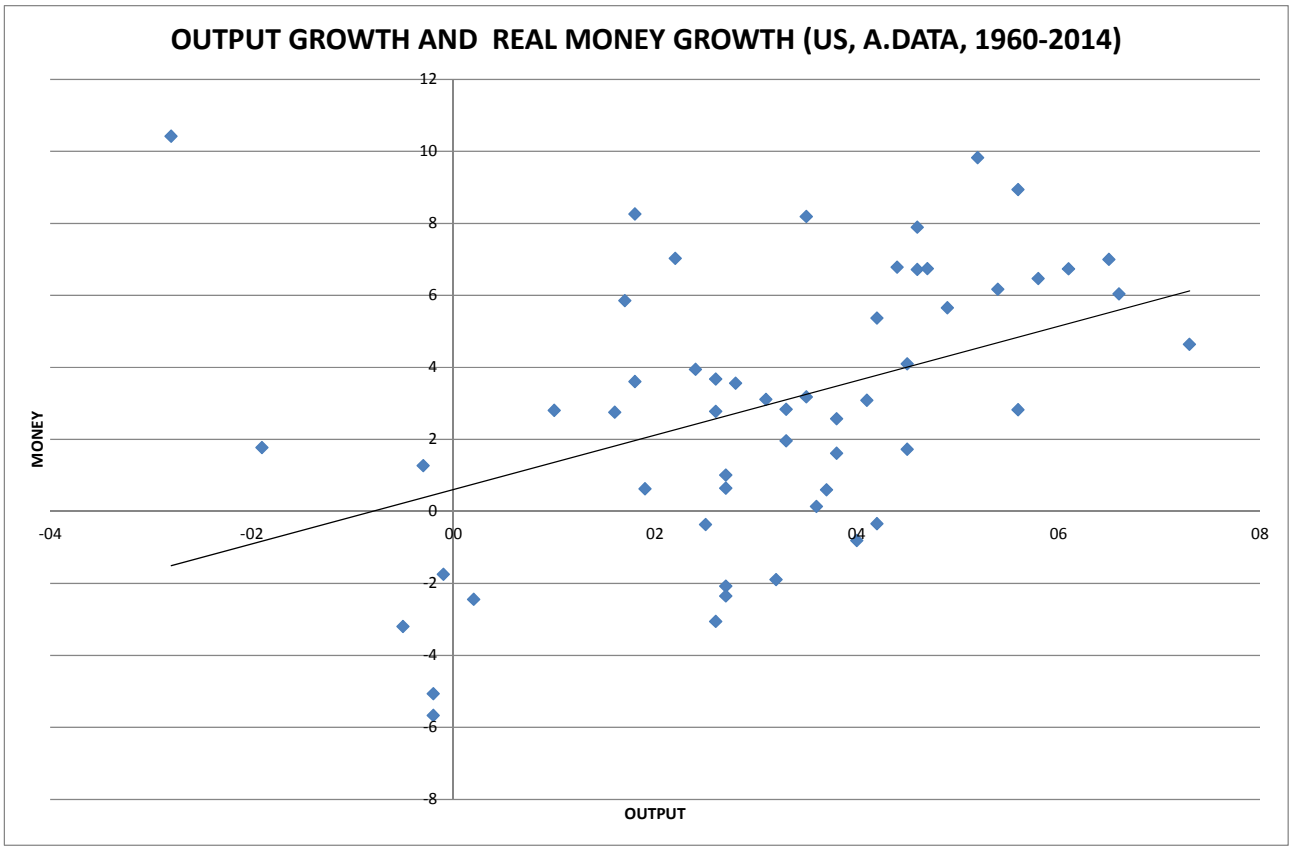
More formally we are assuming that the aggregate demand is associated with changes in the "real" exogenous component – that we call *a* - including for example the investment growth, i.e. (see below):



and changes in the "monetary" component, that we capture with the real money growth (changes in money supply minus inflation)[25], i.e. (see below) :

[24] In other words we assume that the elasticity of the so called Fisher Effect – i.e. the nominal interest rate change triggered by an inflation change – is greater than one; on the Fisher Effect in the Fisher pages see Gylfason et al. 2015.

[25] We will see that in general we are assuming that the real multiplier and the monetary multiplier have the same value, which is greater than 1 and that in the demand for goods and services the role of endogenous components – i.e. components which depend on output growth and/or inflation – is negligible. It is obvious that these assumptions are made just for the sake of simplicity, given that explicit introduction of heterogeneous and/or more complex multipliers wouldn't change the general results. On the multipliers in the real world see among others Batini et al. 2014, Riera –Crichton et al. 2014, Warmedinger et al. 2015. On the case of negative fiscal multipliers – i.e. fiscal stimuli based upon taxes cut are more likely to increase growth that those based on spending increases - see Alesina and Ardagna 2009. On the money financed fiscal multipliers see Galì 2014. On the fiscal multipliers in Europe over the period 1998-2011 see Attinasi and Klemm 2014 and over the years 2009-2013 see Alesina et al. 2015; see also Canzoneri et al. 2015. On the fiscal multipliers in the US see Barnichon and Matthes 2015. On the weakness of simple correlation analyses between fiscal policies and growth see Mauro and Zilinsky 2015. On the case of positive multipliers see Fatas and Summers 2016.



Putting it in another way:

$$y = a + (m - \pi)$$

Thirdly we assume that inflation expectations matter: higher inflation expectations for tomorrow increase expenditures in goods and services today; the opposite is true if lower inflation – or deflation - is expected for tomorrow. One more transmission channel can be highlighted via the expected real interest rate: higher inflation expectations mean lower expected real interest rate which triggers the investment demand. In this case both the actual and the expected real interest rates matter in influencing the aggregate demand.

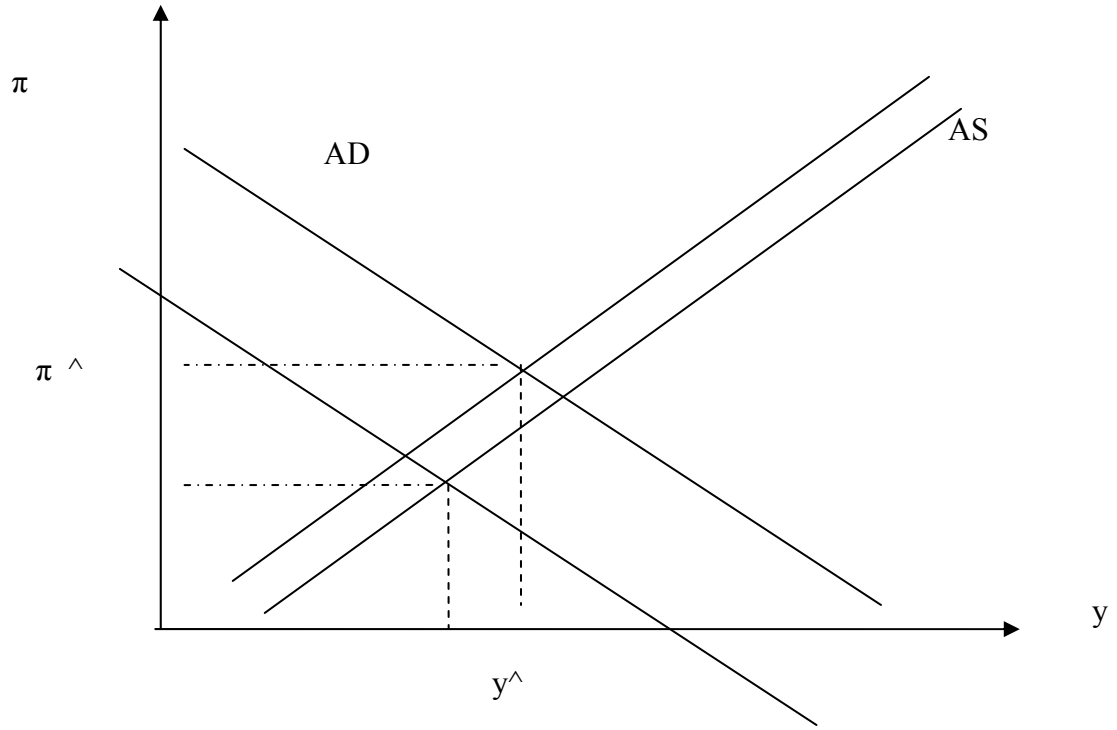
Therefore, being the parameter $0<\phi<1$ the sensibility of the aggregate demand to inflation expectations we have that:

$$y = a + m - \pi + \phi\pi^{e}$$

The parameter ϕ represents the *expectational accelerator*, i.e. how sensible is the demand for goods and services respect to inflation expectations.

The effects of a shock in inflation expectations on the output growth depends on how the supply and the demand side react. In other words it is relevant to define the relative sensibility of supply and demand when expectations change. Given our assumptions on expectations and wages – i.e. the supply sensibility is equal to one – the demand sensibility – i.e. the value of ϕ – becomes crucial, where the rule of thumb is to distinguish between low sensibility – i.e. $\phi<1$ - and high sensibility – i.e $\phi>1$.

For example a deflationary shock in the expectations – i.e. $\pi^e < 0$ – triggers a recession if and only if the demand effect is relatively high – i.e. $\phi > 1$. Graphically, just the intuition:



Our framework can capture in the simplest way concrete and recent episodes: for example, it could be the case that "if agents start to look at the track record of (low) inflation (…) it affect their benchmarks for wage and price setting decisions. What happens then is that low inflation feeds into inflation expectations and creates second round effects. In that situation, even what began as a positive supply shock can turn into a negative demand shock. As inflation expectations fall, it pushes up real interest rates (…), which has a negative effect on aggregate demand due to the different propensities to consume and invest of borrowers and lenders. Output and inflation then move (…) in the same direction, (…) downwards (Draghi, 2016).

On top of that and finally, also in the demand a random shock component *v* can be present, assuming positive or negative values and being normally distributed with zero average and finite variance. Therefore:

$$y = a + (m - \pi) + \phi\pi^e + v$$

The random component is relevant per se, but also it is useful to capture in the simplest way the role of banking and finance in macro (see below).

Therefore, other things being equal, we can easily found out the well-known relationship between aggregate demand and inflation:

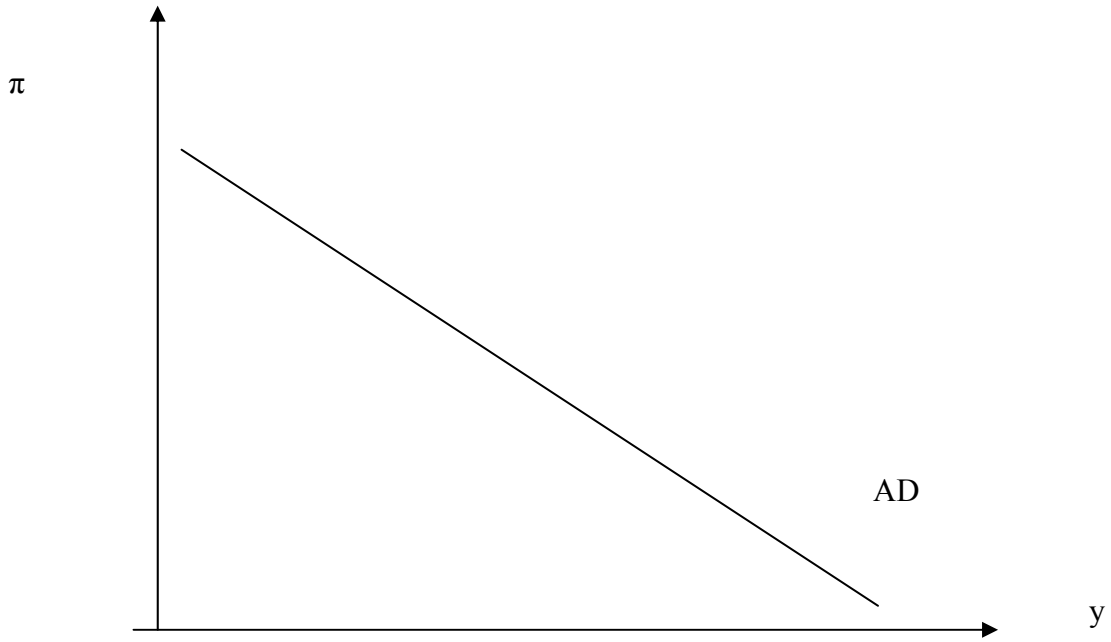
$$y = (a + \bar{m} + l) - \pi + \phi\pi^e + v$$

Again we can note that:

$$y > 0 iff a + m + l + \phi\pi^e + v > \pi$$

I.e. the Household Efficiency Condition holds: i.e. the consumer behavior is consistent with the standard micro optimization assumptions (the demand for goods and services is inversely associated with the price dynamics: the lower the inflation is the higher the likelihood that the abovementioned condition holds).

Graphically:



- Money, Banking and Finance

Prior to the 1990 economics devoted some attention in incorporating banking into macroeconomic models. However during the last two decades the macro modelling tended to view banking and finance either as completely irrelevant or extraneous, usually assuming both the efficient markets hypothesis and the opportunity to adopt light and market friendly regulations. Then the Great Crisis came, stressing the interest in integrating banking and finance into macroeconomics.

In order to analyse the economics of monetary, banking and financial policies in the simplest way we will focused our attention on the one side on money, on the other side on banking and finance as sources of leverage as risk management tool.

The money supply depends on what money is. Money represents the medium of exchange[26] that an economic system needs, in order to reduce the transactions costs due to the fact that to have an exchange between two agents a double coincidence of wants (DCW) is needed[27].

We will consider time to time three kind of money: commodity money (fix convertible money, i.e. the State issues paper money that can be transformed in gold at a fixed price), adjustable money (adjustable convertible money, i.e. the State issues paper money that can be transformed in gold at an adjustable price) and fiat money (the State issues paper money). The authority involved in the money control is the central bank[28].

The aggregate demand can be influenced by the conditions in the banking and financial markets. Prior to the 1990 economics devoted some attention in incorporating banking into macroeconomic models. However during the last two decades the macro modelling tended to view banking and finance either as irrelevant or extraneous, usually assuming both the efficient markets hypothesis and the opportunity to adopt light and market friendly regulations. Banking and finance were considered by definition efficient tools for risk management. But then the Great Crisis came, stressing the interest in integrating banking and finance into macroeconomics.

In order to do this in the simplest way, we can consider banking and finance as the production and distribution of *leverage* contracts, which are used by households, firms and financial intermediaries to manage risks for both hedging and speculation.

The macroeconomic effects of leverage contracts on the aggregate demand dynamics can be time to time negative or positive. Therefore we can capture their role through the effects on the shock component of the aggregate demand[29]. In other words leverage can represent time to time good news and bad news

[26] Alternatively money can be considered a tool of public finance, i.e. developing the so called fiscal theory of inflation; see Leeper and Leith 2016.

[27] For the micro foundations of money see Waller 2015. For an anthropological and evolutionary analysis of the DCW problem see Harwick 2015. For the historical evolution of money as safe asset see Gordon 2016.

[28] Recently new medium of exchange has been introduced in the economic networks, that is the so called virtual currencies, being bitcoin the most famous one; see Yermark 2014 and Bohme et al 2015. For our purposes we can consider the bitcoin virtual currency as a case of commodity money, if it is considered credible the Bitcoin protocol commitment to end the bitcoin production by the year 2140, with a final total fixed at 21 million units. Bitcoin can be considered a modern case of competition in currencies: see Villaverde and Sanches 2016. On bitcoin and central banking see Raskin and Yermack 2016. On central bank issued bitcoins see Barrdear and Kumhof 2016.

[29] Other things being equal, the leverage effect on aggregate demand will depend on the relative weight of debtors and creditors; see Mian et al. 2012, Frieden 2014; on the relationship between leverage, debt overhang and recessions see the reviews made by Lo and Rogoff 2015 and Taylor 2015; see also Chen et al. 2015 and Crowley 2015. It is worth noting that exogenous banking frictions can impact both the aggregate demand and the aggregate supply as cost-push shocks; see Woodford 2012. See above note 4.

for the economy[30]; for example a financial crisis can be considered a demand shock, given that it is likely to be associated with drops in consumption and/or investment[31].

On top of that the leverage effect can also capture the role of income, assets and wealth *distribution* in determining the aggregate demand; as it has been noted for example the debt distribution matters[32]. We assume that household wealth, both financial wealth and housing wealth, can have important effects on consumption.

Just for the sake of simplicity hereafter we will suppose that uncertainty on aggregate demand will depend exclusively on banking and financial shocks *l*, which represent positive and negative shocks in leverage[33]:

$$y = a + (m - \pi) + \phi\pi^{e} + l \qquad (4)$$

We can call the parameter l our *financial accelerator*[34], that is a proxy of the effects of financial frictions on the aggregate demand dynamics[35].

In this setting the international monetary policy coordination can be a spillover effect of national monetary policies which are based on the rules based approach that we mentioned above (Taylor Rule based or Friedman Rule based) [36].

The policy maker – for the sake of simplicity the central bank - can try to manage the leverage effect using the *macro prudential* policies. In fact after the Great Crisis it has been widely recognized that traditional micro prudential policies that are targeted to maintain the safeness and soundness of individual banks are not sufficient to guarantee the overall financial stability. Therefore macro prudential instruments has been adopted. The macro prudential tools target directly credit and financial aggregates[37].

We assume a) the central bank's macro prudential goal as one of minimizing leverage shocks, i.e. the macro prudential policy is anti-cyclical; b) the macro prudential tool is the global level of capital and

[30] In this framework the association between cycles and leverage is based on the assumption that the credit booms and busts are exogenous. The role of banking and finance in exploiting the business cycle has been explored in the Austrian School. On the relationships between the Austrian School and the contemporary macroeconomics see Oppers 2002, Garrison 2005, White 2015., Hoffmann and Schnabl 2016, Lewis and Wagner 2016. On the relationship between housing and business cycle see Piazzesi and Schneider 2016.

[31] In their empirical work Blanchard et al. 2015 consider that a financial crisis should be thought as a supply shock, but acknowledge that the distinction is far for tight.

[32] See Stiglitz p. 6. On the recent debate on inequality and income distribution see Acemoglu and Robinson 2014, Weil 2015. On the weakness of the empirical relationships between inequality and growth see Kraay 2015; For a Kaleckian model on debt servicing and aggregate demand see Setterfield and Kim 2015.

[33] Both economic uncertainty and financial shocks can be potential drivers of economic fluctuations; on top of that the two sources of instability can be toxically intertwined; see Caldara et al. 2016.

[34] The concept of financial accelerator has been used in Bernanke et al. 1998 to clarify the role of credit market frictions in business cycle fluctuations, showing how endogenous developments in credit markets can amplify and propagate macroeconomic shocks. Here we use the concept in a broader sense and more importantly for the sake of simplicity the shocks are exogenous and hit the demand side.

[35] Financial frictions can accelerate shocks producing persistence, amplifications and instability: see Brunnermeier et al. 2012. On the relationships between wholesale banking and macroeconomic instability see Gertler et al. 2016.

[36] See Taylor 2013 and Clarida 2014; for a survey of the current state of the literature on international policy coordination see Engel 2015; for the post Great Crisis situation see Borio 2014b and Mohar and Kapur 2014.

[37] On the macro prudential policies see Cerutti et al. 2015.

liquidity ratios *J*, where *J>0*. Higher levels of ratios indicate restrictive macro prudential policies, and vice versa.

In other words we are assuming that the effects of the financial accelerator on the aggregate demand is associated with the stance of the macroprudential policy:

$$l = l_o - l_1 J \qquad (6)$$

Where l_o is a random component and the absorber *factor* - $\left[l_1\right] \geq 0$ in absolute value captures - the effectiveness of the macroprudential policy. The effectiveness is at the maximum level when $l_1 = 0$, i.e. the macro prudential policy successfully sterilize the leverage cycles, excluding the stochastic component. The opposite is true: ineffective macroprudential policies – i.e. $l_1 \neq 0$ trigger unintended and unexpected consequences on the aggregate demand, that can be negative or positive.

With monetary policy in charge for monetary stabilization and macroprudential policy responsible for financial stability our set up is consistent with the Tinbergen Rule - i.e. each macroeconomic goal should be addressed by a single policy and the two policies are complementary[38].

In other words we are assuming that any spillover from one field to the other one - is negligible and/or can be addressed from the field policy (for example, any effect of the monetary policy in terms of bank and financial risks is negligible and/or can be addressed using the macro prudential policy).

In such as setting the central banks prefers to rely on macroprudential policy to address financial stability risks while maintaining monetary policy firmly zoomed on the standard macroeconomic goals – i.e. inflation and output growth[39].

Alternatively we could assume that a financial stability oriented monetary policy can be designed, i.e. a monetary policy that takes financial stability risks into account, responding systematically to financial shocks. In other words we could assume that on the one side the monetary policy stance influences also the macroeconomic risk profile, i.e. the expansionary policies increase the financial instability risks[40]:

$$l = l_o - l_1 J + l_2 m \qquad (6')$$

On the other side and symmetrically the monetary rule have to respond systematically to the financial cycle. Starting from a standard rule in which, given the natural (real) interest rate, the policy rate responds to deviation of inflation from target and the output gap, the rule itself is augmented to respond to a financial cycle proxy[41].

[38] For a review on the relationships between monetary and macroprudential policies and the related literature see Kim and Mehrotra 2015, Laseen et al. 2015. For macro models that analyses the interconnections between monetary and macroprudential policies see De Paoli and Paustian 2013, Dehmej and Gambacorta 2015, Cesa Bianchi and Rebucci 2016, Faure and Gersbach 2016. On the historical relationships between monetary and macroprudential policies in the UK case see Aikman et al. 2016.

[39] We can also assume that both monetary policy and macroprudential policy are used to stabilize business cycles; See Sergeyev 2016.

[40] On the so called monetary policy's risk taking channel see Smets 2014, Dell'Ariccia and Laeven 2016.

[41] On a monetary policy rule that takes the financial cycle systematically in account see BIS 2016, Juselius et al. 2016.

We assume that the monetary and banking policies[42] are both designed and implemented by the central bank[43]. Furthermore, given the distinction between regulatory and supervisory policies, here we focus our attention exclusively on regulation[44]. Monetary policy aims to fix the traditional macroeconomic targets – inflation and/or output growth – while banking policy addresses financial stability problem; it is worth noting that we are assuming that in general the monetary policy action *per se* can't address at the same time monetary and financial stability[45].

2.1.3 Equilibrium

Putting together the dynamics of demand and supply and specifying how the expectations mechanism works - i.e. using the standard equilibrium condition AS=AD – we will obtain: a) the equilibrium values of the main macroeconomic variables, as inflation and output growth; b) a setting for analysing the role of the public policies: supply policies (i.e. institutional policies, antitrust policies, labour policies, industrial policies); demand policies (monetary, banking and financial policies, as well as fiscal policies).

In general the equilibrium values of output growth and inflation are as follows:

$$y^* = \frac{(a + \bar{m} + l) + 1 - (1 - \phi)\pi^e - (\mu + u)}{\gamma}$$

$$\pi^* = \frac{(a + \bar{m} + l)\beta\varepsilon + (\beta\varepsilon\varphi + 1)\pi^e + (\mu + u) - 1}{\gamma}$$

Where:

$\boldsymbol{\gamma} = (\boldsymbol{b\varepsilon} + 1) > 1$

Note that the more is true that the efficiency conditions hold the more will be likely that output growth and inflation will be positive. From here on we will assume that the efficiency conditions are ever satisfied.

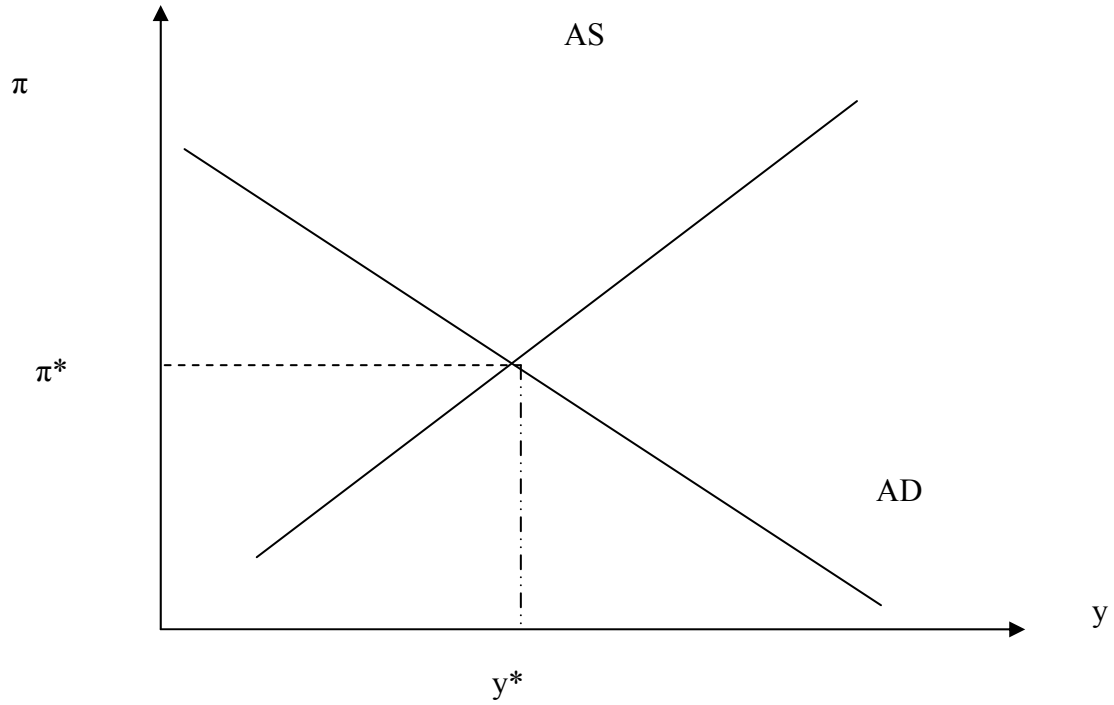
[42] On the evolution of the banking policies, including the distinction between structural and prudential policies see Bordo 2012. On the structural banking policies based on the interest rate caps see Maibo and Gallegos 2014. On the relationships between banking policies and institutional features see Maslowska- Jokinen and Matysek – Jedrych 2016.

[43] For the evolution of the relationships between central banking and monetary policy see the last Section, and among others, Goodhart 2010, Borio 2014a , Ejffinger and Masciandaro 2014, Masciandaro and Romelli 2015. On the monetary policy lessons from the Great Crisis see Bordo 2010, Orphanides 2010, Howells and Mariscal 2011. For the central bank involvement in macroprudential policies see Masciandaro and Volpicella 2015. For a political science perspective on the macroprudential regimes see Lombardi and Moschella 2016b.

[44] On the evolution of the supervisory policies in the last three decades see Masciandaro and Quintyn 2015.

[45] The opposite assumption is made by the so called "conventional (monetarist) wisdom" :a monetary policy that produces monetary stability has a positive spillover in obtaining also financial stability; see Borio and Lowe 2002. The conventional wisdom has been supported by Schwartz (1995) and Issing (2003). On the relationship between monetary policy and financial stability after the Great Crisis see Hellwig 2015; on the empirical assessments of this relationship see Blot et al. 2015. Against the conventional wisdom – i.e. different tools for different goals – see for example Bernanke 2002. For a model on the relationship between interest rates, on the one side, and inflation, output growth, and financial stability on the other side see Ajello et al. 2015. However in an case the conventional wisdom could be simply analysed in our model assuming that the banking and financial dynamics depends on the money supply, i.e. l(m).

Graphically:



Therefore output growth and inflation are driven by a mix of demand and supply factors.

Beginning with the output growth, it is evident that positive shocks in competition (lower μ) or in other components that reduce the cost push factor (lower u) increase the output growth. The same is true if the degree of flexibility in the labor market increases (lower β, i.e. lower γ).

In the demand side, any upside exogenous shock – for example a trade balance surplus or an expansionary fiscal policy (higher a), an expansionary monetary policy(higher m), a positive leverage effect (higher l) – produces a positive pass- through to the production of goods and services. The same is true if the inflation expectations drop (lower π^e) .

How to capture the role of secular drivers, as globalization, the role of institutions, or technology? For the sake of simplicity, we can assume that higher globalization, or better institutions, reduce uncertainty (lower u), and therefore are connected with a supply side expansion. Finally any technological improvement increases the output growth dynamics (lower ε, i.e. lower γ) . Summing up:

$$\frac{\partial y}{\partial a} = \frac{\partial y}{\partial m} = \frac{\partial y}{\partial l} = \frac{1}{\gamma} > 0 \quad \text{(i)}$$

$$\frac{\partial y}{\partial \pi^e} == -\frac{(1-\phi)}{\gamma} < 0 \quad \text{(ii)}$$

$$\frac{\partial y}{\partial \mu} = \frac{\partial y}{\partial u} = -\frac{1}{\gamma} < 0 \text{ (iii)}$$

$$\frac{\partial y}{\partial \gamma} = -\frac{(a + \bar{m} + l) + 1 - (1 - \phi)\pi^e - (\mu + u)}{\gamma^2} < 0 \text{ (iv)}^{46}$$

Focusing now on inflation, and starting from supply, it is evident that positive shocks in competition (lower μ) , or in other components that reduce the cost push factor (lower u), trigger lower levels of the price dynamics. The same is true if the degree of flexibility in the labor market increases (lower β, i.e. lower γ).

In the demand side, any exogenous upside change — for example a trade balance surplus or an expansionary fiscal policy (higher a) , an expansionary monetary policy(higher m), a positive leverage effect (higher l) - produces a pass- through to prices. The same is true if the inflation expectations increases (higher π^e) .

Regarding the abovementioned secular drivers, assuming as usual that higher globalization, or better institutions, reduce uncertainty (lower u), they result in "good" disinflation. In general also technological improvements (lower ε) are likely to reduce the inflation dynamics.

Summing up:

$$\frac{\partial \pi}{\partial a} = \frac{\partial \pi}{\partial m} = \frac{\partial \pi}{\partial l} = \frac{\beta \varepsilon}{\gamma} > 0 \text{ (v)}$$

$$\frac{\partial \pi}{\partial \pi^e} == \varepsilon > 0 \qquad \text{(vi)}$$

$$\frac{\partial \pi}{\partial \mu} = \frac{\partial \pi}{\partial u} = \frac{1}{\gamma} > 0 \qquad \text{(vii)}$$

$$\frac{\partial \pi}{\partial \beta} = \frac{(a + \bar{m} + l + 1)\varepsilon - (1 - \varphi)\varepsilon\pi^e - (\mu + u)\varepsilon}{\gamma^2} > 0 \text{ (viii)}$$

$$\frac{\partial \pi}{\partial \varepsilon} = \frac{(a + \bar{m} + l + 1)\beta - (1 - \varphi)\beta\pi^e - (\mu + u)\beta}{\gamma^2} > 0 \text{ (ix)}^{47}$$

[46] Relationship (iv) will be true the more will be true that the efficient conditions hold.
[47] Relationships (viii) and (ix) will be true the more will be true that the efficient conditions hold.

3. CLASSIC VIEW

We identify the Classic View (CV) as one stressing the dominant role of efficient markets – i.e. the supply side - in determining the business cycle[48]. Uncertainty is irrelevant. The efficient markets assumption implies that the output growth depends on how the competition conditions are satisfied in all the markets, including the labour markets and the money markets; on top of that the medium of exchange is a commodity money.

3.1 Supply Side

In the Classic View inflation depends essentially on wages and firms market power. Uncertainty exists, but it is worth noting that in the Classic View any disturbance is really temporary and short lived[49] . Therefore:

$$\pi = \omega + (\mu - 1) \qquad (1)$$

*) Labour market:

In the classical labour market the real wage is the market clearing price (à la Adam Smith[50]). Workers and firms do not suffer from money illusion[51], i.e. their cost and benefit analysis is always in real and relative terms. The real wage depends on the level of employment, given the institutions . Therefore:

$$\boldsymbol{\varpi - \pi = bn} \qquad (2)$$

Where *n* is the employment growth and *b* is the rigidity factor. Given the institutional setting, the real wages depends on the employment growth, which is identified using the production function.

*) Production Function:

The production growth depends on both employment growth and capital growth (à la Cobb Douglas):

$$\boldsymbol{y = \alpha n + \beta k} \qquad (3)$$

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= productivity factor). Therefore the relationship between employment growth and output growth becomes (with ε=1/α) :

$$\boldsymbol{n = \varepsilon y} \qquad (4)$$

The labour equation (2) becomes:

[48] Snowdon and Vane 2005 p.43.
[49] Snowdon and Vane 2005 p.37.
[50] On the role of Adam Smith as a forefather of the Law and Economics approach see Mahoney 2016.
[51] Snowdon and Vane 2005 p.8.

$$\varpi - \pi = b\varepsilon y$$

It is interesting to note that the relationship between real wages and output growth is pro – cyclical. On top of that in the CV the institutional factor represents the friction which reduces the equilibrating association between real wages and employment[52].

The supply side equation (1) becomes:

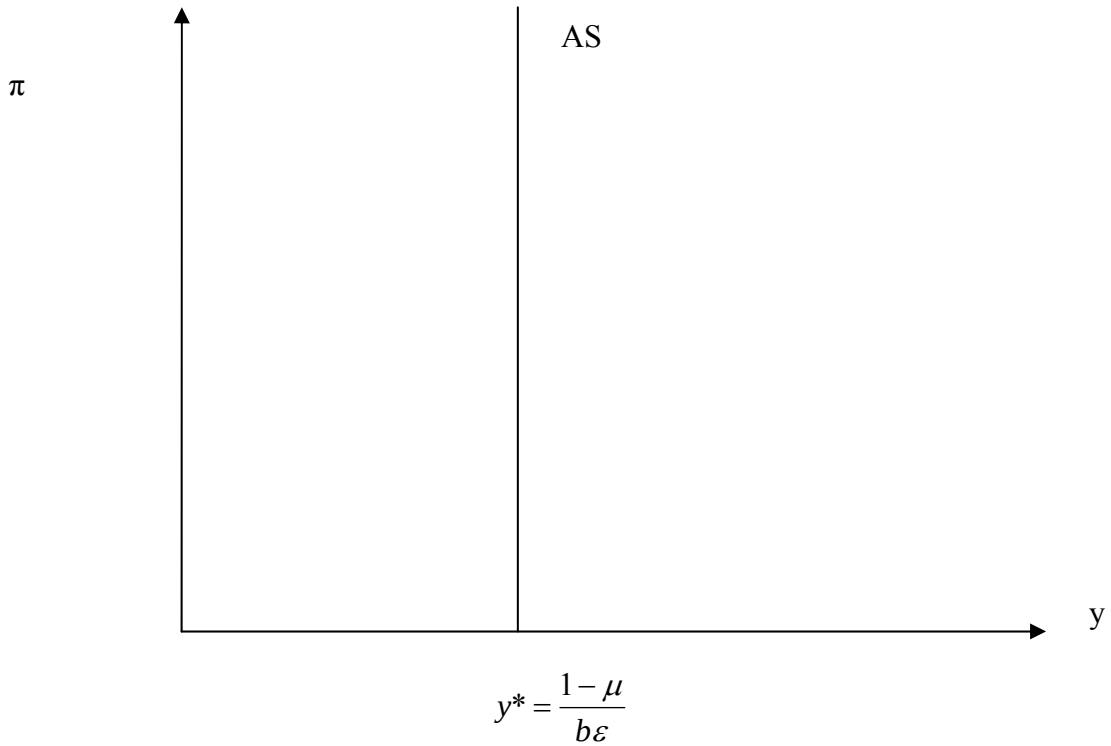
$$\pi = \pi + b\varepsilon y + (\mu - 1) + u$$

The supply side equation defines the equilibrium output y* (the classical model economy is a dichotomous one[53]: given the two macro goals, the output growth depends on supply) (à la Say, [54]):

$$y^* = \frac{1-\mu}{b\varepsilon}$$

The equilibrium output depends on: competition in the markets for goods and services (less competition means less output); labour market rigidity (less flexibility in the labour market means less output) ; efficiency (less productivity means less output). The equilibrium values of the real variables are defined exclusively in the input and output markets[55].

Graphically, with increasing competition – i.e. $1 > \mu$ - we have:



[52] Snowdon and Vane 2005 p.38.
[53] Snowdon and Vane 2005 p.38.
[54] Snowdon and Vane 2005 p.43,46.
[55] Snowdon and Vane 2005 p.38.

If we assume that the markets are stable if and only if the competition is perfect - then $\mu = 1$ – i.e. the ideal setting in the CV[56] - all the resources are fully employed in the best way[57]. The CV can be considered consistent with the *laissez- faire doctrines*, which were mainly preoccupied with government failures, including the monopoly situations[58].

3.2 Demand side

In general the aggregate demand depends on the real component, the real money growth and the leverage shocks:

$$y = a + m - \pi + l \qquad (4)$$

- Money

In the classic view money is a commodity: the State – i.e. the Central Bank (CB) - issues paper money that can be converted in every moment in gold at a fixed price(fixed convertibility promise)[59].

The role of the CB is twofold. In normal times – i.e. without banking shocks - the is just a money broker, i.e. a bank with 100% of reserves (*narrow bank*)[60]. In extraordinary times – i.e. the probability of negative banking shocks in different from zero – the CB can act as lender of last resort (LLR), i.e. a bank with reserves which can be temporarily lower than 100% of the issued paper money. The LLR action is performed using collateralized bank loans with a penalty interest rate (Bagehot Rule).

Therefore in general (normal times) the money growth *m* depends on the commodity growth, i.e. the growth of the commodity money reserves[61] (for example mines production or deterioration) [62]:

$$m = \hat{g} \qquad (5)$$

Here we follow to assume that the demand for money is the standard one, i.e. stable and associated with the interest rate changes[63].

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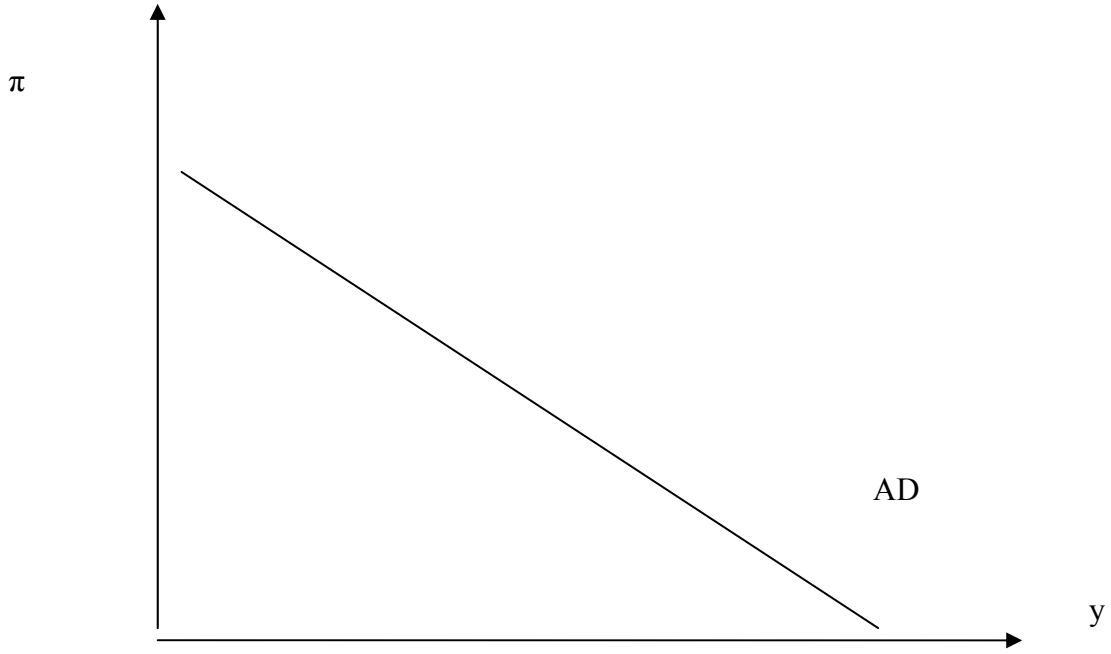
[56] Snowdon and Vane 2005 p.38.
[57] Snowdon and Vane 2005 p.55. In the model perfect competition is just a sufficient condition. An efficient economy is also stable, while the opposite isn't true.
[58] Snowdon and Vane 2005 p.55.
[59] See Bordo and Kydland 1990.
[60] In the real world the concrete monetary policies to maintain the convertibility promise can be heterogeneous; see for example Bazot el al. 2014
[61] The fiduciaries notes issued by the central bank has to be automatically varied with the level of reserves (Currency School) rather than followed the central banker discretion (Banking Schhol); see Bordo and Kydland 1990. On the debate concerning free banking, currency school and banking school see Doroftei 2013. Recently the free banking follows to be supported in the debate on dollarization; see White 2014.
[62] In an open economy the fixed convertibility promise means a regime of fixed exchange rates; Snowdon and Vane p.80. On the economic performances of different monetary regimes see Bordo 1993 and Bordo and Schwartz 1997 .
[63] Another assumption could be that in the classic regime the demand for money is associated with the transactions only, i.e. it corresponds to the "real" component of the aggregate demand; therefore we can use the net supply of gold. The overall results become even more robust.

In the Classic view banking instability can occur. Therefore the possibility of leverage shocks is different from zero. The banking stability will be more likely to occur the more the central bank is active is effective in acting as lender of last resort.

Then, substituting in (4) the assumption (5) we obtain:

$$\pi = a + g + l - y$$

Graphically:



Note that given the equilibrium output *y**, if both the real and banking component are stable – i.e. *a* and *l* are zero - we obtain the classic quantitative relationship between the rate of inflation in equilibrium π* and the money supply (à la Hume) [64]. In other words if the growth is predetermined at its supply side value and the system is completely stable the money growth defines the inflation growth[65].

3.3 Equilibrium

In equilibrium:

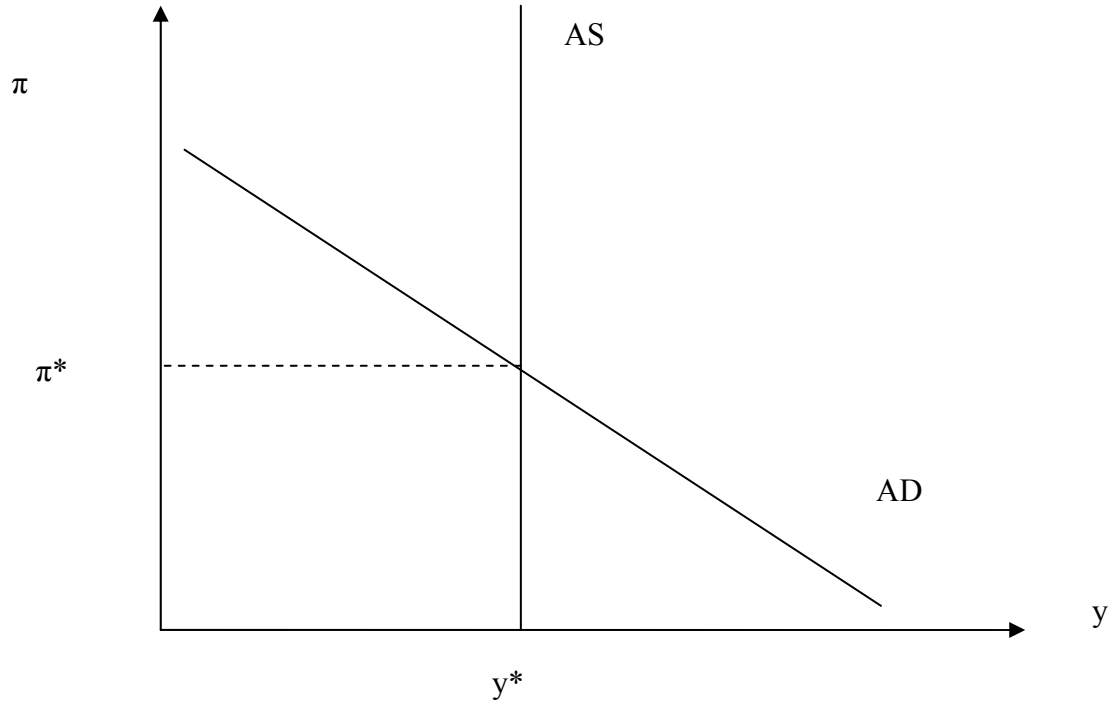
[64] Snowdon and Vane 2005 p.38,50. For recent empirics on the quantity theory of money see Teles and Uhlig 2013.

[65] Snowdon and Vane 2005 p.51. The quantity theory of money can be supported using the Cambridge equation – the demand for money, which is proportional to nominal income, is equal to the money supply – or the Fischer equation – the overall amount of money is equal to the nominal income.

$$y^* = \frac{1-\mu}{b\varepsilon} \qquad (7)$$

$$\pi^* = a + \bar{g} + l - y^* \qquad (8)$$

Graphically:



In the Classic View four features emerge:

a) If the labour price is the real wage, the output growth is exclusively supply driven;
b) Higher levels of output growth depend on: more competition in the markets for goods and services; more flexibility in the labour market; more technological efficiency;
c) Any active demand policy produces just nominal effects (instability[66]); specifically:
d) Money is neutral, i.e. it doesn't produce real effects;

3.4 The Classic View and the Great Depression

[66] Snowdon and Vane 2005 p.37. For a "just in time" comparison between the Great Depression and the Great Crisis see Eichengreen and O'Rourke 2009.

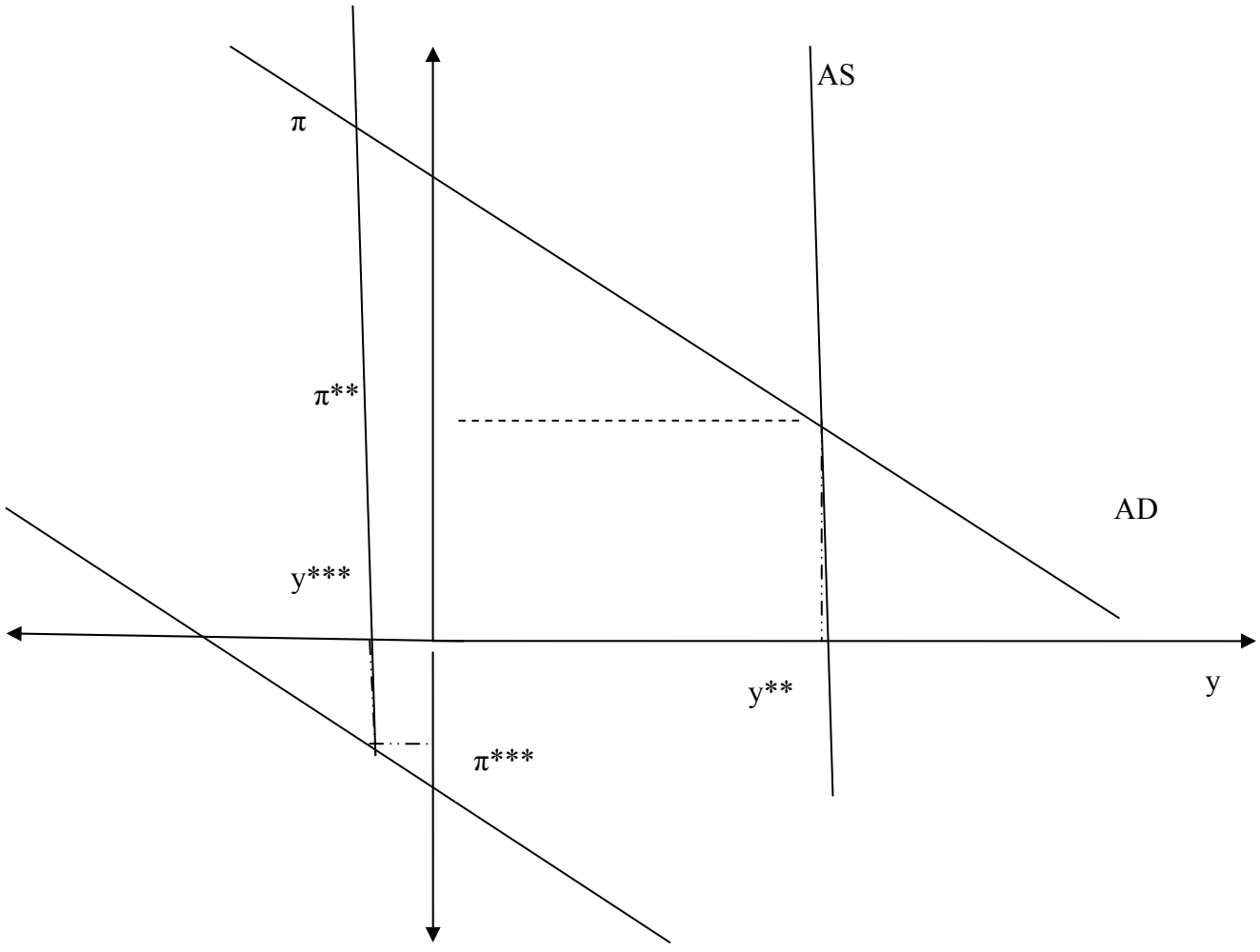
The Great Depression (GD) was the most significant economic crash which affected the advanced economies[67] before the Great Crisis. The Great Depression was characterized by both recession and deflation.

How to interpret the GD using the Classic View? Given that the economic system is a dichotomous one, the recession is likely to depend just on negative supply shocks, remembering that:

$$y^* = \frac{1-\mu}{b\varepsilon}$$

While deflation is due to negative aggregate demand shocks, introducing for example the possibility of bank failures, which trigger a fall in the demand for goods and services:

$$\pi^* = a + \bar{g} - y^* - l$$



[67] Snowdon and Vane 2005 p.76.

In this economy the implementation of supply policies is the necessary and sufficient condition to restore growth and to transform the falling prices phenomenon in a "good deflation"[68] . The stance of the fiscal policies has to be- as it is usual in the CV – neutral; the government should do nothing[69]. The stance of the monetary policy has to be restrictive (LLR action with penalty rate) in order to address and fix the banking shock, defending the fixed convertibility promise[70]. The final result is a growing economy with disappearing banking instability.

But if the economy is working in a different way, the CV policies are likely to fail. This is the general interpretation of the Great Depression, excluding the non-monetary neoclassical real business cycle hypothesis[71], which highlighted the role of supply shocks and of institutional failures – i.e. less competition and flexibility – in explaining the big crash. On top of that the GD was characterized by countercyclical movement of the real wage , which cannot be explained in a CV word.

[68] On the concept of good and bad deflation see Bordo et al. 2004.
[69] Stiglitz 2014 p. 3.
[70] Bank instability means bank losses, which reduce the gold reserves, increasing "naturally" the interest rates and threating the credibility of the State to be able to maintain the convertibility promise. The restrictive monetary policy stance strengthens the "natural" increase of the interest rate ("liquidation theory" or Hayek (Austrian) view). In a open economy, the fixed convertibility promise implies a fixed exchange regime, as the Gold Standard was. If banking instability occurs a restrictive monetary policy is a necessary tools to defend the fixed exchange regime. See Snowdon and Vane 2005 p.80-83, Bordo and Kydland 1990, Sargent 2010. On the possibility to reconcile the Hayek view – recession from over-investment - with the Keynes view – recession from demand deficit – see Beaudry et al. 2014.
[71] Snowdon and Vane 2005 p.79.

4. TRADITIONAL VIEW

We identify the Traditional (Keynesian) View (TV) as one stressing the dominant role of market imperfections - with particular attention to the price stickiness[72] - in determining the business cycle, extending the role for public policies in influencing both supply and aggregate policies[73]. Bottom Line: instability calls for more active government interventions[74].

4.1. Supply Side

In the traditional view inflation depends on wages, firm market power and uncertainty as follows:

$$\pi = \omega + (\mu - 1) + u \qquad (1)$$

*) Labour market:

In the traditional labour market the nominal wage is the equilibrium variable (à la Keynes). The nominal wage growth depends on the employment growth, given the rigidity factor. Therefore:

$$\boldsymbol{\varpi = bn} \qquad (2)$$

Where *n* is the employment growth and *b* is the rigidity factor. As usual the employment growth is identified using the production function.

*) Production Function:

The production growth depends on both employment growth and capital growth (à la Cobb Douglas):

$$\boldsymbol{y = \alpha n + \beta k}$$

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= productivity factor). Therefore the employment equation becomes (with ε=1/α= inefficiency factor) :

$$\boldsymbol{n = \varepsilon y} \qquad (3)$$

Equation (2) becomes:

$$\boldsymbol{\varpi = b\varepsilon y}$$

Note that the nominal wages are pro – cyclical.

The supply side equation becomes:

$$\pi = (\mu - 1) + b\varepsilon y + u$$

[72] The price and wage stickiness can be micro founded in different ways, including behavioural motivations; on the relationships between behavioural economics and macro modelling see Favaretto and Masciandaro 2015, Gabaix 2015, De Grauwe and Yumei 2016.

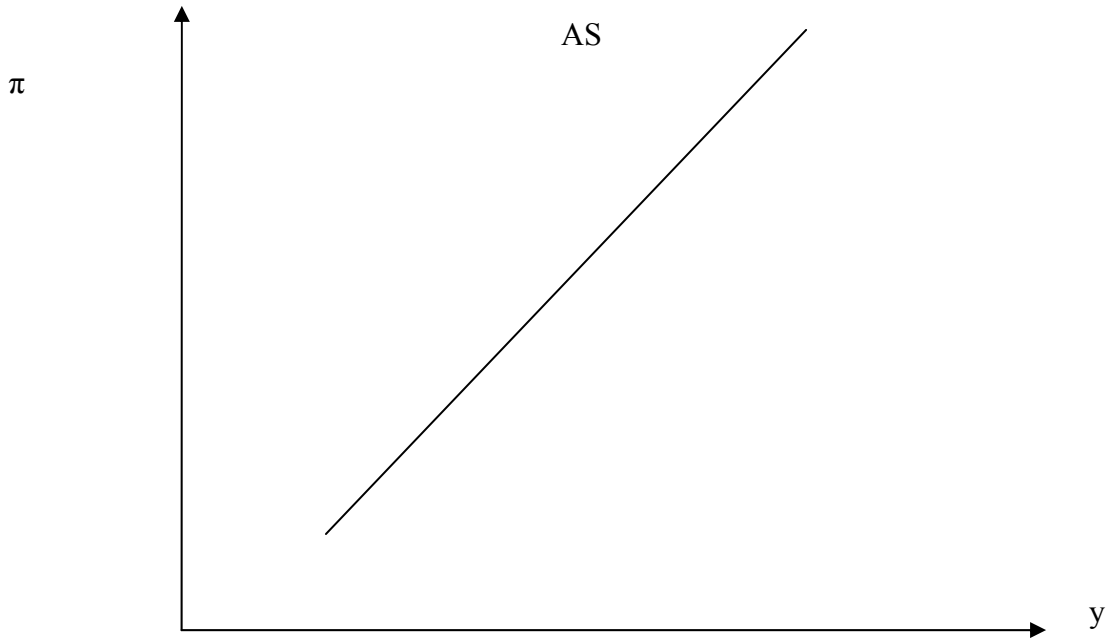
[73] Snowdon and Vane 2005 p.7.

[74] Snowdon and Vane2005 p.8.

$$y = \frac{\pi + (1-\mu) - u}{b\varepsilon}$$

It defines the well-known relationship between inflation and output (or Phillips Curve[75]) (in the Traditional View the economy is an integrated one, i.e. in the Keynesian approach as well as in the Malthus thought[76] we need information on the aggregate demand situation to determine the actual growth rate[77]):

Graphically:



Given the uncertainty, The output growth is associated with the mark up factor (less competition in the markets of goods and services means less output); the rigidity factor (less flexibility in the labour markets means less output) ; the inefficiency factor (less productivity means less output); the inflation (more output means more employment which increases the wages and, given the mark up, the inflation).

4.2 Demand side

In general the aggregate demand depends on the real component, the real money growth and the leverage shocks:

[75] On the genesis of the Phillips Curve see Hoover 2015.
[76] Snowdon and Vane 2005 p.49.
[77] Snowdon and Vane 2005 p.43.

$$y = a + m - \pi + l \qquad (4)$$

- Money

In the Traditional view the economy uses adjustable money: the convertibility promise is flexible[78]. The money growth *m* depends on the central bank choices, given the constraint that the convertibility promise represents. The more the convertibility price is flexible, the more the central bank gains degrees of freedom. The flexibility of money is a necessary condition, given that the volatility of the money demand can trigger further instability in the overall economy[79]. The more unstable the demand for money is, the less sustainable is the quantity theory of money [80].The money supply is as follows:

$$m = \bar{m} = s\hat{g} \qquad (5)$$

Where *s* is the parameter which summarizes the degree of discretion of the central bank in changing the convertibility promise.

- Banking and Finance

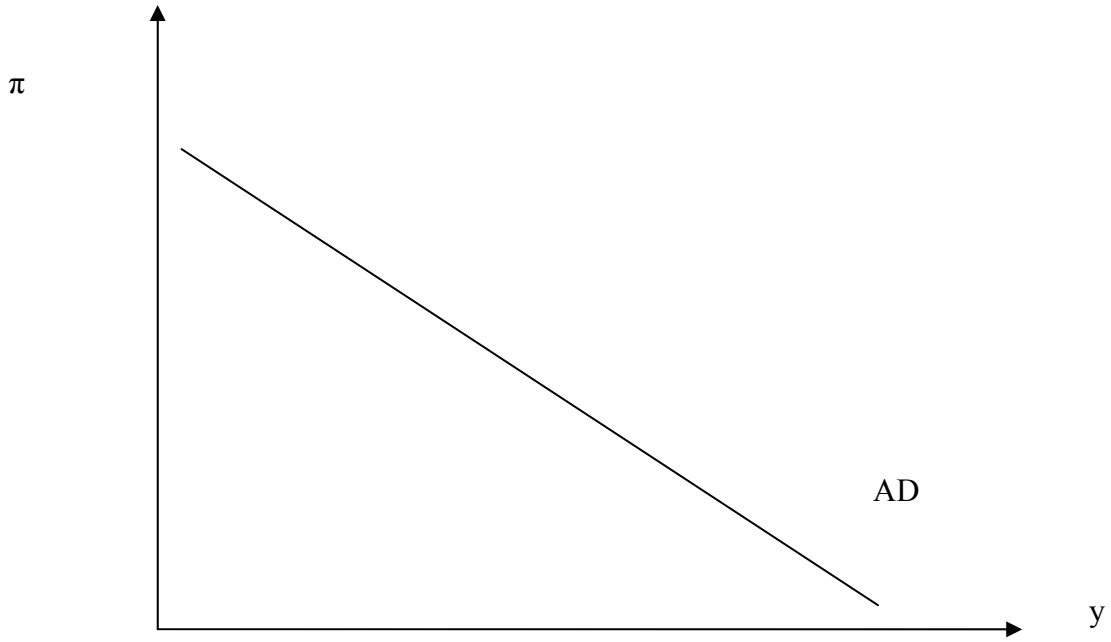
In general in the Traditional View the aggregate demand is extremely volatile and unstable, for more than one reason – uncertainty, animal spirits, etc[81]. Also the banking and financial markets are physiologically unstable; therefore the possibility of leverage shocks is different from zero. The banking stability will be more likely to occur the more the central bank is active is effective in acting both as lender of last resort and as banking regulator, using structural regulation. Therefore:

$$y = a + \bar{m} - \pi + l$$

Here we find the well-known relationship between aggregate demand and money supply; now it is possible to design and implement monetary policies

Graphically:

[78] In an open economy the flexible convertibility promise means a regime of pegged but adjustable exchange rate (for example the Bretton Woods Regime); Snowdon and Vane2005 p.85. On the Bretton Woods regime and the US monetary policy see Bordo and Humpage 2014.
[79] Snowdon and Vane 2005 p.62. On the debate between flexibility (discretion) and rules see Taylor 2011.
[80] Snowdon and Vane 2005 p.70.
[81] Snowdon and Vane 2005 p.59.



4.3 Equilibrium

We have all the information to obtain the equilibrium level of both output *y*** and inflation π^{**}:

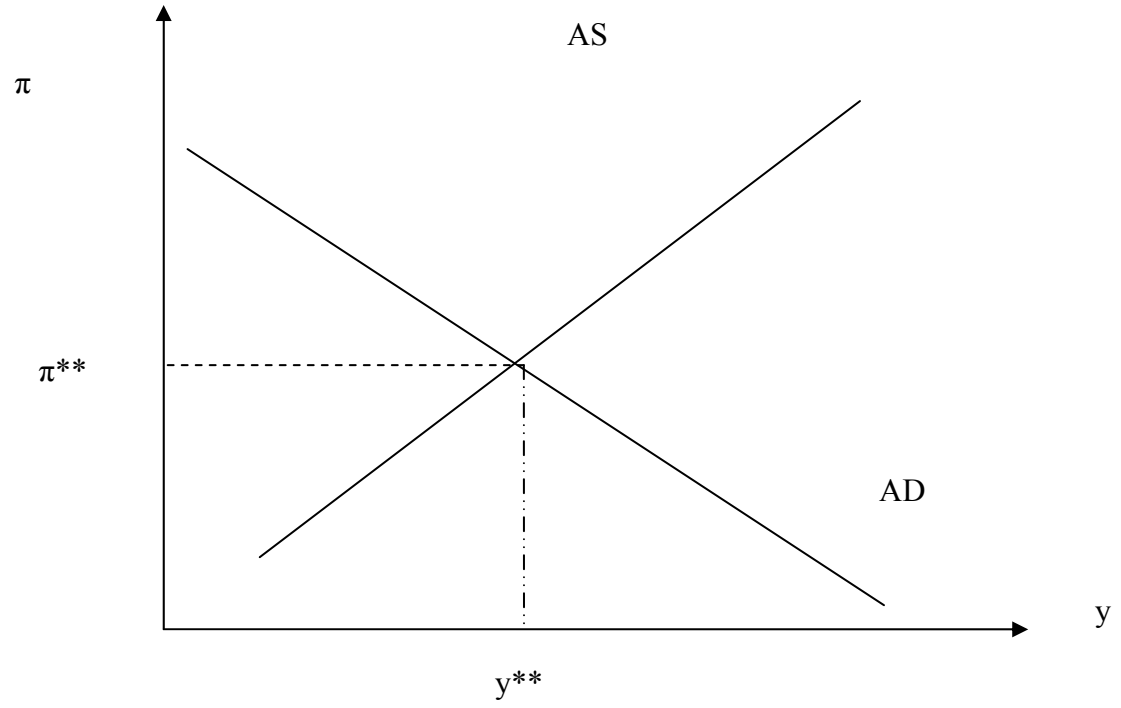
$$y^{**} = \frac{(a + \bar{m} + l) - (\mu + u) + 1}{\gamma}$$

$$\pi^{**} = \frac{(a + \bar{m} + l)(\gamma - 1) + (\mu + u) - 1}{\gamma}$$

Where:

$$\gamma = (b\varepsilon + 1)$$

Graphically:



In an economy consistent with the Traditional View four results emerge:

1) Supply still matters: higher levels of output growth depend on: more competition in the markets for goods and services; more flexibility in the labour setting; more technological efficiency;
2) Uncertainty matters: higher uncertainty reduces output and increases inflation[82];
3) Also demand matters: the Say's Law is rejected[83]. Fiscal and monetary policies[84] can have real effects, paying a price in terms of inflation; vice versa, low level of inflation can be obtained, paying a price in terms of lower growth and employment as well. Demand management is needed both in booms and busts[85];
4) The equilibrium outcome doesn't necessarily correspond to the full and best employment of all resources, including labour[86].

   We can elaborate on this, focusing on the monetary policy effects – the same can be shown regarding fiscal policy. We can define the output multiplier (OM)- which characterizes the TV[87]- and the inflation accelerator (IA), where:

[82] Uncertainty can be considered a key feature of a Keynesian world; see Snowdon and Vane 2005 p.75-76.
[83] Snowdon and Vane 2005 p.69.
[84] The Keynesian view endorsed active monetary policies; the Monetarism supported the opposite view; see Snowdon and Vane 2005 p.163-218; on the monetarist objections to the Keynesian IS LM model see Bordo and Schwartz 2003. For a negative evaluation of the Keynesian view see Boettke and Newman 2016.
[85] Snowdon and Vane 2005 p.83.
[86] Snowdon and Vane 2005 p.58, Stiglitz p.3.
[87] Snowdon and Vane 2005 p.60-62.

$$OM = \frac{\partial y^{**}}{\partial \bar{m}} = \frac{1}{\gamma} \qquad IA = \frac{\partial \pi^{**}}{\partial \bar{m}} = \frac{(\gamma - 1)}{\gamma}$$

Given a money supply change, OM and IA measure respectively the effects on output and inflation. The values of the OM and the IA are useful to calculate the sacrifice ratio, i.e. the ratio between the inflation costs and the output gains. The sacrifice ratio SR is equal to:

$$\frac{IA}{OM} = (\gamma - 1) = b\varepsilon$$

The SR depends on : the rigidity factor (less flexibility in the labour markets means greater SR) ; the inefficiency factor (less productivity means greater SR). Therefore, notwithstanding the nominal wages assumption, more flexibility means can trigger higher output and employment growth[88].

Furthermore the Traditional View can be used to analyse situations where, other things being equal, the aggregate demand doesn't react to the monetary stimulus (liquidity trap)[89]. In a liquidity trap any change in the monetary stance doesn't influence the aggregate demand, while the fiscal policy can stimulate the economy[90] i.e.

$$y = a + l$$

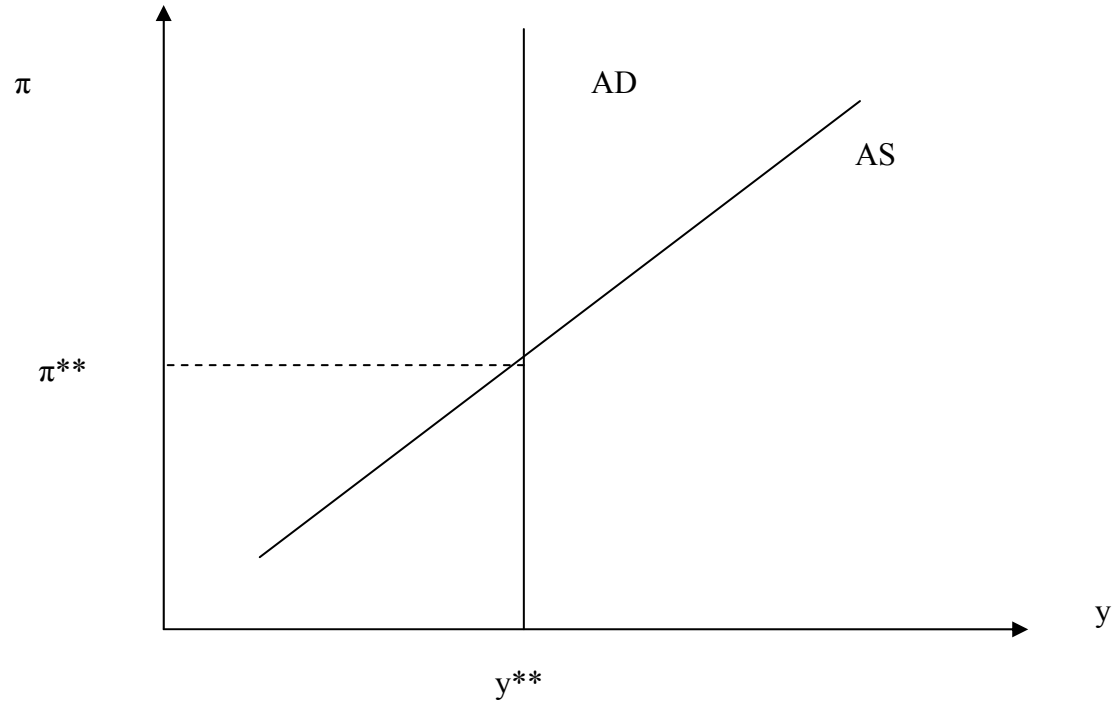
Where the supply remains equal to:

$$y = \frac{\pi + 1 - (\mu + u)}{b\varepsilon}$$

In a liquidity trap the economy becomes again a dichotomous system, where the output growth is driven only by changes of the real component of the aggregate demand.

Graphically:

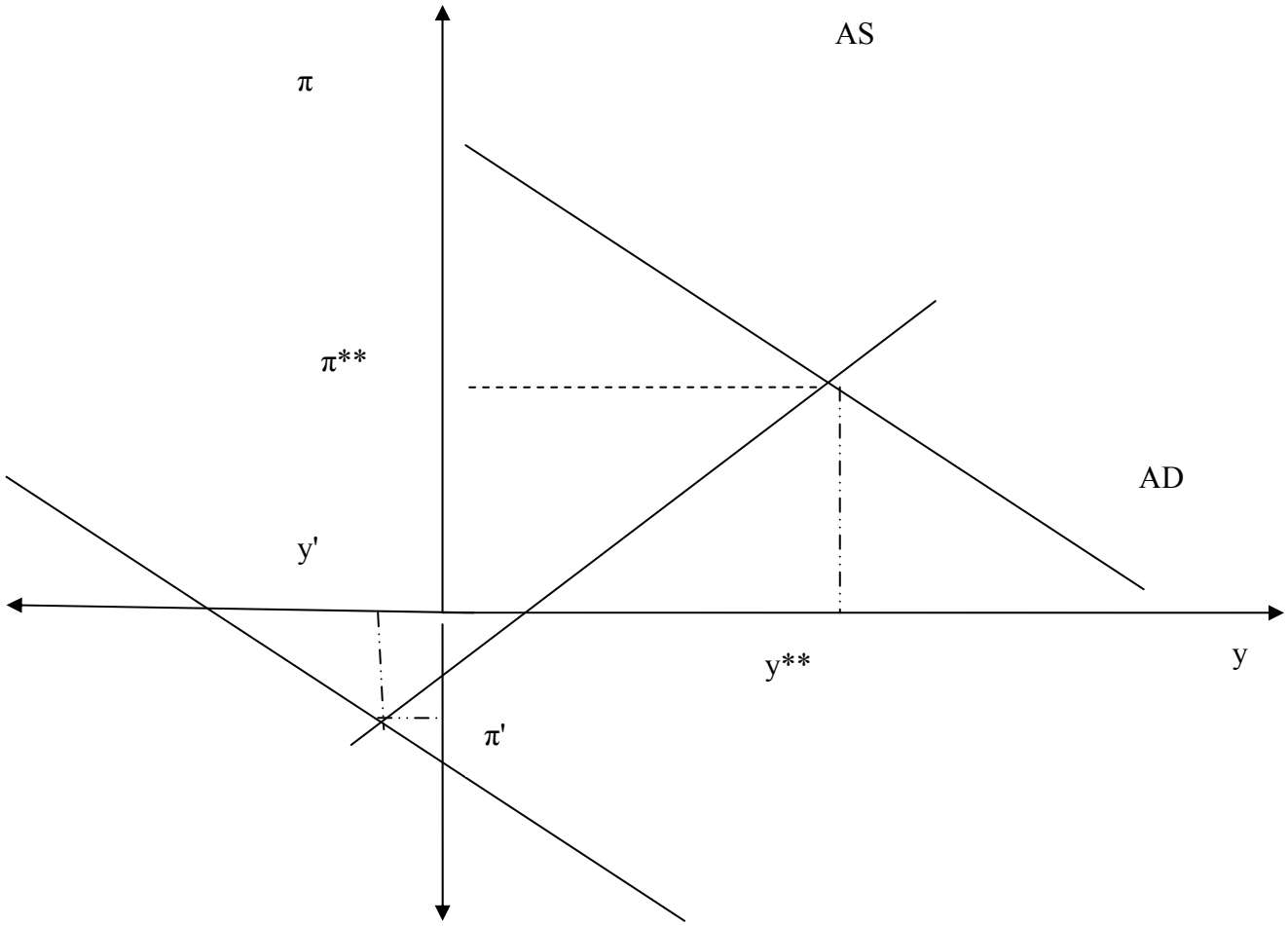
[88] Snowdon and Vane 2005 p.68.
[89] On the Keynesian concept of liquidity trap see Sutch 2014.
[90] Stiglitz 2014.



4.4 The Traditional View and the Great Depression

As we already know, The Great Depression was characterized by both recession and deflation. The two phenomena can be explained in a TV world by way of a dramatic decline in the aggregate demand[91]:

[91] Snowdon and Vane 2005 p.77. On the relationships between the Keynesian General Theory and the Great Depression see Luzzetti and Ohanian 2010; see also Galì 2012. On Keynes and econometrics see Garrone and Marchionatti 2004. On Keynes and central banking see Bibow 2001. On the relationship between monetarism and the Great Depression see Bordo and Rockoff 2013.



The AD decline can be explaining zooming on the decisions of consumers and firms (the non-monetary/non-financial hypothesis), on the monetary policy failures (the monetary hypothesis and the gold standard hypothesis), on the banking failures (the non-monetary/financial hypothesis) [92].

To address and fix the stag-deflation – i.e. recession with deflation – active economic policies are needed. The stance of the fiscal and monetary policies has to be aggressively expansionary, including the flexibility of the convertibility promise[93], in order to increase the money supply.

On top of that the countercyclical movements of the real wage – which cannot be explained in a CV word – can find a rationale in a nominal wage setting, when the price deflation exceeded the nominal wage deflation[94].

[92] Snowdon and Vane 2005 p.79-82. On the monetary hypothesis see among others Romer and Romer 2013.
[93] On the Great Depression and the Gold Standard crisis see Snowdon and Vane 2005 p.82.
[94] Snowdon and Vane 2005 p.77.

5.MODERN VIEW

We identify the Modern View (MV) as one stressing the role of expectations in determining the business cycle[95]. The assumptions on expectations determine the possible role for public policies in influencing both supply and aggregate policies. Opposite assumptions on expectations produce opposite view in economic policy design: rational (endogenous) expectations call for Neoclassical supply side policies, while sticky (exogenous) expectations call for Neokeynesian demand side policies[96].

5.1 Supply Side

In the Modern view inflation depends on wages, firm market power and uncertainty as follows:

$$\pi = \omega + (\mu - 1) + u \qquad (1)$$

*) Labour market:

In the labour market the real expected wage is the market clearing price (à la Lucas). Expectations are explicitly used in micro founding[97] the labour market behaviour. The real expected wage depends on employment, given the rigidity factor as follows:

$$\varpi - \pi^e = bn \; ; \qquad \varpi = \pi^e + bn \qquad (2)$$

Where *n* is the employment growth, *b* is the rigidity factor and $\pi^e =$ inflation expectations.

As usual the employment growth is identified using the production function.

*) Production Function:

The production growth depends on both employment growth and capital growth (à la Cobb Douglas):

$$y = \alpha n + \beta k$$

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= productivity factor). Therefore the employment equation becomes (with ε=1/α= inefficiency factor) :

$$n = \varepsilon y \qquad (3)$$

Equation (2c) becomes:

$$\varpi = \pi^e + b\varepsilon y$$

[95] The existence of a mainstream in Macro – i.e. convergence in vision and methodology - after the 1970s is claimed in Blanchard 2000 and 2008.. It is a matter of fact that the New Classical View can be viewed as the logical consequence of the rational expectations assumption, while the New Keynesian View can be interpreted as the response to the issues raised by the New Classical economists, absorbing the rational expectations hypothesis; see Snowdon and Vane 2005 p. 700. On the origins of the rational expectations hypothesis see Lovell et al. 2011. On the relationships between the so called New Classical Counter Revolution and the Keynes's General Theory see Wren-Lewis 2016. On neoclassical models in macroeconomics see Hansen and Ohanian 2016. On the relationship between New Keynesian models and Dynamic Stochastic General Equilibrium (DSGE) models before and after the Global Crisis see Blanchard 2016.

[96] Focusing on opposite assumptions regarding expectations it is the simplest way to highlight the crucial differences in explaining the business cycle between New Keynesian economists – which explored the role of market imperfections – and New Classical economists - which concentrated their attentions on the optimizing and rational patterns which characterized the market economy. See Snowdon and Vane 2005 p. 697 and Blanchard 2008.

[97] Snowdon and Vane 2005 p.220.

Note that the real expected wages are pro – cyclical.

The supply side equation defines the relationship between inflation surprise and output (in general the Modern View economy is an integrated system, i.e. the two macro goals depend on both supply and demand):

The equation (1) becomes:

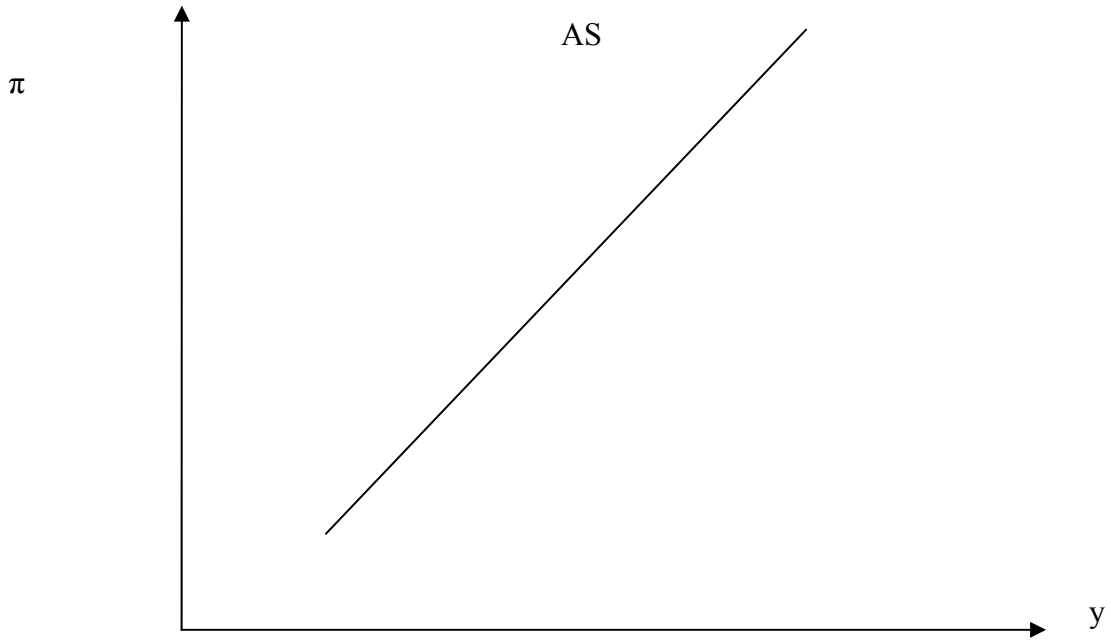
$$\pi = \pi^e + (\mu - 1) + b\varepsilon y + u$$

Or:

$$y = \frac{(\pi - \pi^e) + 1 - (\mu + u)}{b\varepsilon}$$

Given the uncertainty, The output growth is related to: the inflation surprise (more inflation surprise means higher expected real wages which are related to higher employment and higher output); the mark up factor (less competition in the markets of goods and services means less output); the rigidity factor (less flexibility in the labour markets means less output) ; the inefficiency factor (less productivity means less output).

Graphically:



5.2 Demand side

In general the aggregate demand depends on four components: real component *a*, real money growth $(m-\pi)$, inflation expectations π^e and financial accelerator l [98]:

$$y = a + m - \pi + \phi\pi^e + l \qquad (4)$$

- Money

In a Modern View economy fiat money is used: the money growth *m* depends totally on central bank choices. The money supply is an exogenous variable $\bar{\boldsymbol{m}}$ [99]:

$$\boldsymbol{m} = \bar{\boldsymbol{m}} \qquad (5)$$

The monetary policy is implemented using flexible rules – as the Taylor-type rule - which can be modelled both in New Keynesian and New Classical ways[100].

- Banking and Finance

In general in the Modern View the aggregate demand can be volatile and unstable; therefore the possibility of leverage shocks is different from zero. The banking stability will be more likely to occur the more the central bank is effective as lender of last resort and the more the banking policy is effective, using the macro prudential regulation[101].

The policy maker – for the sake of simplicity the central bank - can try to manage the leverage effect using the *macro prudential* policies. Particularly after the Great Crisis it has been widely recognized that traditional micro prudential policies that are targeted to maintain the safeness and soundness of individual banks are not sufficient to guarantee the overall financial stability. Therefore macro prudential instruments has been adopted. The macro prudential tools target directly credit and financial aggregates. We assume a) the macro prudential goal as one of minimizing leverage shocks, i.e. the macro prudential policy is anti-cyclical; b) the macro prudential tool is the global level of capital and liquidity ratios J, where J>0. Higher levels of ratios indicate restrictive macro prudential policies, and vice versa.

In other words we are assuming that the effects of the financial accelerator on the aggregate demand is associated with the stance of the macroprudential policy:

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[98] It is also possible to consider the role of expectations as key driver; see Appendix Two. The modern view can be expressed in a reduced form (Cochrane 2015; see also Garcia-Shmidt and Woodford 2015), where demand and supply are respectively:

$$y_t = y^e_{t+1} - \sigma(i_t - \pi^e_{t+1})$$

$$\pi_t = \beta\pi^e_{t+1} + \kappa y_t$$

[99] At the same time in the New Political Economy approach the central bank decisions on money and interest rates can be considered the final outcome of the interactions between citizens, policymakers and bureaucracies taking into account the institutional features in order to solve time –inconsistency problems; see Snowdon and Vane p. 546-554. See also Persson and Tabellini 1997, Alesina and Stella 2010, Ejiffinger and Masciandaro 2014.

[100] See Snowdon and Vane 700 and Ejffinger and Masciandaro 2014.

[101] On banking regulation and supervision in the modern times see Masciandaro and Quintyn 2015.

$$l = l_o - l_1 J \qquad (6)$$

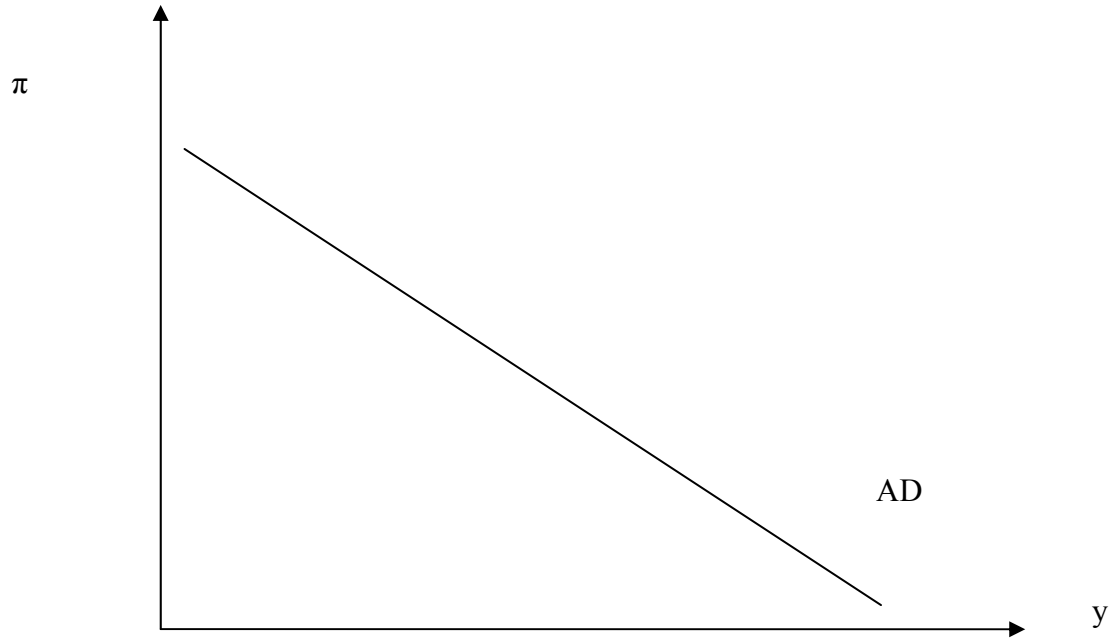
Where l_o is a random component and the sterilization parameter - $[l_1] \geq 0$ in absolute value captures - the effectiveness of the macroprudential policy. The effectiveness is at the maximum level when $l_1 = 0$, i.e. the macro prudential policy successfully sterilize the leverage cycles, excluding the shock component. The opposite is true: ineffective macroprudential policies trigger unintended and unexpected consequences on the aggregate demand, that can be negative – or positive.

It is worth remembering what we already stressed above, i.e. 1) with monetary policy in charge for monetary stabilization and macroprudential policy responsible for financial stability our set up is consistent with the Tinbergen Rule; 2) the monetary and banking policies are both designed and implemented by the central bank.

Therefore:

$$y = a + \bar{m} - \pi + \phi\pi^e + l$$

Graphically:



5.3 Equilibrium

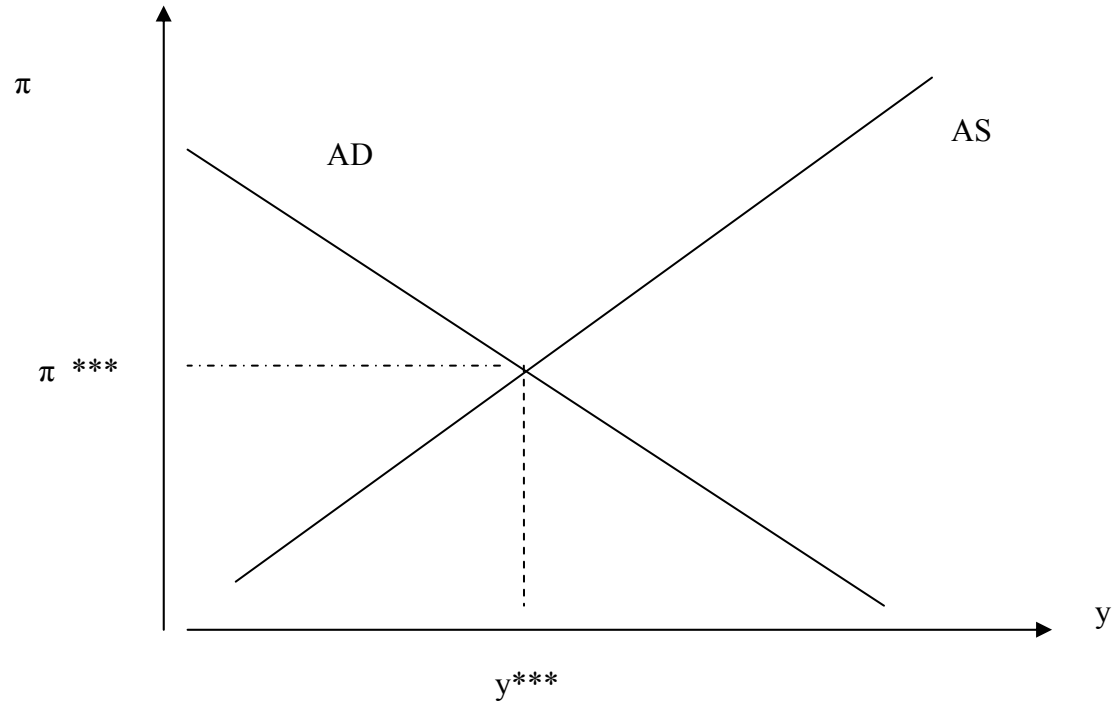
Now we have all the information to obtain the equilibrium level of both output *y*** *and inflation *π****:

$$y*** = \frac{(a + \bar{m} + l) + 1 - (1 - \phi)\pi^e - (\mu + u)}{\gamma} \qquad (7)$$

$$\pi* = \frac{(a + \bar{m} + l)\beta\varepsilon + (\beta\varepsilon\varphi + 1)\pi^e + (\mu + u) - 1}{\gamma}$$

Where:

$\boldsymbol{\gamma} = (\boldsymbol{b\varepsilon} + 1) > 1$



The role of expectations is crucial in defining time to time the equilibrium values. We can discuss two opposite extreme cases[102].

A) Neoclassical Equilibrium: If the rational (perfectly endogenous) expectations hypothesis (REH) holds:

$\boldsymbol{\pi^e = \pi}$

Therefore:

$$y* = \frac{1 - (\mu + u)}{b\varepsilon}$$

[102] The two cases has been defined "two churches" stressing the role of strong beliefs: see Stiglitz p.4.

$$\pi^* = \frac{(a + \bar{m} + l) - y^*}{(1 - \phi)}$$

The supply side equation defines the equilibrium output y*, as in the Classic View. The inflation path π* takes into account directly or indirectly – via the output growth effect - all the kinds of shock[103], including the economic policy actions. Both fiscal policy and monetary policy are neutral[104]. The NCV mimics the results of the CV, taking into account the role of the rational expectations and stressing the importance of the free market forces[105].

B) Neokeynesian equilibrium: let us suppose that inflation expectations are exogenous[106] - i.e. the agents are rational using all the available information but their expectations are not perfectly endogenous[107]. As in the Traditional View the monetary policy is effective, given the role of market failures – as price stickiness – in determining the economic macro performances[108], including the possibility of a Liquidity Trap. Therefore:

$$y^{**} = \frac{(a + \bar{m} + l) + 1 - (1 - \phi)\hat{\pi} - (\mu + u)}{\gamma} \qquad (7)$$

$$\pi^* = \frac{(a + \bar{m} + l)\beta\varepsilon + (\beta\varepsilon\varphi + 1)\hat{\pi} + (\mu + u) - 1}{\gamma} \qquad (8)$$

Where:

$$\gamma = (\boldsymbol{b\varepsilon} + 1) > 1$$

[103] It is worth noting that assuming rational expectations doesn't mean perfect foresight, i.e. uncertainty matters; see Snowdon and Vane 2005 p.226

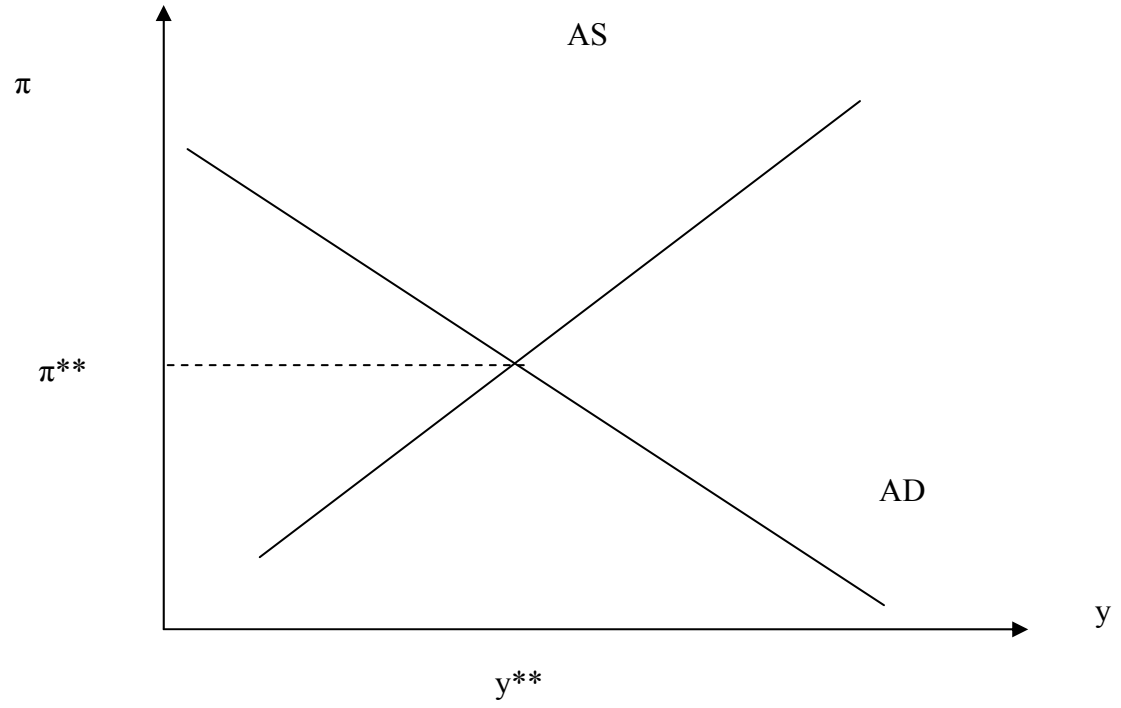
[104] The same policy prescription was made in the monetarism:; see Snowdon and Vane 2005 p.222.

[105] Snowdon and Vane 2005 p.36, p.219, p.360.

[106] Snowdon and Vane 2005 p.36, p.219.

[107] Adaptive expectations are a particular case of exogenous expectations. The same is true for the Keynesian "animal spirits"; see Snowdon and Vane 2005 p.225.

[108] Snowdon and Vane 2005 p.36.



It is worth noting that the more the exogenous expectations are unstable the more the overall economic performances will be unstable[109].

Finally let us remember that the two positions – Neoclassical equilibrium and Neokeynesian equilibrium – can be conciliated assuming that the expectations become rational the more the time goes by – i.e. exogenous expectations in the short run and rational expectations in the long run[110].

5.4 Stagflation: New Keynesian Policies versus New Classical Policies

Let us assume to be in a stagflation – i.e. recession with inflation, which was for example the economic situation during the Great Inflation[111] . How to design the right policies? We will analyse two views.

A)Assuming the New Keynesian View, we postulate exogenous expectations. For the sake of simplicity, we assume that the expectations are equal to the policymaker announcements, where inflation announcements are identified with monetary announcements[112]. On top of that, again for the sake of simplicity, the announced inflation is zero. Therefore:

$$\pi^e = \pi^a = m^a = 0$$

[109] Unstable expectations, as well as the role of psychological factors, can been considered a key feature of a Keynesian world, both in standard and more radical interpretations; see Snowdon and Vane 2005 p.70-71, p-74.
[110] The synthesis between the two positions can be called New Neoclassical Synthesis: see Goodfriend and King 1997.
[111] On the Great Inflation see Nelson 2004.
[112] On the relationship between monetary policy and inflation expectations see Andreou et al. 2016.

Now, from the equilibrium values of output growth and inflation

$$y^{**} = \frac{(a + \bar{m} + l) + 1 - (1 - \phi)\hat{\pi} - (\mu + u)}{\gamma} \quad (7)$$

$$\pi^{**} = \frac{(a + \bar{m} + l)b\varepsilon + \gamma\phi\hat{\pi} + (\mu + u) - 1}{\gamma} \quad (8)$$

$$\pi^{**} = \frac{(a + \bar{m} + l)\beta\varepsilon + (\beta\varepsilon\varphi + 1)\hat{\pi} + (\mu + u) - 1}{\gamma}$$

If the policymaker implements a time consistent monetary policy:

$m = m^a = 0$

And

$\pi^e = \pi^a = m^a = 0$

We have:

$$y^{**} = \frac{(a + l) + 1 - (\mu + u)}{\gamma} \quad (6)$$

$$\pi^{**} = \frac{(a + l)\beta\varepsilon + (\mu + u) - 1}{\gamma} \quad (7)$$

Monetary policy is neutral. But if the policymaker cheats the markets, and the implemented monetary policy is an expansionary one, we have:

$m > m^a > 0$

And

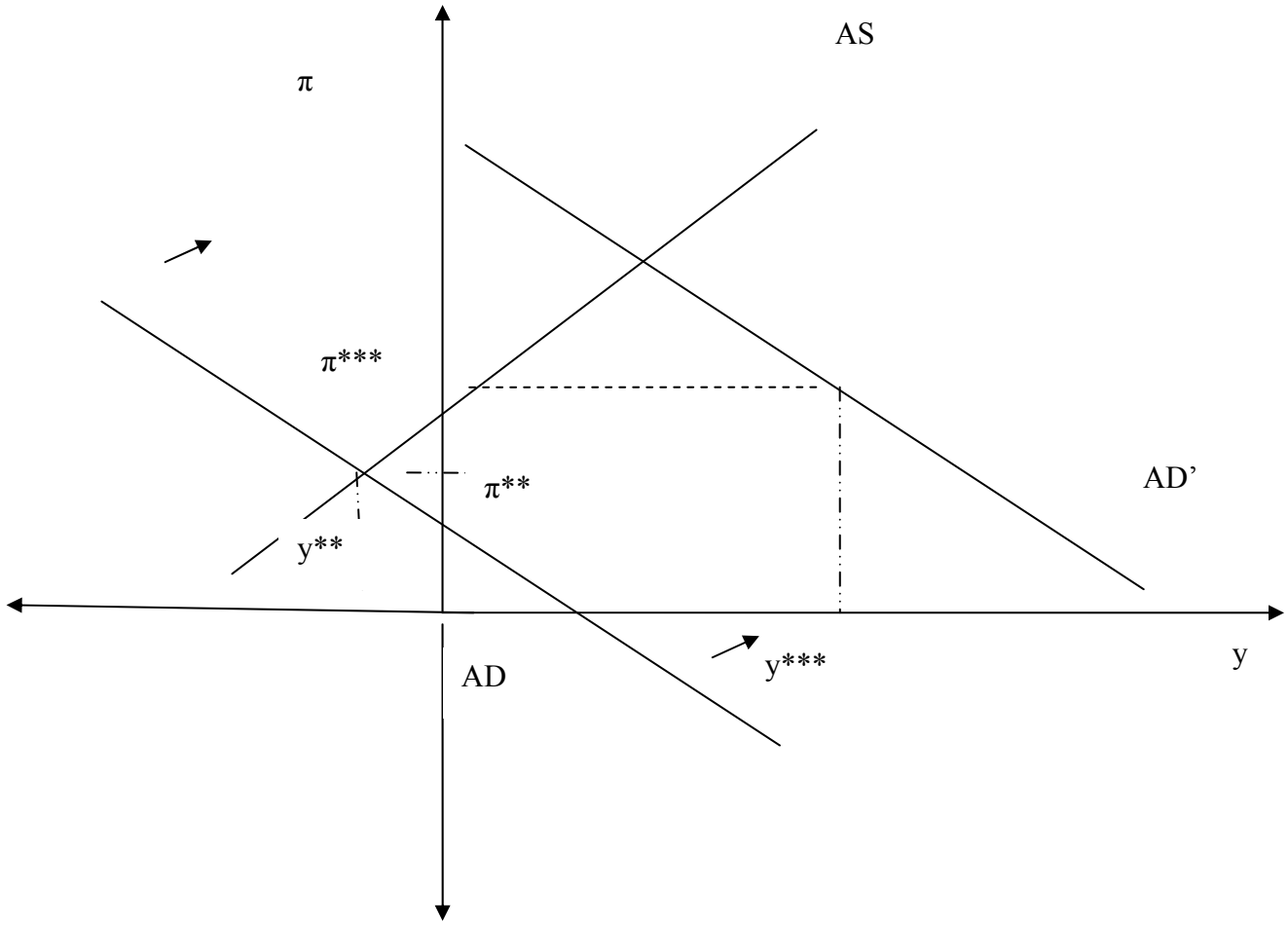
$\pi^e = \pi^a = m^a = 0$

We have:

$$y^{***} = \frac{(a + l + m) + 1 - (\mu + u)}{\gamma} \quad (6)$$

$$\pi^{***} = \frac{(a + l + m)\beta\varepsilon + (\mu + u) - 1}{\gamma} \quad (7)$$

Monetary policy is effective, producing output growth and paying a cost in terms of inflation (sacrifice ratio); graphically:



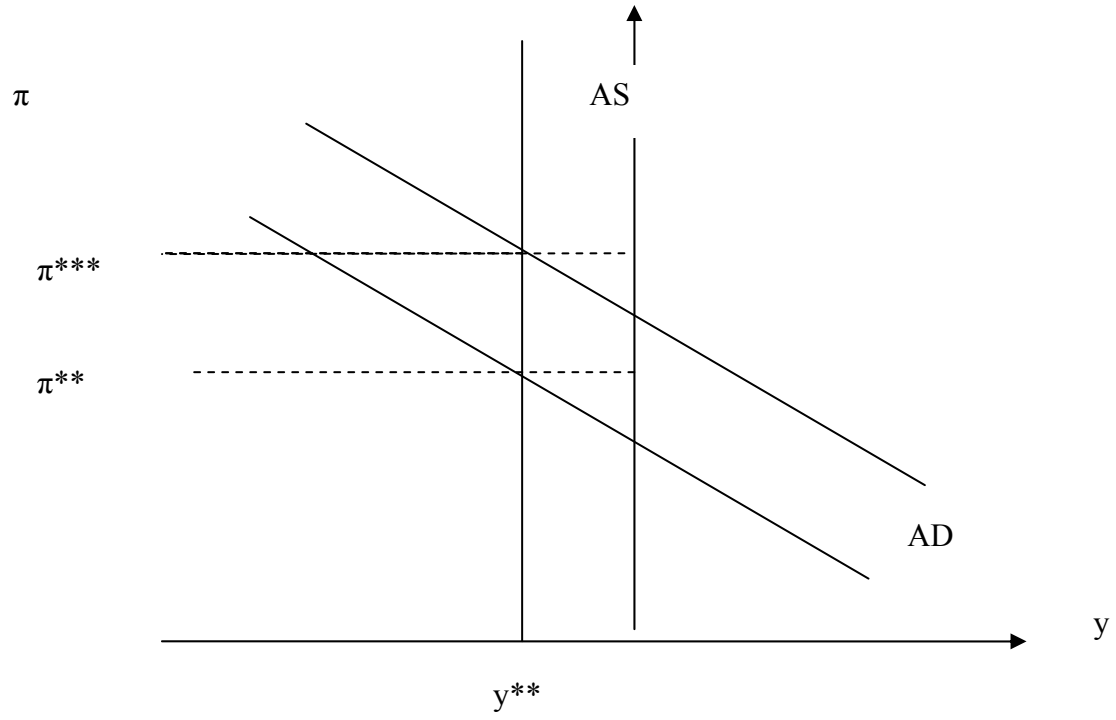
A)Assuming now the New Classical View, we postulate rational expectations. Therefore the agents perfectly anticipated the inflation path. In equilibrium we will have:

$$y^* = \frac{1-(\mu+u)}{b\varepsilon} \qquad (7)$$

$$\pi^* = \frac{(a+\bar{m}+l)-y^*}{(1-\phi)} \qquad (8)$$

The main effects are as follows:

1) The output growth is completely supply driven (real business cycle);
2) The expansionary economic policies are inflationary; monetary policy is always neutral :



Therefore the more is true that the REH holds, the less effective is the monetary policy action in stimulating output growth. The only monetary goal becomes monetary stability and its effectiveness will depends on the central bank institutional setting[113].

5.5 The Neoclassical View and the Great Moderation (a case of Good Real Business Cycle)

Let us assume that the Great Moderation[114] can be described as a Neoclassical View economy, assuming that the agents perfectly anticipated the inflation path. The main effects are as follows:

1) The output growth is completely supply driven;
2) The aggregate demand shocks produce just nominal effects; more specifically
3) Leverage shocks doesn't trigger the output growth, i.e. bubbles are irrelevant from a macroeconomic point of view[115], and
4) If the mix of leverage finance and accommodative monetary policy triggers real innovation, therefore just positive real shocks can occur[116];

[113] See Ejiffinger and Masciandaro 2014.
[114] On the Great Moderation and its Interpretations see Blanchard et al. 2010.
[115] Stiglitz 2014, p.2. On the drivers of the Great Crisis see Diamond and Rajan 2009, Blanchard 2009, Merrouche and Nier 2014. Bordo and Meissner 2015 surveyed drivers and policy responses to crises from 1880 to present; On the responsibilities of the US regulatory agencies – including the FED – in triggering the Great Crisis see Levine 2010. A banking model to describe the Great Crisis is presented in Espinosa – Vega and Russell 2015;

5) Efficiency is associated with stability, notwithstanding uncertainty is present[117].

The Great Moderation can be interpreted as a case of (good) real business cycle, consistent with the Efficiency Markets View (EMV), o Supply Side View .

Economy

Regarding the economy model, the key features of the EMV model is essentially that expectations are ever rational; therefore the aggregate demand policies are neutral and consequently the active role of the State is not effective at all: "The main lesson we should take away from the efficient market hypothesis for policymaking purposes is the futility of trying to deal with crises and recessions by finding central bankers and regulators who can identify and puncture bubbles. If these people exist, we will not be able to afford them." (Robert Lucas, In Defence of the Dismal Science, 2009).

Now we can specify the features of both the supply side and the demand side.

Supply Side

In general inflation is associated with cost growth (wages), firm market power and uncertainty as follows:

$$\pi = \omega + (\mu - 1) + u \qquad (1)$$

Where π= rate of inflation; ω = wage growth, μ = mark-up factor and *u* = uncertainty.

*) Labor market:

In the EMV view the *real wage* is the labor market clearing price (à la *Adam Smith*). The real wage depends on the employment growth, given the market rigidity $b \geq 1$. Therefore:

$$\varpi - \pi = bn$$

The real wages are associated with the employment growth, which is identified using the standard production function.

*) Production Function:

The supply of goods and services is associated with employment growth and capital growth (à *la Cobb Douglas*):

$$y = \alpha n + \beta k \qquad (3)$$

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= *labor productivity factor*) (à *la Okun*). Therefore (with ε=1/α= inefficiency factor):

$$n = \varepsilon y$$

The labor market equation (2) becomes:

---

[116] Regarding the US, the Great Deviation view – Taylor 2007 - claimed the opposite interpretation: the FED policy played a role in the 2003-2005 asset price bubble and thereby in the bust leading to the Great Crisis. The Great Deviation view has been confirmed in Jarocinski and Smets 2008, Ahrend 2010, Kahn 2010, Yu et al. 2015, Bordo and Landon-Lane 2013, Lane 2016. Against the Great Deviation view see Bernanke 2010, as well as the caution expressed in Rogoff 2013.

[117] On stability and uncertainty during the Great Moderation see Cecchetti et al. 2004 and 2006, Davis and Kahn 2008.

$$\varpi - \pi = b\varepsilon y$$

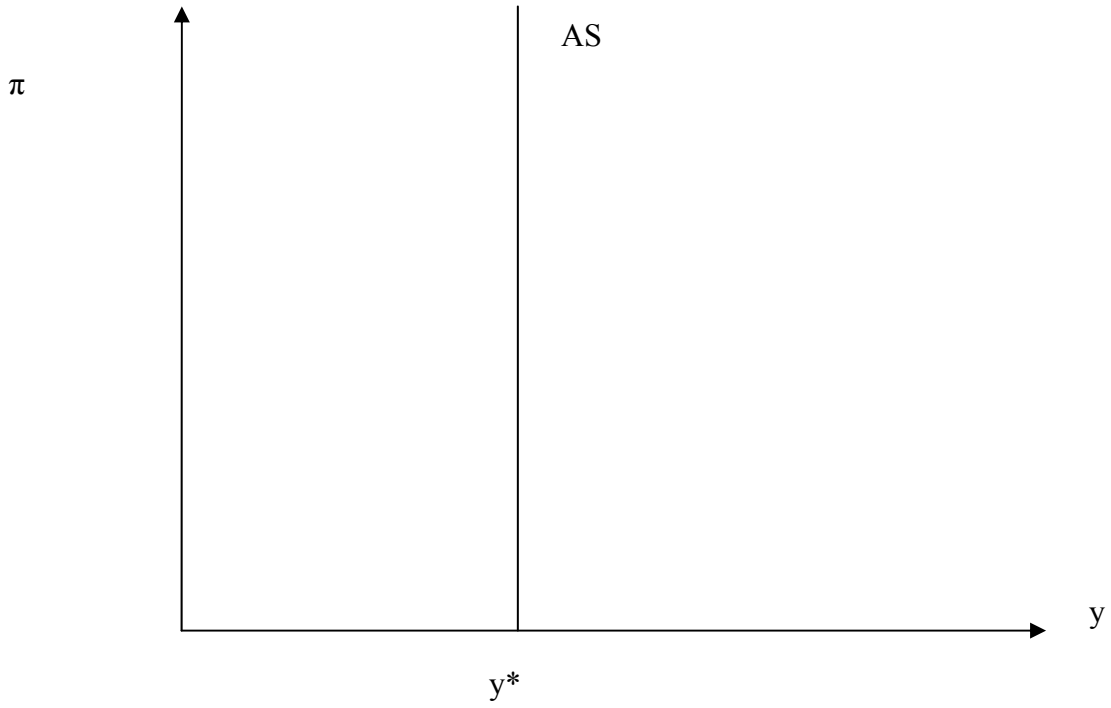
The supply side equation (1) becomes:

$$\pi = \pi + b\varepsilon y + (\mu - 1) + u$$

The supply side equation defines the equilibrium output y* (*à la Say*):

$$y^* = \frac{1 - (\mu + u)}{b\varepsilon}$$

Given the uncertainty, the output growth in equilibrium is associated with technological efficiency, labor market flexibility and competition in the markets for goods and services. Graphically:



Demand side

In general the aggregate demand depends on: exogenous changes *a* in the demand for goods and services, real money growth, inflation expectations and financial accelerator :

$$y = a + (m - \pi) + \phi\pi^e + l \qquad (4)$$

- Money

In the EMV economy the money growth *m* depends on the central bank choices:

$$\boldsymbol{m} = \bar{\boldsymbol{m}} \qquad (5)$$

- Banking and Finance

The optimal banking and financial policy is the prudential one, which represents the cornerstone of a market friendly regulation. The output of an effective market friendly regulation is that the financial and banking markets are tendentially stable:

$$l = l_o \qquad (6)$$

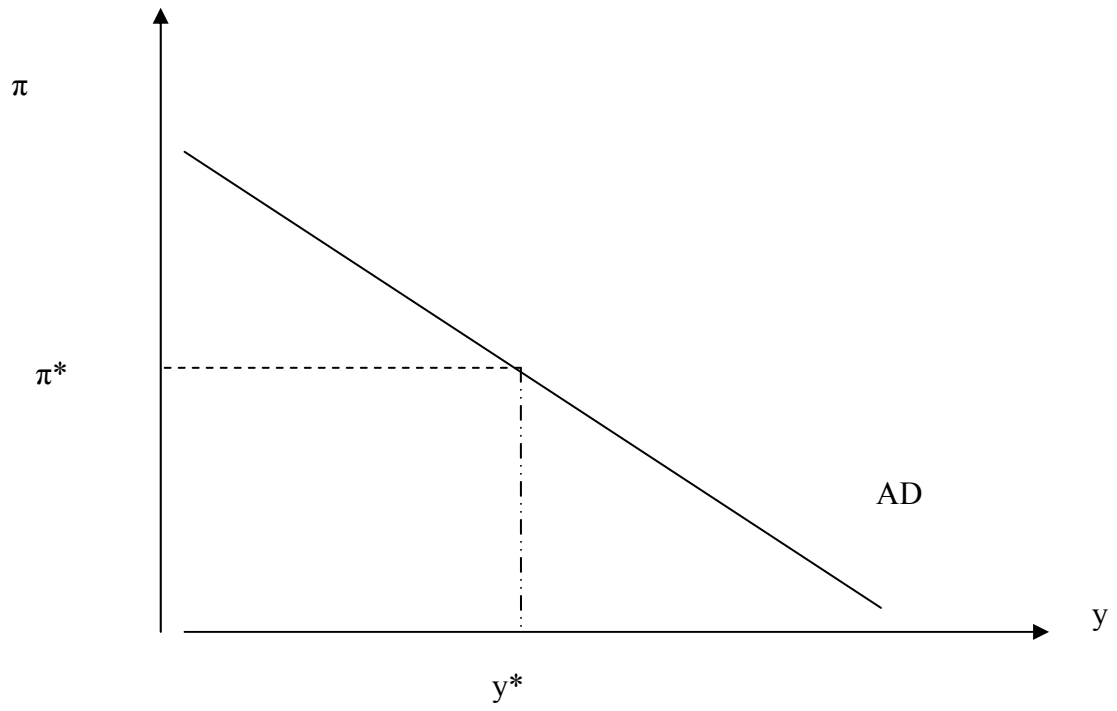
I.e. only the random component l_o ; banking and financial shocks can influence the aggregate demand in a temporary and negligible way.

Then, substituting in (4) the assumptions (5) and (6), and given the equilibrium output *y** and the possibility of "real" (a) and "banking" (l_o) shocks, we obtain the *classic quantitative relationship* between the rate of inflation in equilibrium π* and the money supply growth (à la *Hume)*:

$$y^* = \frac{1-(\mu+u)}{b\varepsilon} \qquad (7)$$

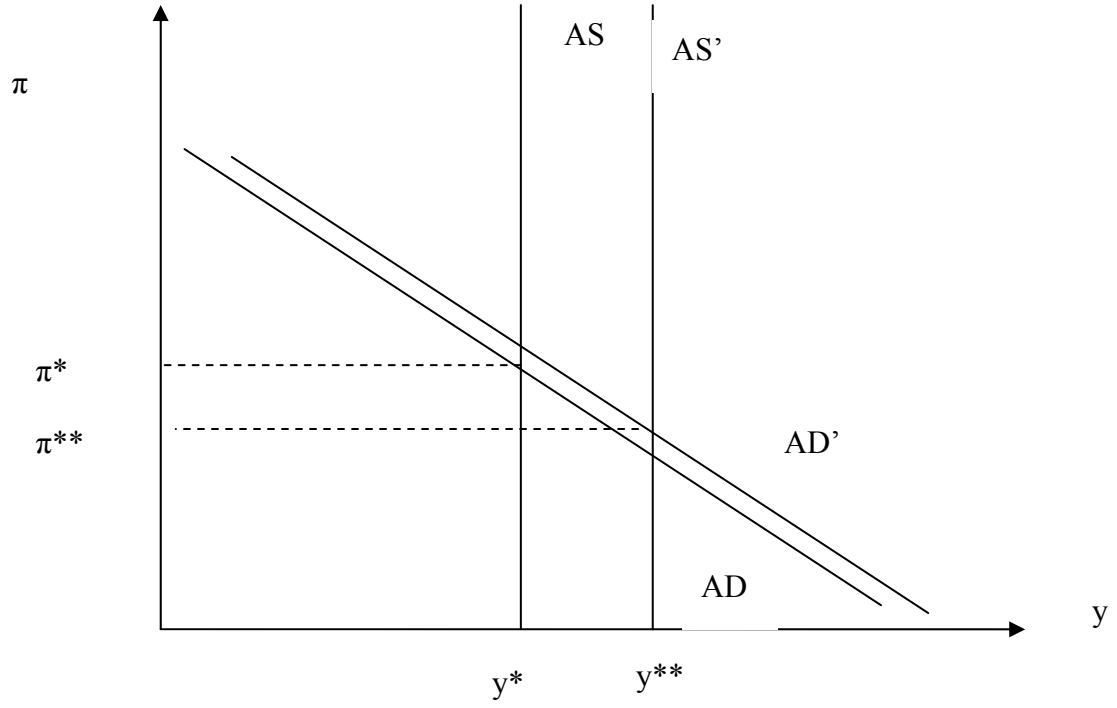
$$\pi^* = \frac{(a+m+l_o)-y^*}{(1-\phi)} \qquad (8)$$

Graphically:



Equilibrium

In a EMV world the output growth is exclusively supply driven and money is neutral:



Up to the 2008 crash the Great Moderation was considered a case of (good) real business cycle: more efficiency in all the markets triggers higher output and lower inflation (stable shifts in the AS curve).

The two decades preceding the Great Crisis were characterized by very good macroeconomic performances, with stable output and employment growth intertwined with low and stable inflation. All the advanced economies show low levels of both real and nominal volatility: the degree of macroeconomic stability was significantly high. The phenomenon was labeled the "Great Moderation".

The Great Moderation was essentially explained stressing the role played by positive changes in the supply side: increasing competition in the markets for goods and services, stable policies and institutions, more flexibility in the labor markets, more innovation in the production function.

At the same time the policy mix between lax monetary policy and financial deregulation was considered a beneficial one: positive real consequences (stability in investment and saving) with temporary and negligible nominal effects (negligible shifts in the AD curve).

The shift from structural regulation to prudential regulation was called deregulation. The financial deregulation process included the progressive elimination of direct controls on bank activities (lending supply and deposit demand) – for example interest rate ceilings and business limitations – and at the same time the liberalization of both the domestic and international markets.

In general deregulation produces an increase in the supply of banking and financial services; the corresponding and necessary increase in the demand is more likely to occur if the monetary policy action produces low and stable interest rates. Both phenomena occurred before the Great Crisis.

In the two decades up to 2007 the ratio of the private debt on GDP increased. Households, firms and financial institutions increased their liabilities. A wave of innovation characterized the financial industry; new classes of instruments, intermediaries and markets were produced and distributed with the aim to strengthen every kind of risk management. The general belief was that financial innovation facilitated risk optimization at both the micro and macro levels. The overall increase in the private leverage was associated time to time with higher prices of specific financial and/or real assets. However the price movements were considered negligible phenomena, given that the overall macroeconomic performances were very positive. In other words the rise and fall of asset prices were evaluated as physiological adjustments of increasingly efficient and resilient markets.

The leverage effect was impressive. Household and corporate debt grew substantially. Supported by the accommodative monetary policy banking lending increased the volume of the credit to construction, real estate and service sectors, and consequently the prices of stock and real estate. The boom in the housing and financial markets was supported by the development of new instruments, that the intermediaries used as ways of extending credit to risky borrowers (for example the subprime lending). At the same time the increase in leverage was associated with more stable growth in consumption, investment and output, as well as with a low and stable level of inflation.

5.6 The Balance Sheet Recession and the Great Crisis

The Great Crisis can be interpreted as a case of balance sheet recession, consistent with the Imperfect Markets View (IMV), o Aggregate Demand View. In a balance sheet recession the role of financial accelerator - which is an AD component - is crucial, as a driver of the output growth.

We can start analyzing the relevant characteristics of a IMV view model.

The roots of the IMV can be identified into the Keynesian Revolution, which stressed the endemic role of market imperfections and consequently the need of having ever an active macroeconomic policy: “The State will have to exercise a guiding influence … partly though its scheme of taxation, partly by fixing the rate of interest, and partly, perhaps, in other ways (…). If the State is able to determine the aggregate amount of resources devoted to augmenting the instruments and the basic rate of reward to those who own them, it will have accomplished all that is necessary” (John Maynard Keynes, The General Theory of Employment, Interest and Money, 1936).

And today: “We are in a new macroeconomic epoch (…); we cannot rely on the self-restoring features of market economies. (…) History tells us that markets are inefficient and often wrong in their judgments about economic fundamentals” (Lawrence Summers, The Case for Expansion, Financial Times, October 10th, 2015).

Economy

Regarding the economy model, the key feature of the IMV view is essentially one:

1) we consider an economy with imperfections in all markets. Also the expectations are imperfect.

Therefore we can specify the features of both the supply side and the demand side.

Supply Side

In the IMV inflation is associated with cost growth (wages), firm market power and uncertainty as follows:

$$\pi = \omega + (\mu - 1) + u \qquad (1)$$

*) Labor market:

In the IMV labor market the nominal wage is the equilibrium variable – i.e. expectations are relevant but sticky and unpredictable , and they are included in the labor nominal price (*à la Keynes*). The nominal wage is associated with the employment growth - given the rigidity factor – and with exogenous expectations. Therefore:

$$\varpi = \hat{\pi} + b\varepsilon y \qquad (2)$$

Where *n* is the employment growth and *b >1* is the rigidity factor. As usual the employment growth is identified using the production function.

*) Production Function:

The supply of goods and services is associated with employment growth and capital growth:

$$y = \alpha n + \beta k \qquad (3)$$

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= labor productivity factor). Therefore the employment equation becomes (with ε=1/α= inefficiency factor) :

$$n = \varepsilon y$$

Equation (2) becomes:

$$\varpi = \hat{\pi} + b\varepsilon y$$

Note that:

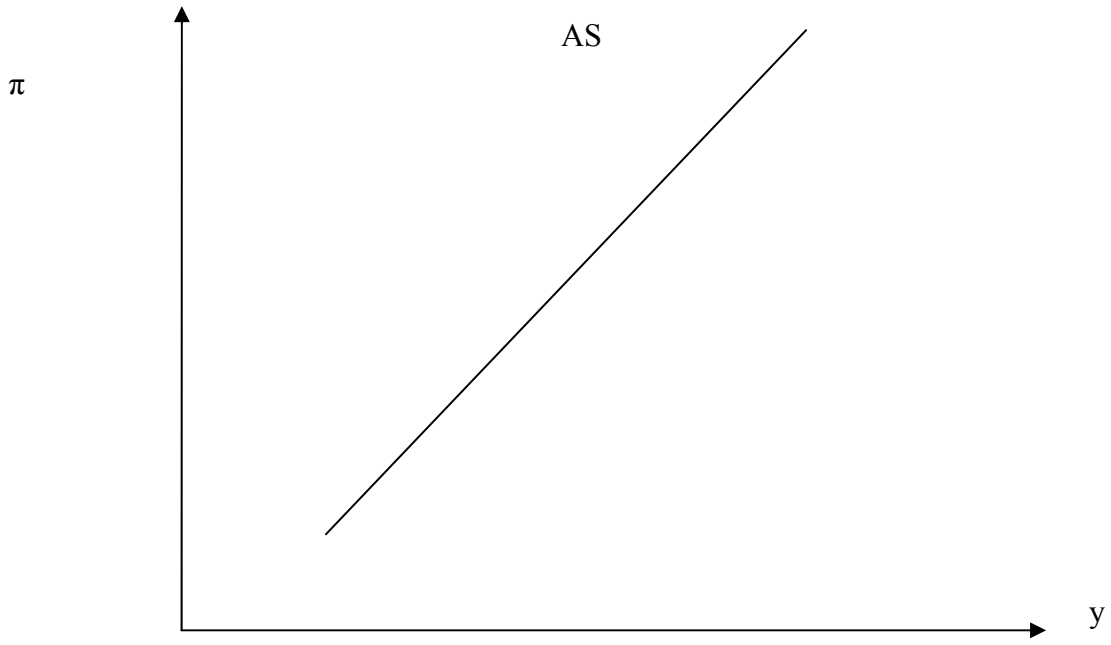
*) The supply side equation defines the well-known relationship between inflation and output :

$$\pi = (\mu - 1) + b\varepsilon y + \hat{\pi} + u$$

$$y = \frac{(\pi - \hat{\pi}) + 1 - (\mu + u)}{b\varepsilon}$$

Given uncertainty and expectations, the output growth is related to the mark up factor (less competition in the markets of goods and services means less output); the rigidity factor (less flexibility in the labor markets means less output) ; the inefficiency factor (less productivity means less output); the inflation (more output means more employment which increases the wages and, given the mark up, the inflation).

Graphically:



Demand side

In general the aggregate demand depends on: exogenous changes *a* in the demand for goods and services, real money growth, inflation expectation and financial accelerator:

$$y = a + m - \pi + \phi \hat{\pi} + l \qquad (4)$$

- Money

In the IMV economy the money growth *m* depends on the central bank choices:

$$\boldsymbol{m} = \bar{\boldsymbol{m}} \qquad (5)$$

- Banking and Financial Policies

In general banking and financial shocks can positively and negatively influence the aggregate demand growth:

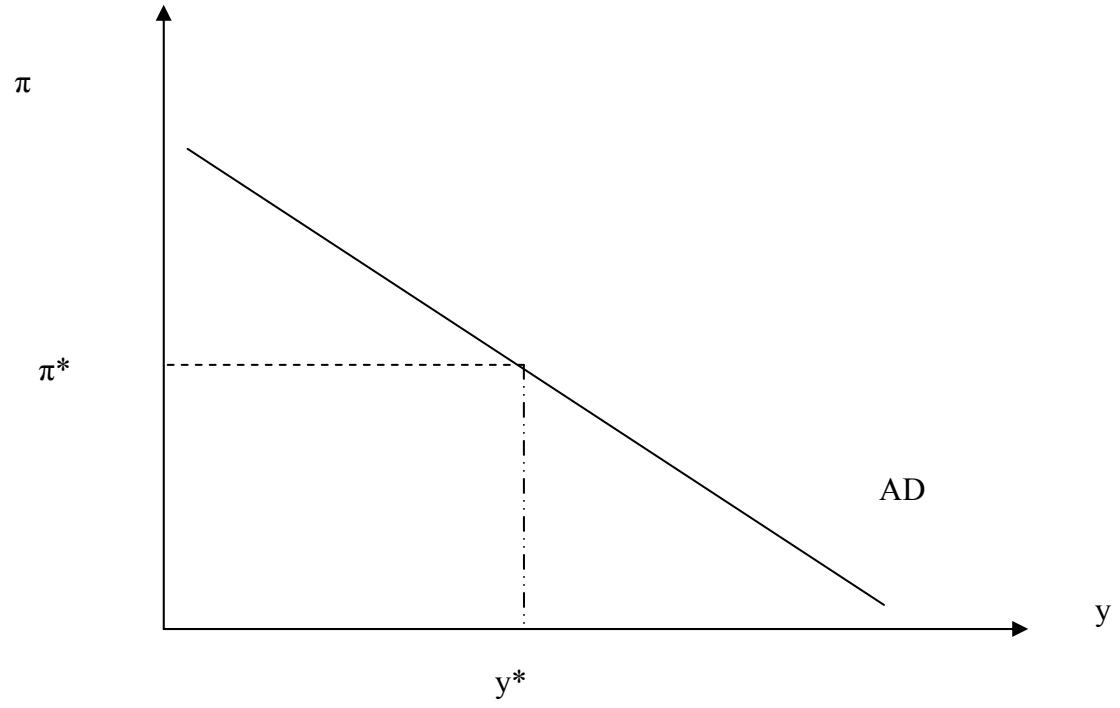
$$l = l_o - l_1 J \qquad (6)$$

Where l_o is a random component and the sterilization parameter - $\left[l_1\right] \geq 0$ in absolute value captures - the effectiveness of the macroprudential policy.

In the IMV economy it is possible to design and implement optimal monetary and macroprudential policies to govern the economic system.

$$y = (a + \bar{m} + l) - (1 - \phi)\pi$$

Graphically:



Equilibrium

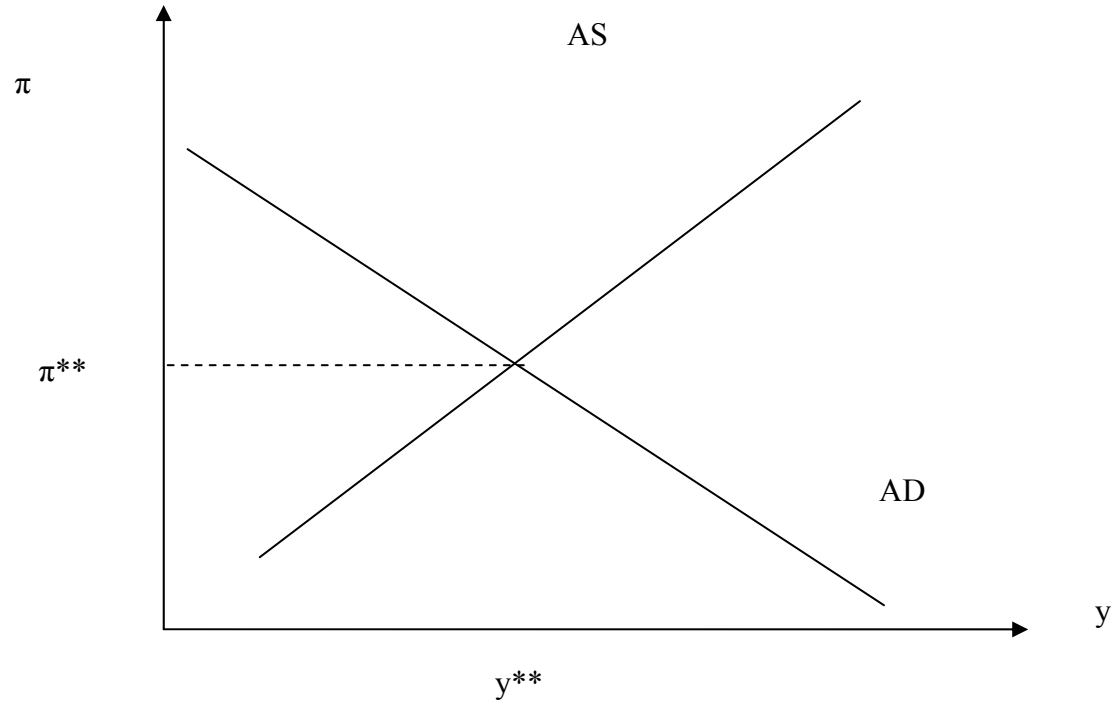
Now we have all the information to obtain the equilibrium level of both output *y*** and inflation π^{**}:

$$y^{**} = \frac{(a + \bar{m} + l) + 1 - (1 - \phi)\hat{\pi} - (\mu + u)}{\gamma}$$

$$\pi^{**} = \frac{(a + \bar{m} + l)\beta\varepsilon + (\beta\varepsilon\varphi + 1)\hat{\pi} + (\mu + u) - 1}{\gamma}$$

Where:

$\gamma = (b\varepsilon + 1) > 1$



Given uncertainty and expectations, in the IMV economy three results emerge:

5) higher levels of output growth depend on: more competition in the markets for goods and services; more flexibility in the institutional setting; more technological efficiency (as in the EMV economy);
6) money is not neutral; monetary policy has real and nominal effects. We can define the output monetary multiplier (OMM) and the inflation monetary multiplier (IMM), where:

$$OMM = \frac{\partial y^{**}}{\partial \bar{m}} = \frac{1}{\gamma} \qquad IMM = \frac{\partial \pi^{**}}{\partial \bar{m}} = \frac{b\varepsilon}{\gamma}$$

Given a money supply change, OMM and IMM measure respectively the effects on output and inflation. The values of the OMM and the IMM are useful to calculate the sacrifice ratio, i.e. the ratio between the inflation costs and the output gains. The sacrifice ratio SR is equal to:

$$\frac{IMM}{OMM} = (\gamma - 1) = b\varepsilon$$

The SR depends on: the rigidity factor (less competition in the labour markets means greater SR) ; the inefficiency factor (less productivity means greater SR).

7) the financial accelerator can influence the aggregate demand in a stable and structural way. In particular the Great Crisis can be interpreted as a case of Balance Sheet (Leverage) Recession. During the Great Deviation a huge amount of private debt has been accumulated, triggered by the policy mix of financial deregulation and lax monetary policy:

$$l = l_o + l_1 J$$

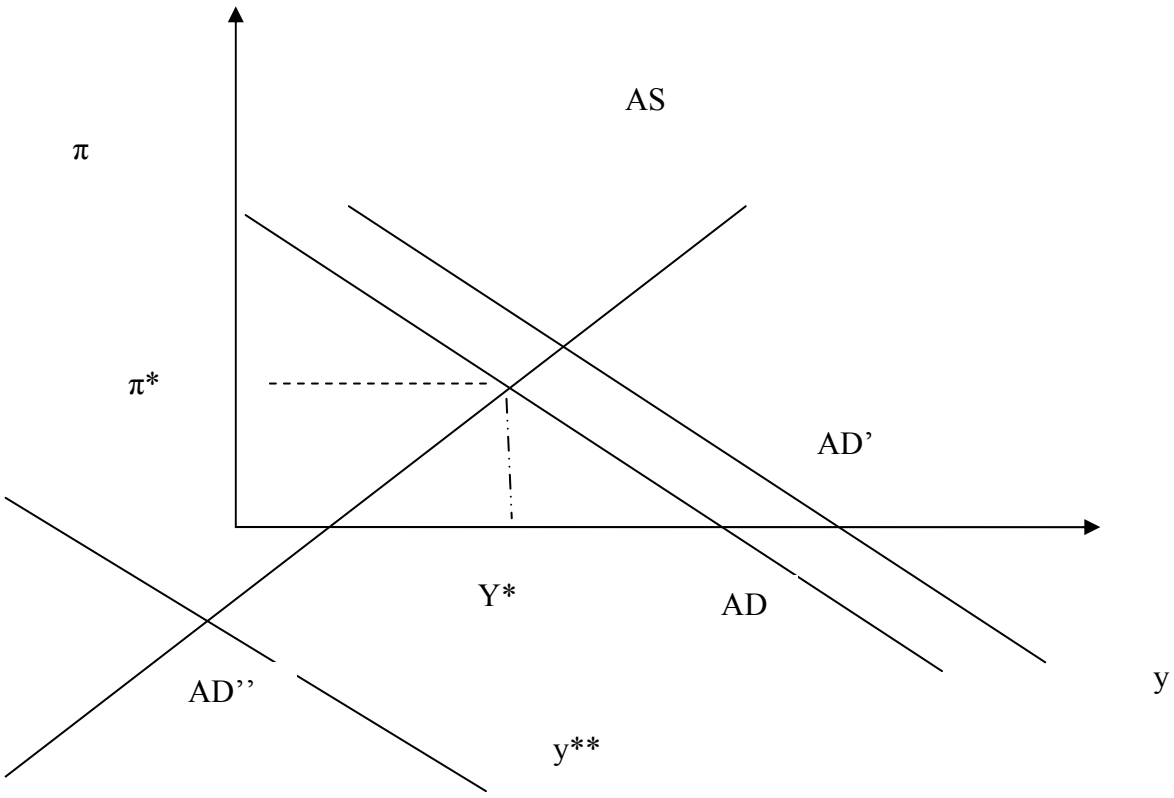
Our assumption is that the role of both the expansionary monetary policy and the lax regulation and supervision policy was crucial in causing the Crisis. It has been highlighted that during the years 2002-2006 the FED interest rates has been well below the level consistent with the Taylor Rule, indicating a too lax monetary policy[118].

The bottom line is as follows: How could what initially seems to be just a sector specific financial turmoil – the subprime default – end up generating a Global Economic Crisis? The answer has been found in the toxic mix between loose monetary policy, that caused too low interest rates, and lax financial regulation, that encourages all the economic actors – households, firms and banks – to leverage up their balance sheets. The leverage industry (finance) became big, complex and interconnected, and consequently opaque. When a relevant shock finally hit the industry – i.e. the Lehman Brothers bankruptcy - a fly to safe assets triggered a domino effect in the financial markets, and the more the financial conditions deteriorated the more the crisis became a deep economic recession. The big, complex and interconnected financial infrastructure amplified the negative spillovers between the real and financial sectors in almost all the advanced economies.

All in all: the lax monetary fueled the growth of the public debt, that has been originated via the deregulation wave due to the shift from the structural regulation approach to the prudential regulation approach.

The intertwined effect of monetary policy and deregulation caused the increase of the private debt during the Great Moderation. The stock of high private debt had a positive leverage effect on output growth up to the 2008, and then triggered the Great Recession:

[118] On the relationships between the Great Moderation and the Great Crisis see Bean 2010, Taylor 2009, Bernanke 2010, Gadea Rivas et al. 2014. On the role of the monetary policy stance – the Great Deviation - see Ahrend et al. 2008, Taylor 2009, Hofmann and Bogdanova 2012; Merrouche and Nier 2014 didn't find any monetary policy role. On the role of housing finance see Jorda et al. 2014. On monetary policy and saving glut see Bernanke 2010; on the corporate saving glut see Gruber and Kamin 2015. Different authors claim that the FED has to be blamed for the Crisis: Borio and White 2003, Gordon 2005, Borio 2006, Taylor 2009, . Other argue against this perspective: Posen 2009, Bean 2010, Bernanke 2010, Svensson 2010, Cesa Bianchi e Rebucci 2016.



The Great Crisis was a financial boom – bust crisis associated with an economic recession (systemic crisis). During the Great Moderation the expansionary monetary policy led to a financial and economic boom up the 2007. The collapse after the Lehman Brothers bankruptcy hit the US economy and then spread to Europe.

5.7 The Liquidity Trap and the Post Great Crisis in Europe

Let us assume that the European economy during the Post Great Crisis[119] can be described as a Liquidity Trap economy[120] with deflation risks[121]. The main effects are as follows:

6) The fiscal policy becomes a crucial tool to increase the output growth;
7) The traditional – conventional – channel of expansionary monetary policy is ineffective;
8) The unconventional[122] channel of expansionary monetary policy can reduce the deflation risks;

[119] Also the US economy during the Great Crisis has been described as a Liquidity Trap case. See Eggertsson and Krugman 2010.
[120] It has been claimed that during the Great Crisis the Liquidity Trap depended on a deficit of safe assets ("Safe Trap") that can be analysed using a IS-LM model plus a safe asset market equilibrium; see Caballero et al. 2016. We define safe asset as an asset with constant face value, i.e. without any devaluation risk, liquidation risk and solvency risk; usually safe assets are money or money-like. On the history and economics of safe assets see Gorton 2016.
[121] On Keynes, the Great Depression, the Great Crisis and the Liquidity Trap see Sutch 2014.On the Eurozone Crisis see Baldwin and Giavazzi 2015.
[122] The Great Crisis started with a financial (bubble) burst that the monetary has to address with conventional and unconventional tools. On the relationship between bubbles and monetary policy see Brunnermeier and Schnabel 2015; on bubbles and credit, i.e. leveraged bubbles see Jorda et al. 2015a and 2015b; on the unconventional monetary policies see Bank of England 2013, Ito 2014,

9) Structural policies alone – i.e. without any aggregate demand shift- can just increase the deflation risks[123].

In general we can interpret the Crisis Management period as a case of Liquidity Trap, where the only effective policy action is the fiscal one.

Since 2008 in almost all advanced economies the central banks have designed and implemented very aggressive monetary policies in order to address the Great Crisis. The severity of the Crisis forced the central bankers to come up with conventional and unconventional tools to generate a macroeconomic turnaround. Drawing from the BIS Annual Reports the narrative is as follows.

In 2008 concerns over losses on US subprime mortgages escalated into worldwide financial stress. Surging demand for liquidity, coupled with growing concerns about counterparty risk, led to unprecedented pressures in financial markets. Monetary Policy faced two conflicting challenges: tensions in financial markets versus inflationary pressures. Central Banks dealt with them in different ways: the FED decreased its policy rate from 5.25% to 2%, whereas the ECB and the BoJ kept their policy rates unchanged. In 2009 interest rates were cut until they were at or near the ZLB. Major central banks expanded their balance sheets massively. In 2010 central banks followed to cut policy rates and reinforced the cuts by unconventional policy measures to address both financial market malfunctioning and the economic meltdown. In 2011 central banks extended the period of monetary accommodation; the end of unconventional policies was delayed. In 2012 almost all advanced economies maintained extraordinary accommodative monetary stances, which were transmitted to emerging market economies in the form of exchange rate and capital flows movements. The monetary conditions became highly accommodative globally. The central banks have had little alternatives but to maintain monetary easy because the prolonged weakness in the real and nominal variables. In 2013 the central banks followed to postpone the exit from the accommodative stance. Also in 2014 monetary policy has remained extraordinary accommodative, with central banks struggled with an unusually sluggish recovery and increasing signs of diminished monetary policy effectiveness. Finally in 2015 monetary policy continued to be exceptionally accommodative, with many central banks easing or delaying tightening. In different countries the ultra-low policy rate setting was reinforced with large-scale asset purchase programs. In advanced economies inflation rates followed to deviate from targets, being still too low.

Conventional monetary policy typically consists of buying short term public bonds to affect short term interest rates (open market operations) and/or setting nominal interest rates (deposit rate and lending rate) to affect the banking liquidity market (bilateral operations). During the Crisis such as tools reached their limits as the policy rates reached the zero lower bound. Then unconventional monetary policies were

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Mishkin Aand White 2014; on unconventional monetary policy and central bank balance sheet see Ferguson et al. 2015, Hall and Reis 2015, Benigno and Nisticò 2015,Reis 2015; on monetary policy and forward guidance see Svensson 2015, on monetary policy and central bank securities see Gray and Pongsaparn 2015.

[123] In an open economy with a liquidity trap and rigidities expansionary monetary policies can be produce global imbalances and beggar –thy-neighbor effects; see Caballero et al. 2015.

implemented: 1) quantitative easing, which consists in buying other types of public and private assets – as long term government bonds or asset backed private securities – with the aim of increasing the liquidity and pushing down also the long term interest rates; 2) forward guidance, which consists in providing explicit and binding guidance about the future path of monetary policy, in order to reduce uncertainty and influence market expectations; 3) negative interest rates, which consists in setting negative deposit remunerations as well as lending costs, with the goal of influencing on the one side the opportunity costs of holding central bank reserves and on the other side the credit supply.

Central banks set out using explored and unexplored monetary policy operations facing a demand for goods and services whose health was increasingly deteriorating and not responding to the usual tools. When the chain between the monetary policy action and the aggregate demand is broken the economy is suffering in a liquidity trap.

In a liquidity trap the functioning of the standard IMV transmission channel – interest rate, money and credit aggregates, aggregate demand, output growth and inflation – is impaired. The policy rate transmission becomes weaker, and at the limit completely ineffective. In the transmission chain two rings are essential: the nexus between the policy rate and the credit aggregates, and the subsequent link with the aggregate demand for goods and services. Weaknesses and lags in one of the two rings can be sufficient to disrupt the overall chain.

In a IMV framework the possibility of a *liquidity trap* can emerge. "A point may be reached where continued open market purchases of short term government debt would reduce the short term rate to zero before producing a sufficient decline in the long term rate. (…) In this event the monetary authority would have lost effective control over the rate of interest" (J.M. Keynes, The General Theory of Employment, Interest and Money, 1936).

Or "*Sometimes*, however, monetary policy loses its effectiveness, especially when rates are close to zero. In that case temporary deficit spending can provide a useful boost. And conversely, fiscal austerity in a depressed economy imposes large economic losses." (Paul Krugman, The Conscience of a Liberal, September 15th, 2015).

From the 2008 interest rates come to record lows in almost all the advanced economies, but the aggressive monetary easing was associated with anemic macroeconomic performances. In a liquidity trap additional injections of monetary stimulus have no effect if the private sector decisions – as well as its expectations – are independent from the central bank choices.

In a liquidity trap any change in the monetary policy doesn't influence the aggregate demand, i.e.

$$y = a + l + \phi \hat{\pi}$$

Where the supply remains equal to:

$$y = \frac{(\pi - \hat{\pi}) + 1 - (\mu + u)}{b\varepsilon}$$

Therefore the economy becomes dichotomous, being demand driven:

$$y^* = a + l + \phi \hat{\pi}$$

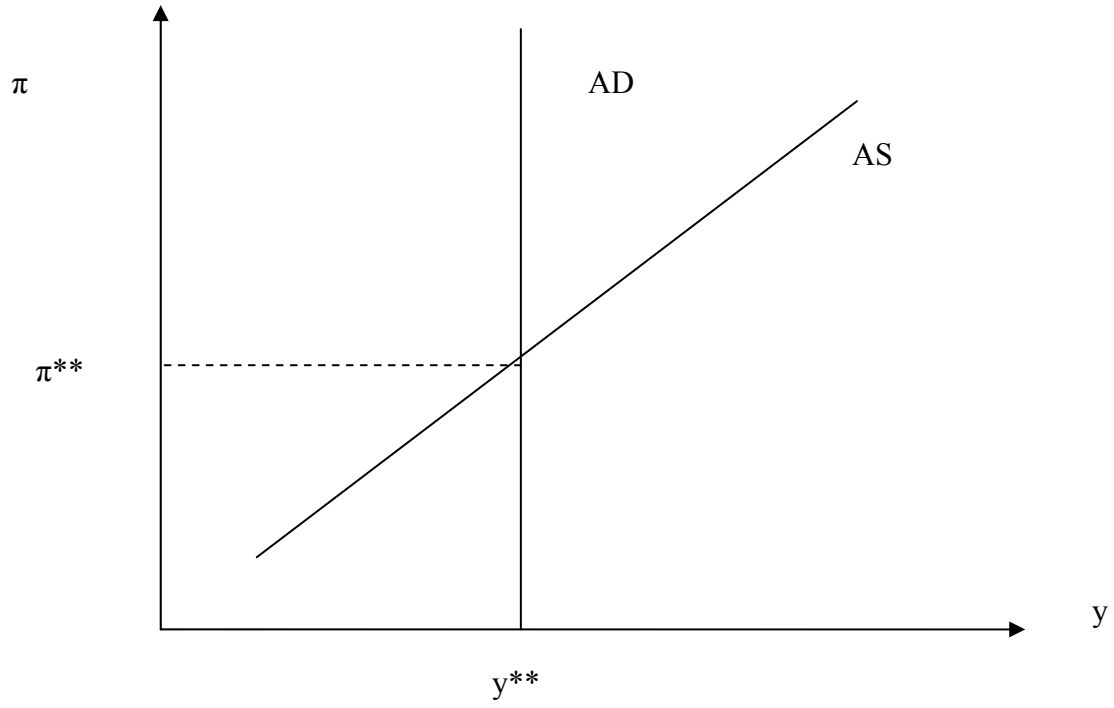
And:

$$b\varepsilon(a + l + \phi \hat{\pi}) = \pi - \hat{\pi} + 1 - (\mu + u)$$

$$\pi^* = b\varepsilon(a + l) + (1 + b\varepsilon\phi)\hat{\pi}) + (\mu + u) - 1$$

In a liquidity trap the economy becomes again a dichotomous system, where now the output growth is driven only by changes of the real component of the aggregate demand. Therefore the fiscal policy becomes the only effective economic too, while any aggregate supply change becomes neutral.

Graphically:



5.8 The Neokeynesian View and the Post Great Crisis in the US

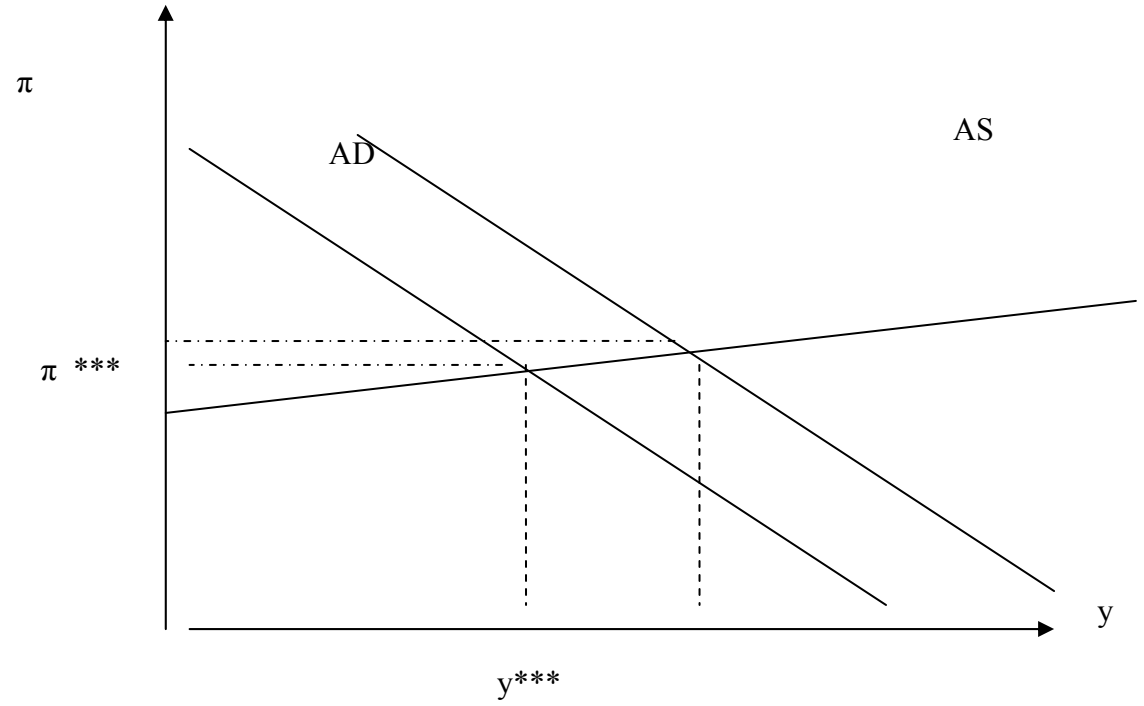
Let us assume that the US economy during the Post Great Crisis can be described as a Neokeynesian world with imperfect but flexible markets – i.e. low sacrifice ratio[124]. The main effects are as follows:

1) Expansionary AD policies – fiscal and monetary actions – are the more effective tools to increase the output growth;

[124] On monetary policy strategies in New Keynesian world at the zero lower bound (ZLB) see Chung et al. 2014. On a New Classical View of the Great Crisis in the US see Lucas 2011 and 2014. The relationships between the zero lower bound policies and the difficulties in achieving full employment triggered the debate on the secular stagnation hyphotesis, i.e. on the possibility that negative interest rates are needed to equate saving and investment with full employment. On the secular stagnation hyphotesis see Teulings and Baldwin 2015. On the relationship between ZLB and supply shocks see Garin et al. 2016.

2) The costs of wrong policies are higher with restrictive AD policies;
3) The supply side policies are relatively weak, given that the markets are already relatively efficient.

Graphically:



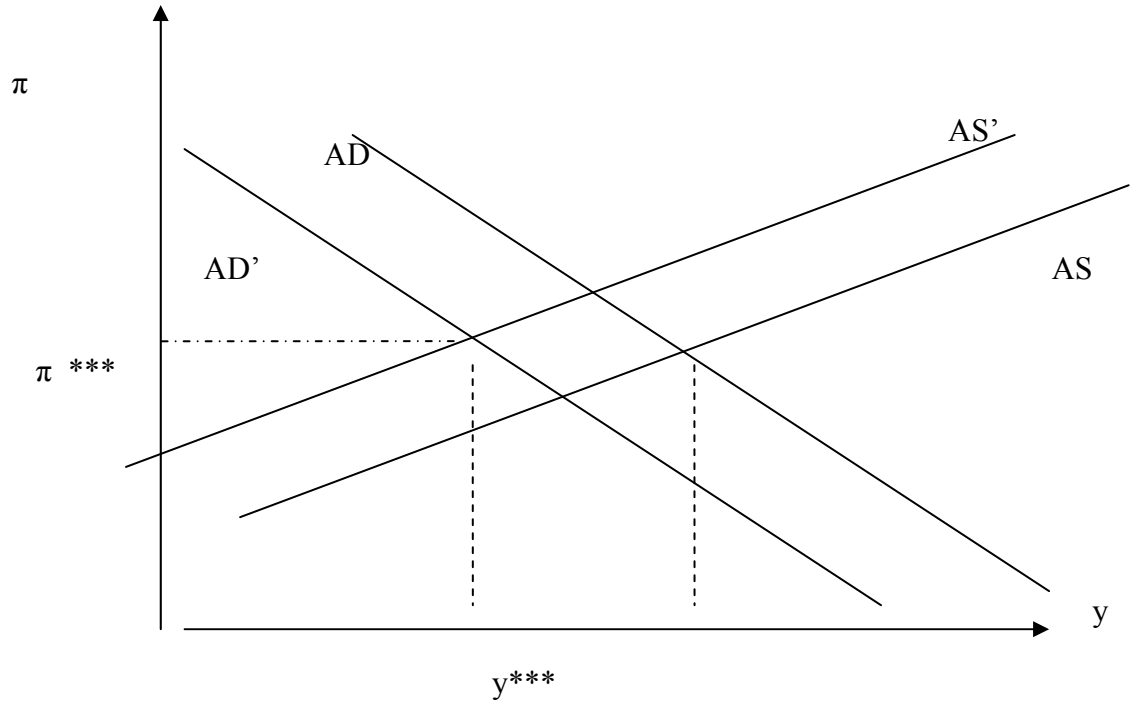
5.8 The Neokeynesian View and the Brexit as an uncertainty shock

Let us assume that the UK economy after an hypothetical decision to leave the European Union can be described as a Neokeynesian world where a big uncertainty shock occurs. The main effects are as follows:

1) The uncertainty shock reduces the supply of goods and services;
2) At the same time three effects can influence the demand for goods and services: a negative shock in the trade balance; a devaluation effect via the pound exchange rate; a negative financial accelerator effect, due the asset price movements.

   The more will be true that the overall AD reaction is likely to be negative the more the Brexit macroeconomic effect will be a drop in output growth. Bottom line: if uncertainty is associated with the EU leaving, Brexit is likely to depress economic activity in the short – medium term. As a consequence Brexit is likely to hit the public finance, triggering a negative second round effect.

   Graphically:



5.10 The Neo- Fischerian View: Rational Expectations in Aggregate Supply and Demand

Let us assume to consider in the Modern View an economy where the expectations are rational and at the same time relevant in influencing both the supply and the aggregate demand. In these conditions a deflationary trap can occur (the Neo- Fischerian View[125]).

Supply Side

In the Modern view inflation depends on wages, firm market power and uncertainty:

$$\pi = \omega + (\mu - 1) + u \qquad (1)$$

*) Labour market:

With rational expectations, in the labour market the real wage is the market clearing price. The real expected wage depends on employment, given the rigidity factor as follows:

$$\varpi - \pi = bn \; ; \qquad \varpi = \pi + bn \qquad (2)$$

Where *n* is the employment growth, *b* is the rigidity factor .

As usual the employment growth is identified using the production function.

*) Production Function:

The production growth depends on both employment growth and capital growth (à la Cobb Douglas):

$$\boldsymbol{y = \alpha n + \beta k}$$

[125] See Cochrane 2015, Garcia-Shmidt and Woodford 2015 and Garin et al. 2016.

With *k=0* – i.e. medium run horizon - the relationship between output and employment is identified (α= productivity factor). Therefore the employment equation becomes (with ε=1/α= inefficiency factor) :

$$\boldsymbol{n} = \boldsymbol{\varepsilon y} \qquad (3)$$

Equation (2) becomes:

$$\varpi = \pi + b\varepsilon y$$

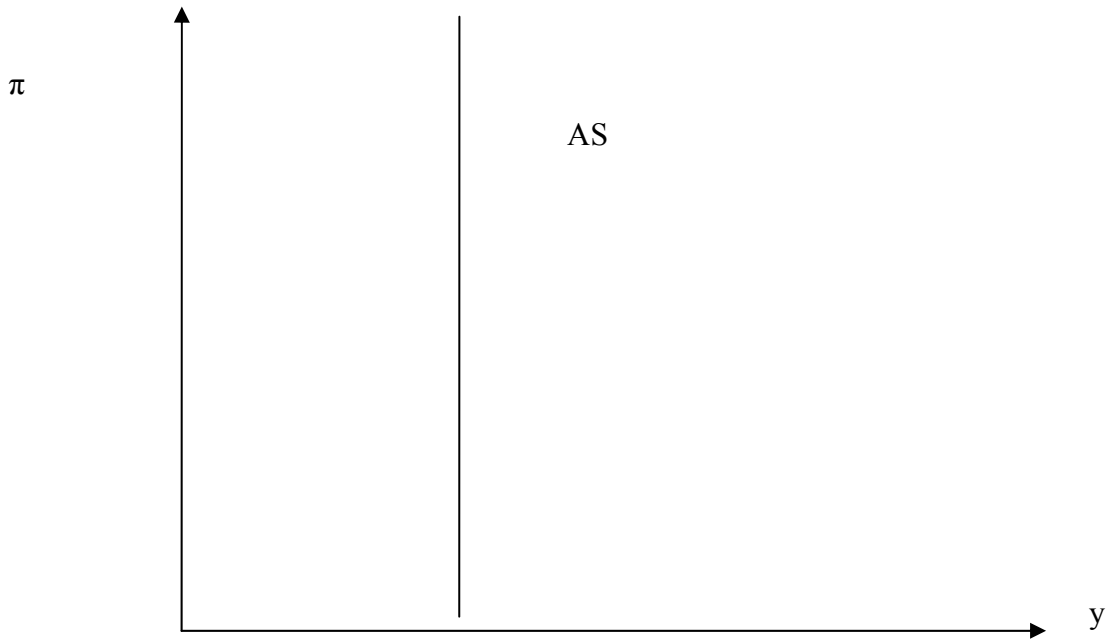
The equation (1) becomes:

$$\pi = \pi + bey + (\mu - 1) + u$$

Or:

$$y = \frac{1 - (\mu + u)}{b\varepsilon}$$

Graphically:



Demand side

In general the aggregate demand depends on the real component *a*, the real money growth and the leverage shocks; on top of that here we can assume that the explicit role of inflation expectations is highlighted: the bottom line is that that higher inflation expectations for tomorrow increase expenditures in goods and services today; the opposite is true if lower inflation – or deflation - is expected for tomorrow. One more transmission channel can be highlighted via the expected real interest rate: higher inflation

expectations mean lower expected real interest rate which triggers the investment demand. In this case both the actual and the expected real interest rates matter in influencing the aggregate demand.

Therefore, being the parameter ϕ the sensibility of the aggregate demand to inflation expectations :

$$y = a + m - \pi + l + \phi\pi^e \qquad (4)$$

The interest in considering the case of highly sensible aggregate demand – i.e. ϕ>1 - emerges when the expectations are perfectly rational – i.e. $\pi^e = \pi$.

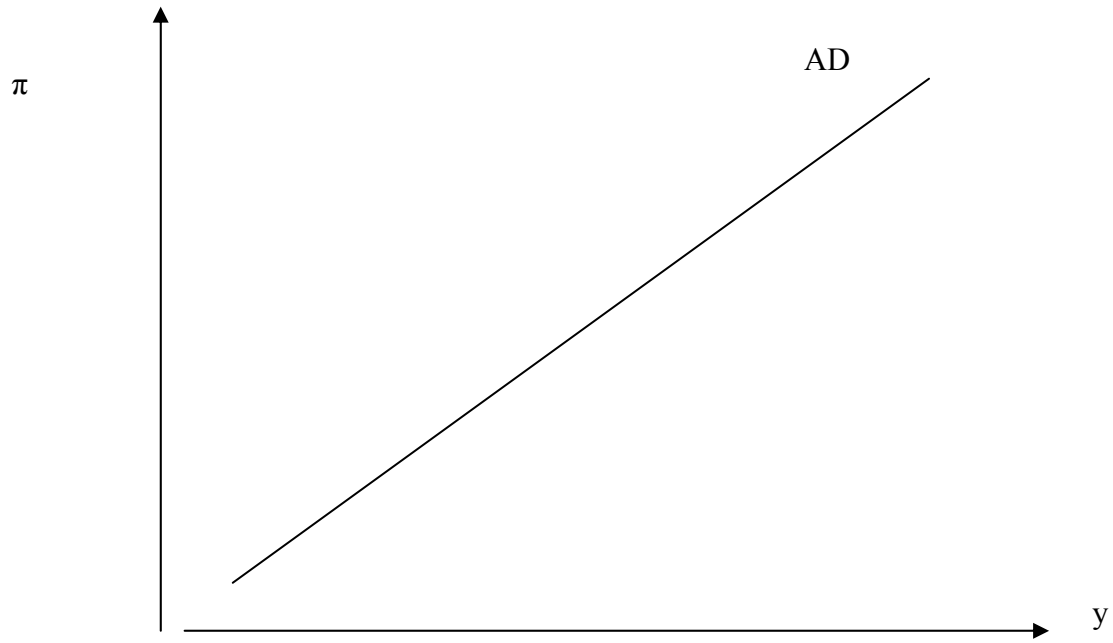
Equation (4) becomes:

$$y = a + m + l + \phi'\pi$$

Where $\phi' = \phi - 1 > 0$

Each agent anticipates the inflation change and consistently move his/her exchanges: higher inflation expectations mean higher demand for goods and services, and therefore higher inflation occurs. The opposite is true when the inflation expectations are lower. It is a case of self-fulfilling expectations. The final result is that the demand for goods and services and the inflation will go hand in hand.

The aggregate demand becomes an upward sloping curve[126]. Graphically:



In this case it is worth noting that:

[126] An upward sloping demand curve can be explained using other motivations, which matter also in New Keynesian settings: for example, with indebted agents, increasing inflation expectations – or inflation tout court – can be associated with a decreasing real burden of the debt, which triggers expenditures; see Eggertsson and Krugman 2010.

$$\pi^{\wedge} = \frac{y - (a + m + l)}{\phi'}$$

Here inflation and money growth are negatively correlated:

$$\frac{\partial \pi}{\partial m} = -\frac{1}{\phi^*}$$

The economic explanation can be that the agents rationally anticipate the long run relationship between interest rates and economic activity – i.e. the Fisher equation. If in equilibrium the Fischer equation holds:

$$i = r + \pi$$

Low interest rates are associated with low levels of growth, both in real and nominal terms; the opposite is true when the interest rates are high. In other words we are assuming that, given a stable real interest rate, inflation is directly associated with the nominal interest rates:

$$i - r = \pi$$

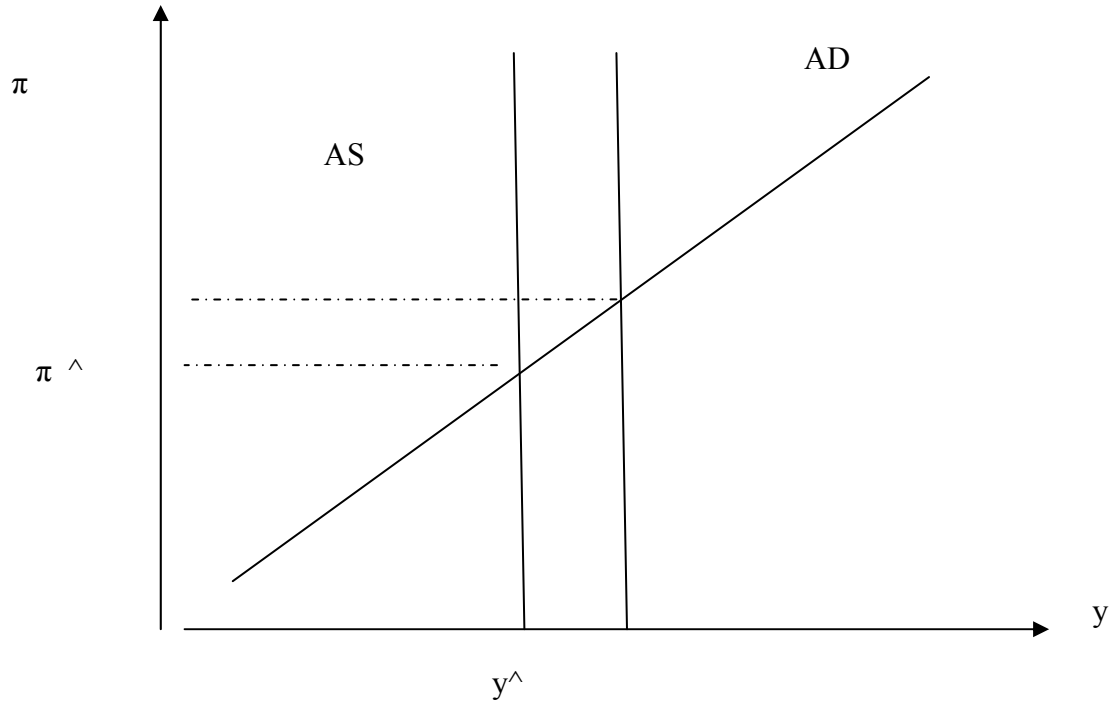
Equilibrium

Now we have all the information to obtain the equilibrium level of both output *y^* and inflation $\pi^{\wedge}$:

$$y^{\wedge} = \frac{1 - (\mu + u)}{b\varepsilon} \qquad (6)$$

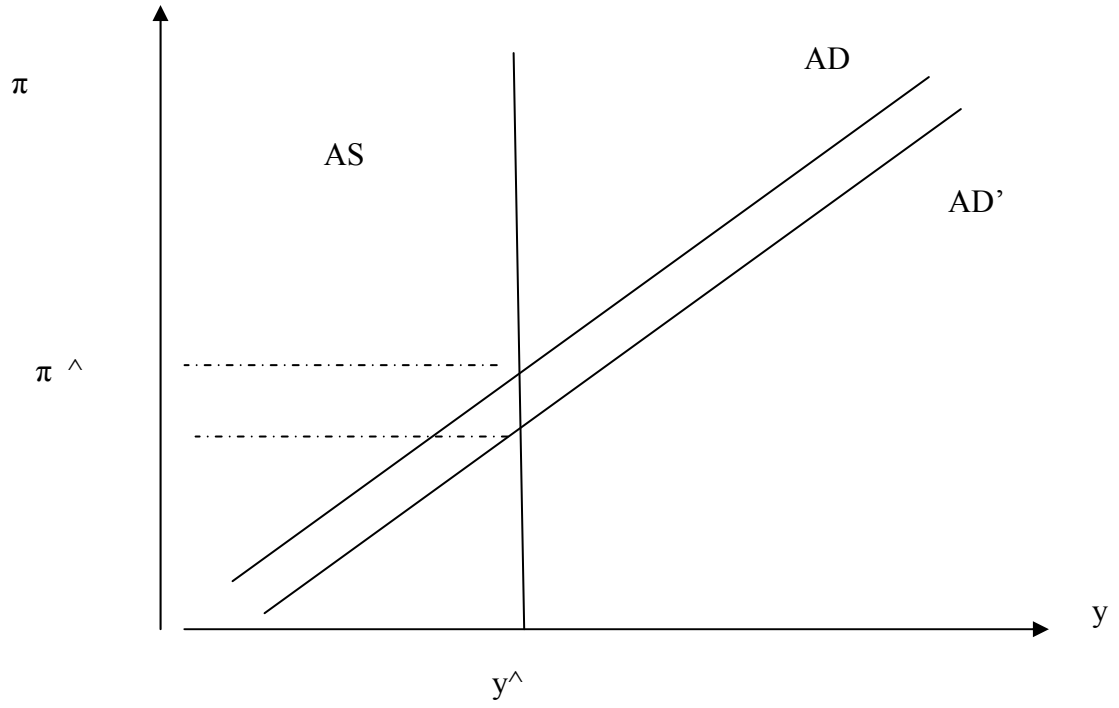
$$\pi^{\wedge} = \frac{y - (a + m + l)}{\phi'} \qquad (7)$$

In this economy two results emerge. First of all, the sacrifice ratio characterizes the AS policies. As it is usual in the perfect rational expectations equilibrium, the AS changes are the only drivers which can trigger the output growth, but in this case higher levels of growth are associated with higher levels of inflation. Graphically:



In this economy higher real growth rates trigger higher inflation via the iper sensible inflation expectations.

Secondly the AD policies produce non-standard effects on inflation. For example an expansionary monetary policy trigger disinflation, via the Fisher effect. A disinflationary trap can occur: an expansionary monetary policy aimed to boost inflation can produce disinflation. Graphically:



Let assume now that the prices are sticky, i.e. the expectations are rational just in the financial markets while the nominal wages incorporate constant expectations. In this case both AS and AD policies will have real and nominal effects, with directions and sizes depending on the relative slopes of the two curves.

6. DESIGNING CENTRAL BANKING: ECONOMICS, POLITICS AND HISTORY

This special Section describes three ages of central banking: Classical (1870-1929), Traditional (up to 1971), Modern (up to 2007). Finally a Post Modern analysis is offered, assuming a specific behavioural bias in the monetary policy decisions.

CB AGE	**Dominant International Monetary Regime**	**Macro Strategy (Goals)**	**Tactics (Tools)**	**Dominant Domestic CB Asset**	**CB Governance**	**Main Policy Field**	**- CB (agency) Nature - Government Nature - Principal Nature**
Classical Regime (from 1870 – end of bimetallic regime - up to '30) 1873: responsibility doctrine (Bagehot)	Fixed Exchange Rates (Gold Standard): Classic Gold Standard (gold reserves) + Gold Exchange Standard (Genoa 1922: gold & foreign currencies)	Monetary Stability (fixed and irredeemable convertibility promise); Financial Stability: Clearing & Lending (discretionary discount window policy);	Interest Rate (Banking Reserves)	Commercial Paper & Short Term Public Bond	No Profit Privately – Owned Stock Company	Banking Policy	-Benevolent Agent -Policymaker (Benevolent Agent) - State
Traditional Regime (up to '70)	Pegged but Adjustable Rates (Bretton Wood 1944-1971) with capital controls	Income: Activism (anti-cyclical monetary policy) - (structural policy, as reserve requirements)	Money supply	Short term Public bond	Government Department	Monetary Policy and Banking Regulation & Supervision	-Benevolent Agent - Policymaker (Benevolent Agent) -Citizens
Modern Regime (up to 2007)	Flexible Rates	Monetary Stability: Flexible Rules (narrow central banking)	Interest Rate (Taylor Rule)	Short term Public bond	Public Authority	Monetary Policy	-Independent Bureaucracy - Politicians - Voters

6.1 CLASSIC VIEW: CENTRAL BANKING AND OPTIMAL LENDINGOF LAST RESORT

In this section we discuss the role of central bank as a specialized banking policy agent – i.e. as a public authority involved in lender of last resort (LLR) management acting in a commodity money regime, where at the same time commercial banks issue deposits as private money .

The existence of a sector where private firms – banks – that offer liabilities – deposits – having at the same opaque assets – loans – triggers the possibility that an effective or just potential single (micro) bankruptcy can spread across the whole industry – bank run – causing aggregate (macro) costs (banking instability). Therefore the need to protect a public goal – i.e. *banking stability* – arises.

We consider the central bank as *the banking authority*, being the agent designated by the State to monitor and influence the *banking reserves* in pursuing the goal of banking stability. The central bank, that acts in the common interest, can be either a centralized public body or a private institution subject to public rules acting as banknote (legal tender) *monopolistic issuer*.

The opposite situation is a set up with a multiplicity of private banks that compete in note issuing, just subject to general commercial law (*free banking*, or what can be called Smith View)[127]. In the real word intermediate settings have been recorded[128].

Being the source of liquidity and acting as liquidity lender, the central banker is deeply and exclusively involved in preventing and managing banking crises. We assume that banking stability is the *only goal*, excluding for example the intent of public finance management, which characterized the main forerunners of central banks[129].

Our problem is to define the optimal *rules* of the game. The relevant players are the State and the government. In setting the rules the key question is: how much the central bank lending *discretion* (CBD) in managing the liquidity have to be extended? Let us remember that in the early times central banking was based on the discretionary exercise of the faculty of converting the banknotes issued by the commercial banks in order to implement the discount policy, and the powers of the central bank were carefully defined and included in the laws[130].

In other words the faculty of issuing monetary base had to be subjected to public rules by governing the central bank discretion of issuing management. The central bank is in a privileged position that has to be

[127] For further details see Giannini 2004.

[128] Giannini 2004, chapter Three. For example in the US during the pre-Fed years the private banks were legally united into a single entities – private clearing houses – that during the banking panics acted as de facto lenders of last resort; see Gordon and Tallman 2016.

[129] Giannini 2004, chapter Three.

[130] Giannini 2004, chapter Three and Four. It is worth noting that custom and informal procedures can be relevant, depending on specific historical situations; see Giannini 2004.

regulated by the State: in modern words, the discretion in the management of the monetary base had to be limited by law. Law limits on note issues were introduced in UK in 1944, in France in 1848, in the US between 1863 and 1865, in Italy in 1874, in Germany in 1875 and in Japan in 1868[131]. The rules designing has to address and fix a trade- off between expected *gains* and *costs*.

On the one side the design of optimal rules produces positive spillovers guarantying *banking stability*, as well as in protecting the *convertibility promise* in the monetary field. In fact notwithstanding the standard separation in the Classic central banks between the Note Issue Department and the Banking Department (from 1844 the so called *English Model*) [132], it is crystal clear that failures in the LLR management are likely to produce negative spillovers in maintaining the commodity money regime.

On the other side the existence of a public backstop can trigger *distortions* in the incentives of the bankers. The standard dilemma between market and public failures may arise.

In order to summarize and simplify the overall question we can identify two opposite view: the *Currency* (Ricardo and Mill) *View*, that argues that central bank liabilities have to correspond exactly to the commodity money reserves, *without any discretion* in creating liquidity in order to avoid any threat regarding the convertibility promise; the *Banking* (Tooke) *View* that was in favour of discretion, claiming that the note issuing has to be flexible and consistent with the economic needs, being the convertibility promise a sufficient constraint to eliminate any risk of notes issue wrongdoing.

Now let us assume that the degree of CBD is equal to the level of a variable **y**, where **0<y<1**. The State is the principal who demand CBD and the incumbent government is the agent which establishes the central bank discretion, supplying it.

The State cares about the optimal level of CBD according to a classic well-behaved concave function **u = U (y)**: state welfare depends on the optimal level of CBD. Linear preferences are used:

$$U(y) = y \qquad (1)$$

Here we adopt the *benevolent player view* of the policymaker's type: she wishes to please the State rather than a particular constituency or lobby. The government needs to provide enough utility to the State; then her utility function is the social welfare function ***U***.

The government (**G**) would like to establish the optimal level of **y**. The government knows pros and cons of different levels of CBD. The need of CBD is usually supported by arguments related to the informational advantages in establishing a public authority which prevent and face the market failures. Setting up a banking authority reduces the risks which characterize the free banking. Therefore the government G

[131] Giannini 2004, chapter Three.
[132] Giannini 2004, chapters Three and Four.

knows that a greater discretion of the central bank (**CB**) in managing liquidity means less efficiency costs. Without a central bank the free banking costs arise[133].

At the same time the government G acknowledges that a central banker devoted to liquidity management can produce greater risks of ineffectiveness. The crucial argument for this point of view is that if the central banker is the liquidity manager a risk of public failure can emerge.

The drivers of the public risk failure are at least four: 1) If a public authority can manage discretionally the liquidity the risk of moral hazard in the supervised banks can increase. 2) Further the discretionary action of the central bank can increase the uncertainty in the supervised markets. 3)At the same time the central bank can lend in the wrong way, i.e. providing liquidity to insolvent banks. 4) On top of that mistakes in the liquidity management can threat the convertibility promise in a commodity money regime.

The risk of public failure, which depend on the central bank discretion in the liquidity management, is therefore unquestionably the crucial issue in the decision of how much discretionary the central bank action can be.

The optimization problem of the **G** can be described as follows. Less discretionary central banker means more market failure costs **MFC** for the Government**.** We simply suppose that the MFC are inversely proportional to the level of CBD:

$$\boldsymbol{MFC} = \boldsymbol{c}(1 - \boldsymbol{Y}) \qquad (2)$$

At the same time the government G knows that the more the central banker is involved in the liquidity management the greater is the risk of public failure. We assume that from the policymaker's point of view the social costs of implementing a CBD regime will depend on her expectations of suffering situations where the central bank can face a liquidity shock in a suboptimal way (liquidity miss-management event **LME**). The more the LME is likely to occur, the greater the social losses will be. Vice versa the social gains of CBD will be greater the smaller is the LME likelihood.

The probability of a LME can depend on different drivers; for example, let us suppose that the quality of the central banker can be crucial (i.e. the art of central banking, as it is classically defined).

If the probability of a **LME** equals **p** two different situations may arise. If the LME doesn't occur, the central bank action will produce social gains. We suppose that the social benefits **SB** are proportional to the central bank discretion, given the parameter **b**, which represents the social importance of the banking stability goal:

$$\boldsymbol{SB} = (1 - \boldsymbol{p})\boldsymbol{bY} \qquad (3)$$

[133] On free banking and bank runs, including the similarities with the Great Crisis, see Bernanke 2013; on the Great Depression and bank runs see Mitchener and Richardson 2016.

If a LME occurs, the costs of the central bank failure will be different from zero and they will depend on the degree of central bank discretion as well as on the produced externalities, which can be different country by country and situation by situation.

Then given the probability of a bad event, the social costs of miss-management **MS** will depend on the degree of CBD, given the vulnerability factor **D:**

$$\boldsymbol{SC = pDY} \qquad (4)$$

The vulnerability can depend on different drivers. Let us zoom on the role of moral hazard. Among bankers the moral hazard is more likely to increase the greater the central bank discretion is. The number of risky bankers increases and every mistake in liquidity management is more costly. Then we assume that the vulnerability depends on CBD through a moral hazard parameter **d**:

$$\boldsymbol{D = dY} \qquad (5)$$

Given (5), the social costs became:

$$\boldsymbol{SC = pdY^2} \qquad (4^)$$

Alternatively expression (4^) can be defended just noting that the costs of a central bank failure are typically no linear (monetary costs, reputation costs, and the likes).

Therefore we have:

$$\boldsymbol{U = (1-p)bY - pdY^2 - c + cY}$$

And the optimal level y* of the CBLD will be equal to:

$$\boldsymbol{Y^* = \frac{(1-p)b + c}{2pd}}$$

The CBD optimal level y* will depend on:

1) Market Vulnerability costs, which decreases the optimal CBD:

$$\frac{\delta Y^*}{\delta d} = -\frac{(1-p)b + c}{2p\ d^2} < 0$$

2) Public Failure costs, , which decreases the optimal CBD :

$$\frac{\delta Y^*}{\delta p} = -\frac{(b+c)}{2p^2 d} < 0$$

3) Free banking costs, , which increases the optimal CBD:

$$\frac{\delta Y^*}{\delta c} = \frac{1}{2pd} > 0$$

4)Banking Stability gains, , which increases the optimal CBD:

$$\frac{\delta Y^*}{\delta b} = \frac{(1-p)}{2pd} > 0$$

6.2 TRADITIONAL VIEW: CENTRAL BANKING AND OPTIMAL MONETARY ACTIVISM

In this section we discuss the role of central bank as a macroeconomic active agent, using basically the same theoretical framework introduced in the previous section.

Now we consider the central bank as the monetary policy authority, i.e. the agent designated by the society to manage the anticyclical policy tools in an active way in order to pursue the macroeconomic stability .In the traditional view the key concept is "managed money" [134]. The Keynesian concept of aggregate demand management for business cycle stabilization was definitively accepted after the Second World War; the central bank became definitively a governmental agency, whose main task was the monetary management in the public interest [135]. But how much the central bank activism (CBA) in managing the policy kit have to be extended?

Being in the traditional framework – see Section Four - n order to model the issue let us assume that the degree of CBA is equal to the level of flexibility in managing the price convertibility σ, where **0<σ<1**. Citizens are the principals who demand CBA and the incumbent government is the agent which establishes the central bank activism, supplying it.

Citizens care about the optimal level of CBA according to a usual well-behaved concave function **u = U (σ)**: social welfare increases with the level of CBD. Linear preferences are used:

$$U(\sigma) = y \qquad (1)$$

Here we adopt the *helping hand* (HH) *view* of the policymaker's type: she wishes to please citizens rather than a particular constituency or lobby. The government needs to provide enough utility to the majority of voters; then her utility function is the social welfare function ***U***. The government (**G**) would like to establish the optimal level of σ. The government knows pros and cons of different levels of CBA.

The CBA is usually supported by arguments related to the possibility to use the policy instruments to prevent and fix market failures. Setting up an active authority reduces the risks of macro instability. Therefore the government G knows that a greater activism of the central bank (**CB**) means potential stabilization gains, following the Keynesian insights. As Modigliani wrote [136] , the Keynesians "accept (…) the fundamental message of the General Theory: that a private enterprise economy using an intangible money needs to be stabilized, can be stabilized, and therefore should be stabilized by appropriate monetary (…) policies". Appropriate monetary policies implies activism; Keynes himself claimed that " I believe that (…)

[134] Giannini 2004, chapter Five.
[135] Giannini 2004, chapter Five.
[136] Bibou 2001.

with a powerful central bank it would be much better to leave the management of the reserves of the central bank at its own discretion than to lay down by law what it should do" [137].

At the same time the government G acknowledges that an active central banker can design and/or implement wrong policy actions, with related potential instability losses. The crucial argument for this point of view is that if the central banker is the active manager a risk of public failure can emerge. If a public authority can manage discretionally the monetary and banking instruments can cause greater cyclical movements, instead of smoothing them. The risks in having active central bankers have been stressed in the Monetarist View. Again following Modigliani :" Monetarists (…) take the view that there is no serious need to stabilize the economy; that even if there were a need, it could be done, for stabilization policies woud be more likely to increase than to decrease instability" [138] . The Monetarist forefather Milton Friedman wrote: "Any system which gives so much power and so much discretion to a few men (…) is a bad system. (…) To paraphrase Clemenceau: money is too much serious a matter to be left to the central bankers" [139] . The risk of public failure is therefore the crucial issue in the decision of how much active the central bank action can be.

The optimization problem of the **G** can be simply described as follows. If the central bank doesn't exist, the G will face potential instability costs I**C.** We suppose that the instability costs are inversely proportional to the level of CBA:

$$IC = c(1 - o) \qquad (2)$$

Here it is interesting to note that the each government G can have different a priori on the dimension of the instability costs, depending on how relevant are the market failures in absence of stabilization policies. For the sake of simplicity we can consider the existence of two types of government. The Keynesian government, which fears the failures as an endemic feature of a market economy, considers that the potential costs tend to be high. The Monetarist government, which trusts in the intrinsic and endogenous market stability, evaluates the instability costs are systematically low.

At the same time the government G knows that the more the central banker is involved in active management the greater is the risk of public failure in his/her policy action. We assume that from the policymaker's point of view the political costs of implementing a CBA regime will depend on her expectations of facing situations where the central bank can implement a policy in a suboptimal way (monetary miss-management event **MME**). Therefore the more the MME is likely to occur the greater the risks of suffering the consequences of a central banker mistake. Let us suppose that the probability of a

[137] Bibou 2001.
[138] Bibou 2001.
[139] Bibou 2001.

MME is equal to **p.** Here we can wonder which can be the possible drivers of a public failure: the first - albeit not unique – answer can be the quality of the central banker.
Again we can disentangle the two types of government. The Keynesian government, which is confident in the public capacity to pick up a good central banker, considers that the probability of mistakes is low. The Monetarist government, which fears the public policy failures, evaluates the probability of bad events systematically high.

Therefore two different situations may arise. If a MME doesn't occur, the central bank action will produce just social gains. We suppose that the social benefits **SB** are proportional to the central bank discretion:

$$SB = (1-p)b\sigma \qquad (4)$$

If a MME occurs, the risk of central bank misconduct will be different from zero and it will depend on the overall setting. In other words, given the probability of a bad event, the costs of misconduct **MS** will depend on the degree of CBA, given the pro-cyclicality parameter **d:**

$$MC = pd\sigma^2 \qquad (5)$$

The costs of misconduct are non- linear, given the well- known externalities produced by stabilization failures (for example, uncertainty and inflation costs). The optimization problem of the government can be illustrated as follows. Therefore we have:

$$U = (1-p)b\sigma - pd\sigma^2 - c + c\sigma$$

And the optimal level σ* of the CBD will be equal to:

$$\sigma^* = \frac{(1-p)b + c}{2pd}$$

The CBA optimal level σ* will depend on:

1) the overall setting:

$$\frac{\delta\sigma^*}{\delta d} = -\frac{(1-p)+c}{2pd^2} < 0$$

2) Public failure: greater probability of central bank failures – i.e. p increases – is associated with less CBA:

$$\frac{\delta\sigma^*}{\delta p} = -\frac{(b+c)}{2p^2 d} < 0$$

3) Market Failure costs: greater externality – c increases – is associated with more CBD:

$$\frac{\delta\sigma^*}{\delta c} = \frac{1}{2pd} > 0 \qquad \frac{\delta\sigma^*}{\delta b} = \frac{(1-p)}{2pd} > 0$$

6.3 MODERN VIEW: MONETARY POLICY AND CENTRAL BANK GOVERNANCE

6.3.1 Economics

The dominant monetary policy theory of the last three decades claimed that monetary policy and central banking are two sides of the same coin: the central banker is essentially a monetary policy agent, primarily focused on macroeconomic stabilization, which can be pursued by targeting as main goal the monetary stability and steering short-term interest rates.

Such as mainstream can be briefly described using the principal-agent terminology. The citizens, who represent the principal, realized that on average politicians in charge tend to use monetary policy tools to obtain short term macroeconomic goals, that can be time to time specific and/or intertwined: to exploit a short-term inflation-growth and employment trade-off; to fix public finance problems; to bail out banks.

The underlying assumption is that politicians are short-sighted, maximizing the probability to remain in office. Therefore, politicians tend to use monetization to address urgent short term macroeconomic problems. But the more the markets are forward-looking, rational and efficient, the more it is likely that monetization policies produce net permanent negative outcomes, both in terms of macroeconomic performances – such as price inflation and volatility, uncertainty, fiscal and banking indiscipline – and incentives distortions – moral hazard in the behaviour of the political actors and/or banking actors.

The association between political incentives in governing monetary policy and negative macroeconomic performances can be defined the monetary policy politicization (MPP) phenomenon.

As citizens realize the existence of the MPP, the politicians in charge are no longer able to exploit the short-term trade-offs and moreover suffer from a lack of credibility. Any monetary policy announcement is likely to be time inconsistent.

To cope with the credibility and time inconsistency problems, the efficient solution is to change the rules of the game: monetary policy is delegated to independent central banks, where unelected public officials with long terms of office conduct monetary policy with a view to safeguarding the primary goal of monetary stability. Since they are held accountable only with respect to the achievement of this goal, which the public understands, their monetary policy is credible in the eyes of the public and does not suffer from the time inconsistency problem. The establishment of an independent central bank eliminates the MPP risks. CBI and monetary policy credibility tend to go hand in hand (Bordo and Siklos 2015).

The more evident macroeconomic gain in having an independent central bank is considered the achievement of a stable and low inflation.

The central bank becomes the money supply manager, with a medium term orientation toward monetary stability. Consequently, for monetary policy effectiveness, it is crucial that the mandate of the central bank is well defined and established using three criteria. First, the primary goal of the central bank has to be monetary stability in order to avoid the short-term "inflationary bias". Second, the central bank must not finance public deficits and debt in order to avoid the "fiscal bias". Third, central bank involvement in financial regulation and supervision has to be designed in a way which avoids a "bank bail-out bias". Eliminating the three biases the MPP risks are addressed and fixed.

Following the same line of reasoning the central bank has to be protected from risks of political capture, by being granted functional, personal, operational and financial independence from government (Gerdesmeier et al. 2007). The financial independence perspective is closely linked with the central bank capitalization issue and therefore deserves a special attention (see below).

The independence requirements find their mirror and are in fact enhanced and rendered sustainable by ensuring that the central bank is strictly accountable on its actions in the pursuit of its mandate vis-à-vis the legislative and the public at large, which is also ensured through a number of provisions ensuring transparency and regular and formalized reporting procedures.

6.3.2 Political Economy

Here we analyse the relationships between central bank governance and monetary policy using a delegation framework, which we consider an efficient way to take into account the abundant, consolidated and still growing literature on the topic[140].

In doing so we adopt a political economy approach, arguing that the policymaker's actual choices related to the central bank governance are conditional on the economic and institutional environment existing at a given time, which in turn determines the political weights put on the pros and cons of CBI[141].

Our framework is based on two hypotheses. First of all, gains and losses of a given central bank setting are variables computed by the incumbent policymaker, who maintains or reforms the central bank regime following his/her own preferences. Secondly, policymakers are politicians, and as such, they are held accountable at elections for how they have managed to please voters. All politicians are career-oriented agents, motivated by the goal of pleasing voters in order to win elections. The main difference among various types of politicians concerns which kinds of voters they wish to please in the first place. Therefore, CBI is likely to change over time following political preferences, which are not automatically coincident with the social ones.

[140] For further details and the related references see Masciandaro and Romelli 2015. See also Alesina and Tabellini 2007. Here in the following notes further references are suggested.
[141] Updates of CBI indexes in Dincer and Eichengreen 2013.

Consider an economy with rational expectations and uncertainty**.** We suppose that the citizens dislikes the monetary settings where the incumbent governments can manage directly and discretionally the monetary policy[142]. The citizens know that the politicians may have an incentive to inflate the economy to address different kinds of macroeconomic shocks. In other words, politicians have an incentive to use systematically the inflation tax (MPP bias).

As a result, rational citizens fully anticipate this political inflation bias and the monetary policies risk to produce an inflation cost without any real gains. All the citizens, or at least the majority of the voters, dislike the use of the inflation tax and like monetary stability, which means that the government cannot use systematically inflation to change the income and wealth distribution. Hence, we are studying a democracy where citizens dislike the political inflationary biases.

As it has been already mentioned and being even more systematic, the MPP biases can be explained in several alternative and, at the same time, complementary ways:

a) First of all, there may be advantages – both for electoral and ideological reasons – brought by an inflationary policy (*partisan bias*);
b) Secondly, governments may try to increase the employment level (*employment bias*);
c) Thirdly, a fiscal temptation may arise: the government may have the incentive to use the monetary policy to make the costs of fiscal policies less onerous in economic or political terms (*fiscal bias*);
d) Fourthly, the government may have the temptation to bail out banks through monetization[143] (*banking bias*);
e) Finally, the government may have the incentive to use accommodative monetary policy to face balance of payment imbalances (*foreign exchanges bias***).**

In all these cases, the government gives a higher expected value to the short run benefits relative to the long run costs of the inflation tax. However, citizens understand the political bias and rationally adjust their expectations: in equilibrium, there is inflation above the social optimal level and no real effects. Therefore, if the government is the monetary policy authority, monetary policy is likely to be time inconsistent: no pre-announced monetary path is credible.

Here is where central bank independence comes in[144]. The CBI becomes a possible institutional device to face the political bias: the monetary policy is delegated to an unelected bureaucracy – the central bank – which is committed to pursue the monetary stability goal (conservativeness[145]) – i.e. to avoid any inflationary bias – and it is both independent from the government and accountable to the Parliament. The citizens acknowledge that the definition of the optimal level of CBI means to exploit the trade-off between

[142] On ageing and CBI see Farvaque et al. 2008. On social trust and CBI see Berggren et al. 2015.
[143] On the economics and empirics of inflationary bias in having monetary and banking powers' consolidation see Lima et al. 2016.
[144] On central bank independence as a special case of the general relationships between agency delegation and democracy see Strausz 2011, de Figueredo and Stiglitz 2015.
[145] On central bank independence and conservativeness see Berlemann and Hielscher 2016.

avoiding the inflationary bias in normal times and having a stabilization device in extraordinary times. The CBI becomes a necessary condition to implement any optimal monetary policy rule[146].

Citizens care about the effectiveness of the central bank regime according to a classic well-behaved concave function $u = U(y)$: social welfare increases with the optimal level of CBI. Linear preferences are used:

$$U(y) = y \qquad (1)$$

In a democracy, citizens assign to the elected policymaker the task of designing the optimal level of CBI, i.e. the setting that guarantees the monetary policy effectiveness. For the sake of simplicity, we suppose that the elected policymaker represents both the legislative and the executive powers, i.e. the interests of the majority of the Parliament and of the government in charge are perfectly aligned.

The incumbent policymaker is delegated by society to define and implement the optimal level of CBI[147]. The policymaker reward is based on how he/she (hereafter she) carries out her job, i.e. defining and implementing the level of CBI.

Our policymaker is a politician. We assume that the policymaker wishes to please the citizens; alternatively, we could also assume that the policymaker aim is to please specific constituencies, i.e. the lobbies. Nonetheless, in this paper, we adopt the *helping hand view* of the policymaker's type: she wishes to please citizens rather than a particular constituency or lobby (*grabbing hand view*). It will be interesting to demonstrate that, notwithstanding the policymaker wishes to please the citizens, the final outcome – the actual CBI – can be different from the social optimal one.

The level *y* of CBI is determined by the policymaker's ability Ω and by her effort *a*:

$$y = a + \Omega \qquad (2)$$

Let us describe the delegation framework. The sequence of events is as follows:

1) Society chooses to delegate to the policymaker the task of designing the optimal level of CBI;
2) Next, the policymaker chooses effort *a*, before knowing her ability Ω in implementing this particular task (building up CBI is not a usual nor a day by day operation);
3) The policymaker implements the CBI regime, revealing her ability Ω;
4) Citizens observe the CBI level, but not the relationship between effort and ability, since they cannot distinguish innate talent from contingent effort, and reward the policymaker for this task.

Coming back to the policymaker, her utility function, denote by $\mathcal{Z}_{HH}$, is defined as:

[146] On the relationship between CBI and the Taylor rule see Maslowska 2011b.
[147] On the CBI measurements see Maslowska 2011a.

$$Z_{HH} = R(U) - C(a), \qquad (3)$$

where $R(U)$ is the reward function and $C(a)$ is the cost function. The political reward is function of the social utility, while the political costs are function of the effort in implementing the task. The policymaker evaluates every task assignment while taking into account the political rewards and costs in doing so. Let us describe the three crucial features of the policymaker:

A) Ability: the ability of the policymaker is a random variable with the usual normal distribution (where we denote by Ω_{av} the mean);

B) Political Reward: The incumbent policymaker wishes to be re-elected. The government needs to provide enough utility to the majority of voters; then her utility function is the social welfare function *U*.

In general, the policymaker wishes to please voters and her goal is the alignment of interest between her and citizens. Then each delegated task – i.e. each specific alignment – can be more or less convenient from the policymaker's point of view in terms of political gains. We denote the political value she assigns to fulfil the specific task on CBI by β – with $0 \leq \beta \leq 1$. Therefore:

$$R(U) = \beta U$$

The incentives alignment between the policymaker and citizens is a necessary and sufficient condition to find the optimal behaviour of the policymaker. One more step is necessary to find out the effective political reward. The reward will be useful if the citizens' utility exceeds the minimum threshold of utility W that they expect from an incumbent government *(*political competition condition*)*. Citizens compare government performances with the expected performances of outside politicians. The political competition condition can be defined as follows:

$$R_{HH} = \beta \Pr(U \geq W) \qquad (4)$$

Therefore, the usefulness of the political reward will depend on condition (4).

C) Political Costs: The policymaker knows that if monetary policy is delegated to an independent bureaucracy committed to a monetary stability goal, rigidities in implementing accommodative policies (conservative veto player event) may arise: the inflation tax cannot be used to finance stabilization policies;

In other words, we assume that from the policymaker's point of view the political costs of implementing a CBI regime will depend on her expectations of facing at least one of five different situations calling for a lax monetary policy during her office, which cannot be implemented given the existence of a non-accommodative central banker:

1) Political shocks (PS**)**;
2) Unemployment shocks (ES);

3) Fiscal shocks (FS) [148].;

4) Financial shocks (FINS);

5) Foreign Exchanges shocks (FES)[149].

From the citizens' point of view, the government can be a natural scapegoat in each crisis, but she is not able to control monetary policy tools to implement the right short sighted policy. In each case, the government is likely to be blamed; political costs will arise.

Therefore, the policymaker's cost function can assume the following simple specification:

$$C(a) = ca^2 , \qquad (5)$$

where, $c = c_0 \mid c_1(probPS \mid probES \mid probFS \mid probFIN \mid probFE)$ and $prob$ represents a probability between zero and one that each shock occurs.

Thus, the political cost of the effort in establishing CBI depends on how the incumbent government is blamed when the shocks occurred, i.e. on the size of reputation losses.

When a shock occurs, citizens can be more or less sensitive to the use of accommodative policies. From the government's point of view, the crisis likelihood *per se* is not relevant, but its political cost affects her reputation. The reputation factor is represented by the parameter c_1. For the sake of simplicity, we assume: a) that the negative effect on the government's reputation is the same irrespective of the type of shock; and b) the shocks are independently distributed[150].

We will see in what follows that the size of the reputational costs can determine the difference between the optimal CBI and the actual one. As a result, for the incumbent policymaker the political cost in building up a CBI regime is represented by the likelihood of facing a macroeconomic crisis without the possibility of implementing the desired *ad hoc* short sighted monetary policy.

We can now use this theoretical skeleton to mimic the evolution of the central bank governance in advanced countries before and after the Crisis[151].

Establishing a level of CBI is a two-step process: (i) defining the policymaker effort and (ii) evaluating the level of CBI. In defining her optimal effort a_1, the policymaker maximizes her objective function. Then her ability Ω_{HH} becomes evident, the level of CBI can be evaluated using the CBI equation (2) and her final political reward can be calculated using the political competition equation (4). It follows that the policymaker maximizes social welfare net of costs of executing the task:

$$Max\ \Sigma_{HH} = R(U) - c(a_1) ,$$

where,

[148] On the relationships between fiscal deficits and CBI see Burdekin and Laney 2016.
[149] On a recent case of foreign exchange and CBI see Gurnaynak et al. 2015.
[150] In the real world the shocks can be intertwined, and consequently the pressures in changing the central banking setting are likely to be even more relevant; on the interconnections between banking and fiscal shocks see Bordo and Meissner 2016.
[151] On Latin America see Jacome 2015. On West Africa see Kireyev 2015.

$$R(U) - c(a_1) = \beta U - c(a_1)$$

Given that the level of social utility is equal to the level of CBI, which is function of the policymaker effort, it is evident that both the rewards and the costs depend on the effort:

$$\beta(a_1 + \Omega) - ca_1^2$$

From the first order condition the optimal effort will be:

$$\frac{\delta z_{HH}}{\delta a_1} = \beta - 2ca_1 = 0$$

implying that:

$$a_1 = \frac{\beta}{2c_1}$$

Given a_1, the effective political reward of the policymaker will depend on the condition of political competition (4):

$$R_{HH} = \beta \Pr(U \geq W)$$

Voters are rational. They realise that the alternative to re-electing the incumbent policymaker is to get another politician with average ability. Given their expectations a^e on effort, it follows that:

$$W = a^e + \Omega_{AV}$$

Then:

$$R_{HH} = \beta \Pr(\Omega + a_1 \geq \Omega_{AV} + a^e)$$

$$R_{HH} = \beta \Pr(\Omega - \Omega_{AV} \geq a^e - a_1) \qquad (5)$$

Nature chooses the ability of the incumbent policymaker, Ω_{HH}. It follows that:

$$R_{HH} = \beta \Pr(\Omega_{HH} - \Omega_{AV} \geq a^e - a_1) \qquad (6)$$

When expectations are perfectly matched ($a^e = a_1$), the effective political reward will be positive if the ability of the incumbent policymaker is greater than average:

$$\Omega_{HH} > \Omega_{AV} \qquad (7)$$

The equilibrium level *y* of the CBI will be determined by the policymaker's ability Ω_{HH} and by her effort a_1:

$$y_{HH} = a_1 + \Omega_{HH} = \frac{\beta}{2c_1} + \Omega_{HH} \qquad (8)$$

Given the exogenous policymaker ability, on one hand the level of CBI depends on how politically relevant it is for the government to build up a central bank regime pleasing the majority of voters, which dislikes the inflation tax as economic policy tool. In other words, the policymaker's perception of the relevance of the central bank setting matters. On the other hand, the government takes into account the expected costs of facing a conservative veto player in monetary affairs when macroeconomic shocks have to be addressed.

The parameter c_1 can be easily used to show under which conditions the actual level of CBI is different from the social optimal one. In fact, we can suppose that the citizens acknowledge the need in extraordinary times to address shocks using the inflation tax, which is perfectly consistent with the aim to

avoid in normal times the inflationary bias. The social optimal value of the reaction parameter c_1^{soc} is different from zero: for the sake of simplicity, we can assume that:

$c_1^{soc} = 1$.

Now, if the reputational costs for the government in facing macroeconomic shocks is particularly high, it is likely that $c_1 > c_1^{soc}$. Consequently, the actual level of CBI designed by the policymaker will be lower than the social optimally one.

Which was the situation before the Crisis? In three decades before the 2008 financial meltdown safeguarding monetary stability became a primary goal in many advanced, emerging and less developed countries alike and CBI was the selected institutional device to rise the commitment in avoiding the use of the inflation tax. The expected high political gains pushed several governments all around the world to enhance the degree of CBI in their countries, accepting to restrict their future freedom in using the inflation tax through the presence of a veto player. The monetary policy action was associated with less variance of both inflation and output.

Then the Crisis came. It is possible to identify the potential drivers of a CBI reform after the 2008 financial meltdown[152]? In general, we assume that gains and losses of a CBI regime are variables computed by the incumbent policymaker, who maintains or reforms the central bank regime, following her preferences. Therefore, any situation that influences the policymaker's gains and costs in changing the monetary regime can produce incentives to modify the CBI level.

First, consider the case in which society's aversion against inflation is decreasing. In our model, this would correspond to a decrease in the parameter β, which would, in turn, decrease the gains from maintaining/adopting a high level of CBI. Nowadays in advanced economies both inflation and inflation expectations seem to be stable at low but positive levels and the same it is true for inflation volatility[153]. Thus, a pressure from voters to increase the level of CBI is unlikely. Furthermore, if deflation becomes a concrete macroeconomic problem, political pressures can arise in order to reduce the central bank's conservativeness[154] and/or the CBI.

Second, any situation that changes the policymaker's political costs c_1 in reforming the monetary regime can produce incentives to modify the degree of CBI. The policymaker's incentives to decrease the level of CBI in order to be able to implement monetary accommodation are likely to increase if the incumbent governments are facing macroeconomic shocks. Our theoretical model discusses five types of macroeconomic shocks likely to influence the policymaker's costs. In the post-crisis period, three of these

[152] On CBI after the Crisis see Cecchetti 2013, Bayoumi et al. 2014, Buiter 2014, Fisher 2015, Williams 2015, Masciandaro and Romelli 2015, Balls et al. 2016, Aklin and Kern 2016. On central bank governance after the Crisis see Nier 2009, BIS 2011, Khan 2016.

[153] On the possibility of an inflationary bias in the Euro area monetary policy see Beccarini 2016.

[154] On the opposite side it has been claimed that central bank conservativeness can be a device against liquidity trap and deflation risks; see Taisuke and Shmidt 2015; on deflation and central banking see Eichengreen 2015.

have had a larger weight: 1) public deficit financing, 2) unemployment shocks and 3) financial shocks[155]. The large public deficits and unemployment rates, which characterised many advanced and emerging economies alike in the post-crisis period, are likely to have exerted a great influence on the political costs associated with a high level of central bank independence creating thus incentives to decrease the level of CBI.

In conclusion, our simple theoretical framework highlights how changes in either political and/or citizen preferences can explain the ups – before the Crisis – and downs – after the Crisis – in the level of independence. In the next section, we investigate empirically if the evolution of CBI prior and post the Global Financial Crisis is in line with our theoretical arguments.

Alternatively we can use a *grabbing hand* (GH) *view* of the political actor. According to the grabbing hand approach, policymakers are motivated by the aim to please the interest of specific, well-defined voters in order to win elections. In our case, the financial industry may be considered a highly organised and powerful interest group which can influence political competition.

The financial industry is likely to be a smaller and more coherent group than the consumers of their services, and therefore politically better organised. The GH policymaker, in defining the central bank regime, depends on the financial industry view of CBI, if this can strongly determine her/his re-election (hereafter his). For the point of the policymaker any misalignment compared to public preferences in order to be consistent with lobby preferences can be considered only if a potential political reward emerges.

The preferences of the financial constituency can be written as:

$$V = (1+\delta)y_2 - f \qquad (8)$$

The parameter δ represents how different the importance of the CBI goal for the financial constituency is compared to other citizens. The more the financial industry is interested in establishing a more independent central bank regime (**conservativeness attitude**) the greater the parameter $\delta \geq 0$ will be. At the same time it is possible that the financial industry dislikes a CBI regime. In this case its conservativeness propensity is negative – i.e. the inflationary propensity is positive – and $\delta \leq 0$.

The parameter *f >0 (***lobbying commitment***)* represents the capturing costs. The financial industry can invest an amount of resources in campaign contributions, which can potentially change the chances of re-election of the incumbent policymaker. Campaign contributions can be contingent upon the effort of the

[155] Financial stability consideration can trigger changes in the central bank conservativeness; Chortareas et al. 2016 empirically show that central banking acting in both the monetary policy and bank supervision functions are less conservative that those with only a price stability mandate. On the preferences of supervisors regarding alternative supervisory settings, in the case of the European Single Supervisory Mechanism (SSM) see Lombardi and Moschella 2016.

policymaker; for simplicity $\boldsymbol{f} = \boldsymbol{k}\boldsymbol{a}_2$. The parameter k represents the **lobbying cost** of the financial industry: the greater the necessary investment to implement campaign contributions the higher the value of the parameter will be. The alignment between the lobby's wishes and the politician's conduct is costly.

The purpose of campaign contributions is to influence the incumbent's chances of winning elections. Let us assume that the policymaker's effort $\boldsymbol{a}_2$ devoted to implementing the central bank regime is observable by financial professionals, given that they can be considered insider agents compared to other citizens.

The GH policymaker chooses his effort while taking into account the lobby goal function. The GH policymaker needs to provide enough utility to the financial lobby. He will align his function with the interests of the financial industry. The reason is simple: the GH policymaker knows that campaign contributions can reduce the political competition in his favour, although the effect on voters is stochastic.

This assumption can be simply represented by suggesting that the lobby is able to influence voters' reservation utility using campaign contributions:

$$\boldsymbol{W}^{'} = \boldsymbol{a}^{\boldsymbol{e}} + \Omega_{\boldsymbol{AV}} - \boldsymbol{M}$$

The variable **M** represents the **voting effect** of campaign contributions on voters. We can suppose that the voting effect is stochastically distributed:

$$\boldsymbol{M} = \boldsymbol{m}\boldsymbol{f}$$

Where **m** is a random variable with standardized normal distribution $(0;1)$. The campaign contributions may change the incumbent government's chances of remaining in charge modifying citizens' reservation utility. In general the effect of campaign contributions on voter sentiment is uncertain. The GH knows *ex ante* that if he pleases the financial industry he certainly gains its favour – i.e. contributions – while voter reaction is uncertain. The incumbent government being supported directly or indirectly by the financial industry can produce a mixed reaction in voter sentiment; the final effect is unknown *ex ante*. Nature determines *ex post* if the political effect of campaign contributions implemented by the financial industry is positive, neutral or negative, i.e. $0 \leq \boldsymbol{m}_{\boldsymbol{GH}} \leq 0$.

Returning to the policymaker, his utility function $\boldsymbol{Z}_{\boldsymbol{GH}}$ is defined as:

$$\boldsymbol{Z}_{\boldsymbol{GH}} = \boldsymbol{R}(\boldsymbol{V}) - \boldsymbol{C}(\boldsymbol{a}) \qquad (3)$$

The GH policymaker reward function depends on the financial industry function *V*. As usual, we denote the political value he assigns to fulfil the specific mandate on CBI with β; therefore:

$$\boldsymbol{R(V) = \beta V}$$

We assume that from the GH policymaker's point of view, the political costs of implementing an increasing level of CBI are the usual ones, i.e. the cost function assumes the same specification (5):

$$\boldsymbol{C(a) = ca^2} \qquad (5)$$

Therefore, given the utility function $\boldsymbol{Z_{GH}}$ of the GH government, his optimal behaviour will be the result of the following maximization:

$$\max Z_{GH} = \max\left[R(V) - c(a_2\right]$$

Where:

$$\boldsymbol{R(V) = \beta V = \beta\left[(1+\delta)y_2 - f\right] = \beta\left[(1+\delta)(a_2 + \Omega) - ka_2\right]} \qquad (8)$$

Given the cost function (5) we have:

$$\boldsymbol{R(V) - C(a_2) = \beta\left[(1+\delta)(a_2 + \Omega) - ka_2\right] - c(a_2{}^2)}$$

It follows that the GH policymaker maximizes the financial industry welfare net of costs of executing the task. From the first order condition:

$$\frac{\delta Z_{GH}}{\delta a_2} = \beta\left[(1+\delta)\right] - 2ca_2 = 0$$

The optimal effort will be:

$$\boldsymbol{a_2 = \frac{\beta(1+\delta-k)}{2c}}$$

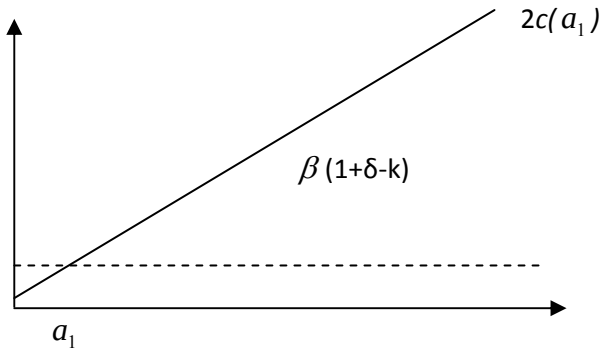


Figure 5

Figure 5 describes the marginal reward function and the marginal cost function of the policymaker (vertical axis); as in the previous case only the latter depends on effort (horizontal axis).

Given α_2, the effective political reward of the GH policymaker will depend on the condition of political competition (4):

$$R_{GH} = \beta \Pr\left(U \geq W'\right)$$

Where:

$$W' = a^e + \Omega_{AV} - m_{AV} f$$

$$W' = a^e + \Omega_{AV}$$

Then:

$$R_{GH} = \beta \Pr\left(\Omega + a_2 \geq \Omega_{AV} + a^e\right)$$

$$R_{GH} = \beta \Pr\left(\Omega - \Omega_{AV} \geq a^e - a_1\right) \qquad (4c)$$

Comparing conditions (4a) and (4c) it is evident that the HH policymaker and the GH policymaker face the same condition *ex ante*. Both agents wish to pick up their optimal effect, given that they do nOt know their ability and in the case of the GH policymaker he does not know the final effect of lobbying activity on voters.

Nature chooses the ability of the incumbent policymaker Ω_{GH}. It follows that the effective reward will be:

$$R_{GH} = \beta \Pr\left(\Omega_{GH} - \Omega_{AV} \geq a^e - a_2 - m_{GH} k a_2\right)$$

When expectations are perfectly matched $\left(a^e = a_2\right)$ the effective political reward will be positive if the ability of the incumbent policymaker is greater than average, taking into account the *ex post* effect of campaign contributions:

$$\left(\Omega_{GH} > \Omega_{AV} - m_{GN} k a_2\right) \qquad (4d)$$

The equilibrium level *y* of CBI will be determined by the GH policymaker's ability Ω_{GH} and by his effort α_2:

$$y_{GH} = a_2 + \Omega_{GH} = \frac{\beta(1+\delta-k)}{2c} + \Omega_{GH} \qquad (9)$$

Finally we can compare the two policymakers. Given the ability of the government and comparing (8) and (9) we have the effect on CBI of different types of policymaker. From

$$y_{HH} = a_1 + \Omega_{HH} = \frac{\beta}{2c} + \Omega_{HH} \qquad (8)$$

$$y_{GH} = a_2 + \Omega_{GH} = \frac{\beta(1+\delta-k)}{2c} + \Omega_{GH} \qquad (9)$$

If $\Omega_{HH} = \Omega_{GH}$

We have that:

$y_{HH} > y_{GH}$ if $k - \delta > 0$

When the financial industry is conservative – i.e. $\delta \geq 0$ - the CBI level is greater when the government is HH type rather than GH type if the lobbing cost is higher compared to the conservativeness propensity of the financial industry. The HH policymaker implements an increasingly higher level of CBI compared to the GH policymaker when the financial lobby likes inflation - $\delta \leq 0$.

In general a high level of CBI can reflect two very different situations: the agreement in society about lowering inflation – i.e. the HH policymaker is in action – or alternatively the fact that the financial industry as a predominant social group prefers low and stable inflation – i.e. the GH policymaker is active.

6.3.3 Institutions

How to measure the CBI in a specific country? For our purposes, the huge literature on the CBI measurement can be described as follows. (Masciandaro and Romelli 2015).

The literature on CBI generally uses two different strategies to capture the degree of independence of a central bank: a) indices based on central bank legislation (de jure), or b) on the turnover rate of the central bank governor (de facto).

De jure indices are more likely to capture the degree of CBI for several reasons. First, turnover rates relate the independence of central banks to the autonomy of their governors. While extensively used, this approach has been shown to be less robust in empirical estimations as compared to the GMT index of legal independence (Maslowska, 2011a). Second, the legal measures of CBI are more likely to reflect the true relationships between the central bank, the policymakers and the bankers especially in countries where the rule of law is more strongly embedded in the political culture, as in many developed economies (De Haan et al. 2008). Thirdly, being nowadays relevant to capture the change, if any, in the level of CBI post 2008, and given that many post-crisis reforms have been related to the involvement of the central bank in supervision, it is more efficient to restrict our attention to de jure indices that can capture such changes (Masciandaro and Romelli 2015).

Two are the main dimensions along which the de jure CBI is usually measured: political and economic CBI. Political CBI refers to the autonomy given to the central bank in the design and implementation of policies consistent with the monetary stability goal. Economic CBI is related to the freedom of the central bank in choosing the set of tools consistent with its monetary policy strategy. Therefore, more central bank involvement in supervision can weak the priority of monetary stability and, as a result, lowers the degree of independence of the central bank.

Despite the wealth of research on CBI indices, the only measure of de jure CBI that differentiates between political and economic CBI, as well as provides information on the involvement of the central bank in banking supervision is the Grilli et al. (1991) index (GMT). Moreover, the inclusion in the GMT index of non-statutory factors that influence the degree of de facto independence, has been shown to strengthen the explanatory power of this index as compared to other indices of de jure CBI (see Maslowska, 2011).

The political CBI index is based on a binary code is assigned to eight different features that sum up the capacity of the central bank to define the monetary policy strategy (goals) consistent with the monetary stability without political interferences. The index captures three characteristics of the central bank governing bodies: a) the appointing procedures ; b) the relationships with the government; c) the formal responsibilities.

The economic CBI index is based on a binary code is assigned to seven different features that sum up the capacity of the central bank to define the monetary policy tactic (tools) consistent with the monetary stability without political interferences. The index captures three main aspects concerning the central bank tool kit: a) the possibility to avoid public finance monetization; a) the autonomy in the interest rate setting; the central bank specialization as monetary policy actor, i.e. without banking policy responsibilities.

The GMT Indexes has been calculated from the period 1972-2010 (Romelli 2015), i.e. the post Bretton Woods years. Here we focus our attention on a sample of ten advanced economies (Tables 1 and2).

Table 1.1: GMT Political Independence (1972-2010)

Countries	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	Pol. Indep.
1972									
Australia		*					*		2
Canada	*	*					*		3
France		*			*				2
Germany		*		*	*	*	*	*	6
Italy	*	*	*		*				4
Japan							*		1
New Zealand									0
Switzerland		*			*	*	*	*	5
United Kingdom					*				1
United States				*	*	*	*	*	5
2010									
Australia		*					*		2
Canada	*	*					*		3
France	*	*	*	*	*	*	*	*	8
Germany	*	*	*	*	*	*	*	*	8
Italy	*	*	*	*	*	*	*	*	8
Japan							*		1
New Zealand					*		*		2
Switzerland		*		*	*	*	*	*	6
United Kingdom					*		*	*	3
United States				*	*	*	*	*	5

Note: (1) governor appointed without government involvement; (2) governor appointed for more than five years; (3) CB board (CBB) appointed without government involvement; (4) CBB appointed for more than five years; (5) no mandatory participation of government representatives in the CBB; (6) no government approval is required for formulation of monetary policy; (7) CB legally obliged to pursue monetary stability as one of its primary objectives; and (8) legal protections that strengthen the CB's position in the event of a conflict with government.
Source: National legislation.

Source: Romelli 2015

Table 1.2: GMT Economic Independence (1972-2010)

Countries	(1)	(2)	(3)	(4)	(5)	(6)	(7)	Econ. Indep.
				1972				
Australia	*	*	*	*		*		5
Canada	*	*	*	*		*	**	7
France				*	*	*	*	4
Germany	*	*	*	*	*	*	*	7
Italy				*				1
Japan	*		*			*	*	4
New Zealand			*	*		*		3
Switzerland		*	*	*	*	*	**	7
United Kingdom	*	*	*	*		*		5
United States	*	*	*	*	*	*	*	7
				2010				
Australia	*	*	*	*		*	**	7
Canada	*	*	*	*		*	**	7
France	*	*	*	*	*		*	6
Germany	*	*	*	*	*		*	6
Italy	*	*	*	*	*			5
Japan	*		*			*	**	5
New Zealand		*	*	*	*	*		5
Switzerland	*	*	*	*	*	*	**	8
United Kingdom	*	*	*	*	*	*	**	8
United States	*	*	*	*	*	*	*	7

Note: (1) no automatic procedure for government to obtain direct credit from CB; (2) when available, credit is extended to government at market interest rates; (3) credit is temporary; (4) and for limited amount; (5) CB does not participate in primary market for public debt; (6) CB responsible for setting policy rate; and (7) CB has no responsibility to oversee banking sector (two points) or shares responsibility with other institutions (one point).
Source: National legislation.

Source: Romelli 2015

Finally, the independence of a central bank will depend also on its autonomy in governing the budget. The intuition is simple: the financial strength is a necessary condition to avoid that the risks of MPP are channelled through the financial and accounting rules concerning the central bank budget. The evaluation of the FED financial CBI will can be implemented using the ECBI Index (Romelli 2015, Masciandaro and Romelli 2016).

The ECBI Index evaluates three sets of rules - i) the conditions for capitalization and recapitalization (provisions *a, b* below), ii) the determination of the central bank budget (provisions c,e,f,g,h) and iii) the arrangements for profit distribution and loss coverage (provisions d,i,j,k,l) – evaluating twelve different procedures. The level of financial CBI will increase if (in branches the rationale, as well as the US situation):

a) The central bank statute describes precisely the provisions relating to the payment of the initial capital (less political discretion means less MPP risks; US case=YES)

b) The central bank statute quantify precisely the authorized capital of the central bank (less political discretion means less MPP risks; US case=NO)

c) The central bank financial autonomy is explicitly mentioned in the legislation (less political discretion means less MPP risks; US case=NO)

d) The recapitalization is automatic, i.e. capital contribution is allowed upon the central bank request (less political discretion means less MPP risks; US case=NO)

e) Any transfer of money from the Treasury to the central bank needs an explicit legislative act (less political discretion means less MPP risks; US case=YES)

f) The central bank has the exclusive right to determine and approve its annual budget (less political discretion means less MPP risks; US case=YES)

g) The adoption of the central bank annual balance sheet belongs exclusively to the central bank governing bodies (less political discretion means less MPP risks; US case=YES)

h) The accounts of the central bank are subject to the control of a state agency of auditing (more accountability means less MPP risks; US case=NO)

i) The law/central bank statute disciplines the allocation of the net profits of the central bank (less political discretion means less MPP risks; US case=YES)

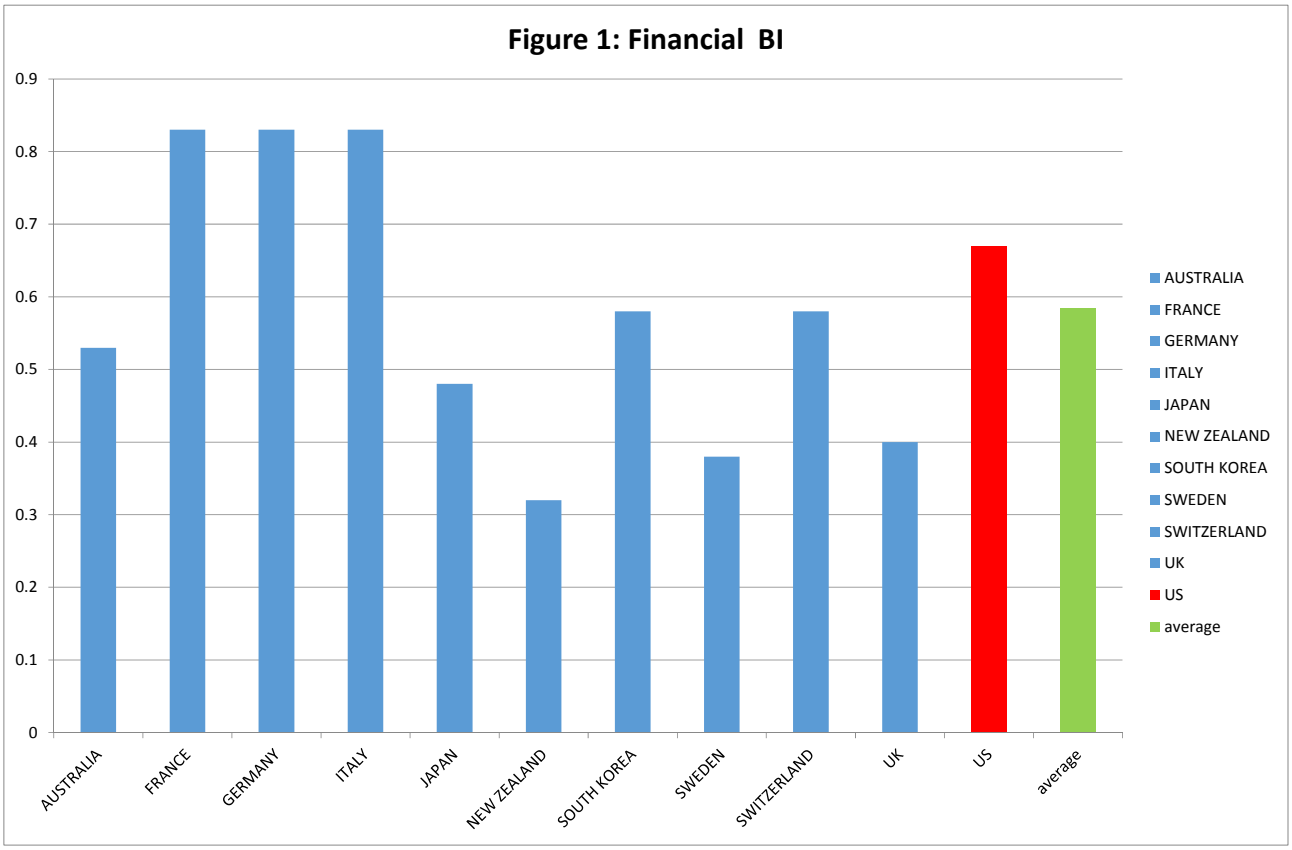
j) The central bank has the exclusive right to determine the allocation of profits to the general reserves (less political discretion means less MPP risks; US case=YES)

k) It is banned the possibility that the shareholders can receive partial payments before the end of the fiscal year (less political discretion means less MPP risks; US case=YES)

l) It is banned the possibility that unrealized profits can be included in the calculation of distributable profits (less political discretion means less MPP risks; US case=YES)

Given the twelve indicators, the level of the FED financial CBI in 2014 is equal to 0.67 (eight provisions on twelve increase the financial CBI. In general, if the legal procedures just specify that the government may provide – but it is not obliged – guarantees with regard to the loss coverage, the financial CBI is lower.

The distribution of the financial CBI is as follows (Figure 1):



Given the provisions relating to the payment of the initial capital, the profit distribution rules lead to the creation of reserves in order to absorb prima facie potential losses. Profit distribution (earnings) and reserves represent the first loss absorbers, being the capital the ultimate one.

Therefore in each institutional setting the relevance of the stock issuing procedures will be inversely associated with the effectiveness of the two first loss buffers. Weaker profit distribution and reserve rules will increase the likelihood of capital depletion.

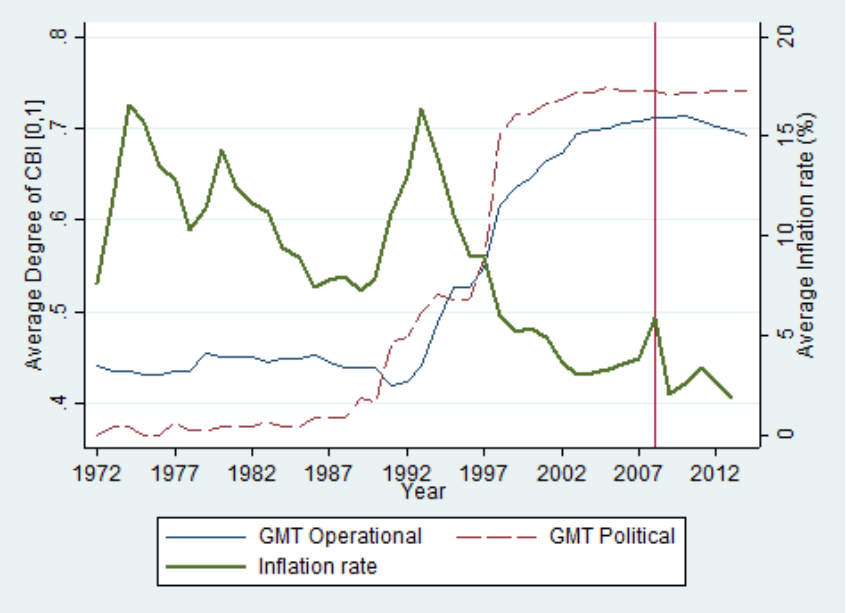
Other things being equal, the financial CBI will be higher the higher will be the autonomy of the central in determining the profit distribution and the reserve allocation. When value or percentage are defined in the legal setting, the financial CBI will be higher the lower is the value/percentage of the current net profit that have to be distributed and the higher the value/percentage of such as net profit that have to be allocated to reserves.

Finally the capital depletion can be mitigated or fixed before to implement a recapitalization offsetting carried losses against future profits. Using the future payments the central bank makes to its owners can be viewed as a mechanism through which the central bank shareholders can *de facto* inject capital into the central bank (Buiter 2008).

The three options to avoid explicit recapitalization - reallocation of present profit distribution,

creation of reserve buffers, use of future profits – are not mutually exclusive and can be used in combination, as well as in sequence (Bunea et al. 2016). Therefore a "one size fits all" model doesn't exit.

The GMT indexes can be fruitfully used to evaluate the evolution of CBI over the past decades. The evolution of the GMT index in a sample of 45 countries over the period 1972 and 2014 is presented in Figure 2:



Source: Masciandaro and Romelli 2015

Figure 2 highlights several important trends, that can be interpreted using a political economy assumption: the CBI dynamics depend on the political cost and benefit analysis in having in charge an independent central bank, i.e. a monetary veto player. Other things being equal, the more is costly/beneficial for the incumbent policymakers to face a money supply manager against the money politicization, the more likely are reforms that reduce/increase the CBI.

Prior to the 2008 Crisis a clear trend towards an increase in the level of both the political and economic CBI is evident. The most striking feature is present in the early 1990s where, together with a spike in the average inflation rate, we see a significant rise in the level of CBI. This coincides with the break-up of the USSR, which resulted in the inclusion in the sample of several economies experiencing high inflation and which implemented significant reforms in their monetary policy institutions throughout this period. The period also coincides with the European Union integration process and the creation of the ECB that required members to implement legislative reforms aimed at assigning their central banks a level of independence similar to the one of the Bundesbank, the highest at the time. Further, in this period the

establishment of an independent central bank became an external prerequisite to maintain or gain access in the financial markets.

From this point on, a transition to a period of more stable and low inflation followed. This, as clearly depicted in Figure 1, corresponded to a levelling in the degree of CBI.

Furthermore, a clear reversal in the level of CBI is noticeable following the 2008 Crisis. This trend is captured by the degree of economic CBI (GMT Operational in Figure 1), since this index is the one capturing the evolution of central bank involvement in banking supervision. Thus, in line with the theoretical assumptions, the post-crises period, which corresponds to a very low inflation aversion and, at the same time, a high probability of experiencing macroeconomic shocks, is associated with a trend towards decreasing the level of independence of central banks.

At the same time all the dimensions of the CBI went under stress, including the financial independence.

Before the Crisis the few descriptions of the central bank governance in advanced economies were in general not associated with the CBI issues. The neglect of such issue may be attributed to several factors (Stella and Lonnberg 2008). However the more general explanation is relatively simple: in normal times – i.e. during the Great Moderation – the central bank activities produced always profits and consequently the rules regarding the central bank balance sheet as well as its capital – central bank finance - were considered completely irrelevant respect to the definition of the monetary policy decisions, as well as the possibility of MPP risks.

But then after the Crisis a natural question arose: does exist any link between CBI and CB finance? The answer was positive; the financial CBI was borne.

In order to support the functioning of financial markets and stimulate the growth of the real and nominal variable almost all the advanced economies central banks started a massive expansionary monetary policy, which impacted massively on both the dimension and the nature of its assets and consequently on their risk profile. The central banks expanded both its list of eligible collateral and eligible counterparties, providing monetary financing against illiquid collateral; the composition of their balance sheets radically changed. The quality of the central banks' balance sheet sharply decreases in terms of credit quality and liquidity.

At least theoretically it is possible to claim that the probability of having in advanced economies a loss making central bank became different from zero. In fact in normal times the advanced economies central banks make automatically profits any year, given the systematic spread between its main conventional liability – banknotes – and its main conventional asset – risk free Treasury liabilities and therefore its loss probability is zero. The less the times are normal, the more the losses become possible.

Other things being equal, the financial CBI will be higher the higher will be the autonomy of the central in determining the profit distribution and the reserve allocation. When value or percentage are defined in the legal setting, the financial CBI will be higher the lower is the value/percentage of the current net profit that have to be distributed and the higher the value/percentage of such as net profit that have to be allocated to reserves.

Finally the capital depletion can be mitigated or fixed before to implement a recapitalization offsetting carried losses against future profits. Using the future payments the central bank makes to its owners can be viewed as a mechanism through which the central bank shareholders can *de facto* inject capital into the central bank (Buiter 2008).

The three options to avoid explicit recapitalization - reallocation of present profit distribution, creation of reserve buffers, use of future profits – are not mutually exclusive and can be used in combination, as well as in sequence (Bunea et al. 2016). Therefore a “one size fits all” model doesn’t exit.

6.4 POST MODERN VIEW:CENTRAL BANKING, MONETARY POLICY AND BEHAVIORAL BIASES

In this section we explore the consequences in assuming a well-defined behavioural bias – i.e. loss aversion – in shaping the central banker monetary policy decisions. In such as situations a status quo bias is more likely to occur[156].

6.4.1. Optimal monetary policy and conservativeness

We start from the basic monetary policy framework with nominal price rigidities[157] . In this model the aggregate equations evolve from optimization by households and firms, which in turn depends on expectations, and monetary policy can affect the real economy.

Letting y_t and z_t be respectively the logs of the stochastic component and the natural level of output, the output gap x_t will be $x_t \equiv y_t - z_t$ while π_t is the period inflation rate and i_t the nominal interest rate. We have an aggregate supply curve that relates positively inflation and output gap which is coupled with an aggregate demand curve, where the output gap is inversely associated with the real interest rate:

$$\pi_t = \lambda x_t + \beta\left[E_t \pi_{t+1}\right] + u_t \qquad (1)$$

$$x_t = E_t x_{t+1} - \varphi\left[i_t - E_t \pi_{t+1}\right] + g_t \qquad (2)$$

Where u_t and g_t are standard disturbance terms that behave as follows:

$$u_t = \rho u_{t-1} + \hat{u}_t$$

$$g_t = \mu g_{t-1} + \hat{g}_t$$

Where $0 \le \rho\mu \le 1$ and $\hat{u}, \hat{g}$ are random variables with zero means and finite variances.

As usual to the extent monetary policy triggers the short term real rate in a setting with nominal rigidities the central bank action can have real effects.

The central bank goal function targets the macroeconomic key variables x_t and π_t having as bliss objectives as usual the natural level of output and zero inflation –without any loss of generality - and therefore assuming its standard form:

$$U_{cb} = \max -\frac{1}{2} E_t \left[\sum_{i=1}^{\infty} \beta^{i} \left(\delta\alpha x_{t+i}^2 + \pi_{t+i}^2 \right) \right] \qquad (3)$$

[156] On status quo equilibria see Dziuda and Loeper 2016.
[157] Clarida et al. 1999.

Where the parameter α is the relative weight of the two macroeconomic goals. At the same time the parameter $0 < \delta \leq 1$ captures in the simplest way the explicit role of the central bank independence. Following the approach introduced in Eijffinger and Hoeberichts (1998) we modified the standard time inconsistency model in order to capture the legal relationships between the central bank and the politicians: the more the central bank is isolated from the short sighted political pressures – i.e. higher independence – the less will be the distortions in weighting the macroeconomic goals. Being interested in zooming on the drivers of the monetary policy action different from the institutional setting, we will assume that $\delta = 1$, i.e. the degree of central bank independence is the maximum one. We assume that an independent central bank can set the monetary policy consistently with her preferences, i.e. the legal mandate can be associated with sufficient discretion in defining the monetary policy strategy.

Assuming now discretion in the monetary policy action and rational expectations, in each period the solution of the optimization problem produces the following optimality condition:

$$\pi_t = -\frac{\alpha}{\lambda} x_t \qquad (4)$$

Condition (4) helps to identify automatically the optimal monetary policy: when inflation is above the target, the central bank have to implement a restrictive policy monetary; the opposite is true when inflation is below the target. The toughness of the central bank reaction depends on the sacrifice ratio λ between gains in inflation control versus costs in term of output losses, as well as on the degree of the central bank dovishness α, i.e. how important is output stabilization respect to inflation stabilization. It is worth remembering that dovishness is the opposite of conservativeness (hawkishness), that we indicate using the parameter $t = \frac{1}{\alpha}$.

Finally, assuming that the monetary policy instrument is the interest rate i_t the formulation of the optimal policy i_t will be equal to:

$$i_t^* = \gamma_\pi \rho \pi_t + \frac{1}{\varphi} g_t \qquad (5)$$

Where:

$$\gamma_\pi = 1 + \frac{(1-\rho)\lambda}{\rho\varphi\alpha} > 1 \qquad (6)$$

. In equilibrium with rational expectations a relationship between inflation and conservativeness is likely to emerge: The optimal rate of inflation is equal to:

$$\pi_t = \frac{\alpha u_t}{\lambda^2 + \alpha(1-\beta\rho)} \qquad (7)$$

Equation (7) shows the well- known result that in the basic macro setting the optimal policy incorporates inflation targeting, as well the relevance of the central bank conservativeness. Given the macroeconomic features of the economy – i.e. the values of λ, ρ, μ - uncertainty and the time discount, the crucial driver will be the degree of conservativeness, i.e. less concern for output losses implies a more rapid convergence of inflation to its target over time, and vice versa.

Inflation and central bank conservativeness are inversely associated, which is immediately evident when the disturbances are completely random – i.e. $\rho, \mu = 0$ [158]:

$$\frac{\partial \pi}{\partial \alpha} = \frac{\lambda^2 u_t}{\lambda^4 + 2\alpha\lambda^2 + \alpha^3} > 0 \qquad (8)$$

Which implies:

$$\frac{\partial \pi}{\partial t} = -\frac{\lambda^2 u_t}{\lambda^4 t^2 + 2\lambda^2 t + 1} < 0 \qquad (9)$$

It is interesting to note that also the sensibility of the interest rate – i.e. the value of the parameter γ - depends on conservativeness, given that:

$$\frac{\partial \gamma}{\partial t} = \frac{\lambda(1-\rho)}{\varphi\rho} > 0 \qquad (10)$$

Putting together conditions (9) and (10) it is evident that changes in the degree of central bank conservativeness doesn't imply any automatic effect in terms of interest rate dynamics: a more conservative central banker likes lower level of inflation, but at the same time she becomes more sensible with respect to inflation changes. The two effects push the interest rate in opposite directions and the final outcome has to be defined time to time; in fact:

$$\frac{\partial i}{\partial t} = \left[\frac{u\left(\lambda + \beta\lambda\rho^2 - ((1+\beta\lambda) + \varphi\lambda^2\right)}{\varphi\lambda^4 t^2 + (2\varphi\lambda^2 - 2\beta\phi\lambda^2)t + \beta^2\varphi\rho^2 - 2\beta\varphi\rho + \varphi} \right] \qquad (11)$$

At the end of the day the optimal interest rate policy will depend on the structural features of the economy.

[158] In the general case the inverse association is between inflation volatility and conservativeness; see Clarida et al. 1999.

6.4.2 Interest Rate Rule and Inertia

The existing economic literature points out that in the basic monetary policy model that we described in the previous paragraph monetary inertia can occur, due to the existence of frictions and delays. Overall inertia in the policy rule may reflect the inertia in the economy itself. Traditionally it has been observed the fact that changes in the macroeconomic conditions trigger changes in the interest rate, but these changes occur via a series of small and lagged adjustments, rather than an immediate, harsh and once and for all movement. In other words the past level of nominal interest rate appears to be a crucial driver of the present interest rate level[159]; we can captured this standard result in the simplest way:

$$i_t^* = \xi i_{t-1} + \gamma_\pi \rho \pi_t + \frac{1}{\varphi} g_t \qquad (13)$$

Where the coefficient $0 < \xi < 1$ measures the degree of inertia in the central bank reaction function. The inertial coefficient can explain the fact that in some cases discrete interest rate changes has been much more likely to be followed by another change of the same sign than by a change in the opposite sign[160].

6.4.3 Central Banker as a Bureaucrat and Conservativeness

Now we assume that the society has decided to assign the monetary policy task to a bureaucrat, i.e. a career concerned player that chooses the policy action entailing personal benefits and costs, being preferable to politicians in technical task such as the monetary policy field [161]. Therefore let $V(t,\pi)$ be the personal utility function of the central banker:

$$V(t,\pi) = B(t,\pi) - C(t,\pi) \qquad (14)$$

Where $B(t,\pi)$ and $C(t,\pi)$ are respectively the individual benefits and costs[162].

First of all we know from (3) that, from an institutional point of view, inflation can be a beneficial tool for macro stabilization. On top of that it is worth noting that, being the central banker a bureaucrat, inflation can be considered a financial source for her organization.

In fact given a basic central bank balance sheet constraint[163], we know that, when d is the real dividend the central bank paid to the State, h is the flow of currency and θ the nominal expenses of running the central bank, the central bank income is increasing with inflation:

[159] Woodford 1999.
[160] Rudebush 1985.
[161] Alesina and Tabellini 2007, Dalla Pellegrina and Masciandaro 2008, Masciandaro 2009.
[162] Alesina and Passarelli 2013.

$$d + \pi = h + \theta \qquad (15)$$

Therefore at least for two different and consistent reasons we can assume that the individual benefits are increasing and concave in the inflation rate:

$$\frac{\partial B(t,\pi)}{\partial \pi} > 0 \quad \frac{\partial B^2(t,\pi)}{\partial \pi} < 0 \qquad (16)$$

At the same time again from (3) we know that inflation is costly for the central bank as an institution, so we can assume that the individual costs are increasing and convex:

$$\frac{\partial C(t,\pi)}{\partial \pi} > 0 \quad \frac{\partial C^2(t,\pi)}{\partial \pi} \geq 0 \qquad (17)$$

Further we assume that the central bankers are heterogeneous with respect to their degree of conservativeness; the central bankers can be indexed such that more conservative central bankers bear higher marginal costs and/or enjoy lower marginal benefits from the policy, given that obviously for a conservative central banker the implementation of inflationary policies is costly:

$$\frac{\partial B(t,\pi)}{\partial \pi} \leq 0 \; ; \; \frac{\partial C(t,\pi)}{\partial \pi} \geq 0 \qquad (18)$$

The equilibrium is interior, i.e. we exclude that a deflationary equilibrium can be optimal:

$$\frac{\partial B(t,0)}{\partial \pi} > \frac{\partial C(t,0)}{\partial \pi} \qquad (19)$$

Therefore in equilibrium the central banker optimal inflation rate, π_{cb} is such that the marginal benefits match the marginal costs:

$$\frac{\partial B(t,\pi_{cb})}{\partial \pi} = \frac{\partial C(t,\pi_{cb})}{\partial \pi}$$

And that:

$$\frac{\partial \pi_{cb}}{\partial t} < 0 \qquad (20)$$

Which is exactly the condition (9) that holds in equilibrium in our macroeconomic system with nominal stickiness and rational expectations : inflation and conservativeness are inversely associated.

[163] Reis 2015. On profit distribution and loss coverage rules for central banks see Bunea et al. 2016. On central bank finance and central bank independence see Stella and Lonnberg 2008 and Stella 2009. On central bank finance and stabilization policies see Reis 2016.

6.4.4. Central Bankers, Monetary Policy Committee and Choices

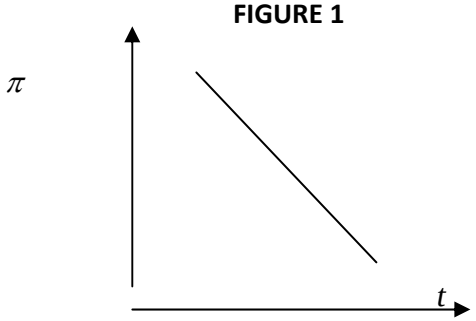
Finally we assume that a Monetary Policy Committee (MPC) with N members formulates the monetary policy decisions. The central bankers, which are the members of the Committee, are individuals (voters), heterogeneous in the parameter t. We assume that:

a) Each MPC member maximizes her own goal function (14);

b) Each MPC member chooses the preferred inflation rate π and consistently with rule (5) the optimal interest rate i, without any inertia;

c) The MPC members vote using a majority rule: therefore the monetary policy outcome is the median type's optimal inflation rate π_m and optimal interest rate i_m. The optimal inflation rate will be inversely associated with the conservativeness of the median central banker t_m (Figure 1):

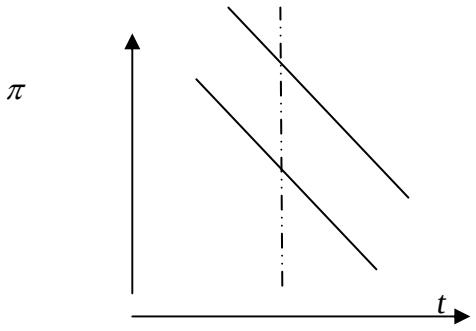
FIGURE 1



It is worth noting that:

i) Given equation (7), any change in the macroeconomic structure will modify the optimal inflation rate, given the central bank conservativeness; for example, a more convenient ratio between output gains and inflation losses – i.e. a change in the sacrifice ratio – will increase inflation (Figure 2):

FIGURE 2



which is as usual immediately evident when the disturbances are completely random – i.e. $\rho, \mu = 0$:

$$\frac{\partial \pi}{\partial \lambda} = -\frac{2\alpha\lambda u_t}{\lambda^4 + 2\alpha\lambda^2 + \alpha^2} < 0 \qquad (21)$$

ii) the median type's policies is not necessarily coincident with the social optimal ones. The social planner would optimize the sum of the preferences of the individual central bankers:

$$\int [B(t,\pi) - C(t,p)] dF(t) \quad (22)$$

Where the social optimal inflation π_s and the consistent interest rate policy i_s is the policy that equalizes the average marginal benefits $B_s(\pi)$ with the average marginal costs $C_s(\pi)$:

$$B_s(\pi) = C_s(\pi) \qquad (23)$$

And therefore in general it will be true that:

$\pi_m \neq \pi_s$ and $i_m \neq i_s$, and $t_m \neq t_s$, (24)

i.e. the conservativeness of the median central banker is not necessarily equal to the average central banker.

ii) We assume constant voting rules, in order to shed light on monetary inertia independently from how the MPC governance is designed.

6.4.5 Central Bank Governance and inertia

From Riboni and Ruge-Murcia (2010) we know that with the median central banker model, regardless of the initial status quo, the MPC will adopt the interest rate preferred by the median voter. In other words the median central banker governance is frictionless in the sense that the status quo doesn't matter in determining the actual interest rate i_m

In order to have monetary policy inertia, we have to assume a different governance setting, where the relevant degree of conservativeness differs from the median one. A sufficient condition is to assume a consensus model, i.e. the interest rate setting require a super-majority to pass. If N is the number of the MPC members, let $\frac{(N+1)}{2} + k$ be the size of

the smallest super-majority required to set the equilibrium interest rate i_{SM} where $i_{SM} = i_m iff k = 0$. Therefore monetary policy inertia – i.e. a significant autocorrelation coefficient $\varsigma > 0$ in the interest rate path – is more likely to occur in a super majority model the greater will the consensus required to change the interest rate, i.e. $k \to \frac{(N-1)}{2}$:

$$i^*_{m,t} = \xi i_{m,t-1} + \gamma_\pi \rho \pi_t + \frac{1}{\varphi} g_t \qquad (25)$$

6.4.6. Optimal Monetary Policy: Loss Aversion and Central Banker Types

Now we assume that with loss aversion, and for every monetary policy choice, losses loom larger than gains, and both are evaluated with respect to the *status quo*. Let $z > 0$ be the parameter which captures loss aversion and let π^s the status quo inflation. Increasing inflation - $\pi > \pi^s$ - entails more benefits and costs, but higher inflation costs yield a psychological experience of losses, which amounts to:

$$z(C(t_i, \pi) - C(t_i, \pi^s)) \qquad (26)$$

In other words the loss adverse central bankers overweight the inflation distortions. Vice versa reducing the inflation rate - $\pi < \pi^s$ - entails less benefits and costs, but with a psychological losses which amount to:

$$z(B(t_i, \pi) - B(t_i, \pi^s)) \qquad (27)$$

Here the loss adverse central banks overweight the seignorage losses as well as the decreasing macro stabilization capacities. Therefore the central banker goal function with loss aversion $V(t_i, \pi / \pi^s)$ is given by the standard utility $V(t_i, \pi)$ minus the psychological losses due to the departures from the status quo:

$$V(t_i \pi / \pi^s) = V(t_i, \pi) - z(C(t_i, \pi) - C(t_i, \pi^s)) if \pi > \pi^s$$

$$V(t_i \pi / \pi^s) = V(t_i, \pi) - z(B(t_i, \pi) - B(t_i, \pi^s)) if \pi < \pi^s$$

The optimal conditions are as follows:

$$B(t_i, \pi) = (1+z) C(t_i, \pi^s) if \pi > \pi^s \qquad (28)$$

$$(1+z) B(t_i, \pi) = C(t_i, \pi^s) if \pi < \pi^s \qquad (29)$$

Now, given the status quo inflation π^s, the dove central banker will be characterized by a level of conservativeness $\overset{d}{t}$,such that:

$$B(t_i, \pi^s) = (1+z)C(t_i, \pi^s) \qquad (30)$$

While the hawk (conservative) central banker will be characterized by a level of conservativeness $\overset{h}{t}$,such that:

$$(1+z)B(t_i, \pi^s) = C(t_i, \pi^s) \qquad (31)$$

Where $\overset{d}{t} < \overset{h}{t}$

Therefore, for each central banker it will be true that, given her level of conservativeness t_i, she will set her preferred inflation target π_i according to the following rule:

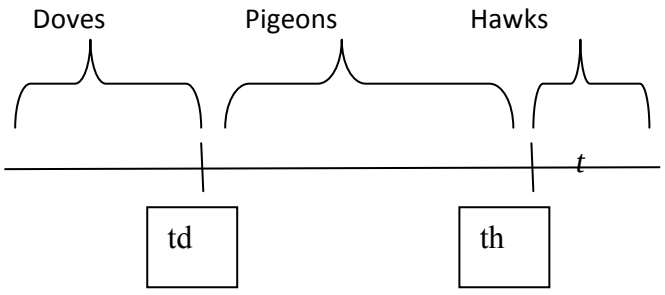
$$B(t_i, \pi) = (1+z)C(t_i, \pi^s) if t_i < \overset{d}{t}$$

$$(1+z)B(t_i, \pi) = C(t_i, \pi^s) if t_i > \overset{h}{t} \qquad (32)$$

$$\pi = \pi^s if\ t^d < t < t^h$$

Therefore every MPC can be splitted in three different groups: doves - $if t_i < \overset{d}{t}$ - hawks - $if t_i > \overset{h}{t}$ and pigeons - $if\ t^d < t < t^h$ (Figure 3).

FIGURE 3



And each MPC member will express well defined inflation and interest rate preferences. Respect to the standard situation we are assuming that i) each central banker will evaluate any policy in terms of changes from a monetary policy status quo; ii) any negative effect of a change with respect to the

monetary policy status quo are thought to loom larger that positive effect of equivalent magnitude. The two assumptions are a simply application of the loss aversion principle (Kahneman and Tversky 1979, Tversky and Kahneman 1991), highlighting that if a loss/gain asymmetry hits the central bankers a monetary inertia is more likely to occur, as we will see in the next paragraph.

6.4.7 The Status Quo Bias in the Monetary Policy Choices: When the Pigeons Win

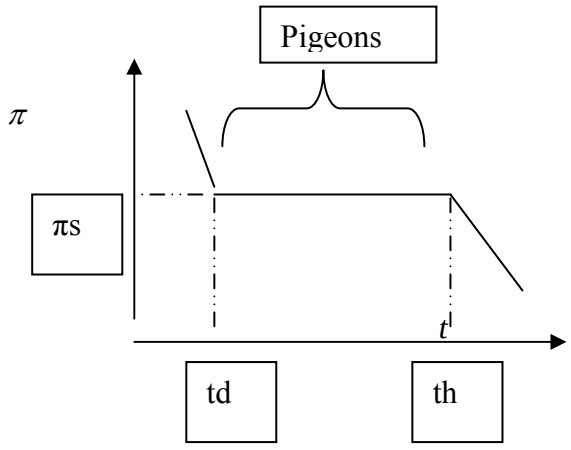
We already know that the MPC chooses the monetary policy strategy using a majority rule and that the consequent outcome is the median type's optimal inflation rate π_m and optimal interest rate i_m Therefore the optimal inflation rate will depend on the median conservativeness t_m, having three possibilities: dove, pigeon and hawks. More precisely three different equilibria can arise (Figure 4):

$$\pi = \pi^s if\ t^d < t_m < t^h$$

$$\pi < \pi^s if\ t_m < t^d \qquad (33)$$

$$\pi > \pi^s if\ t_m > t^h$$

FIGURE 4



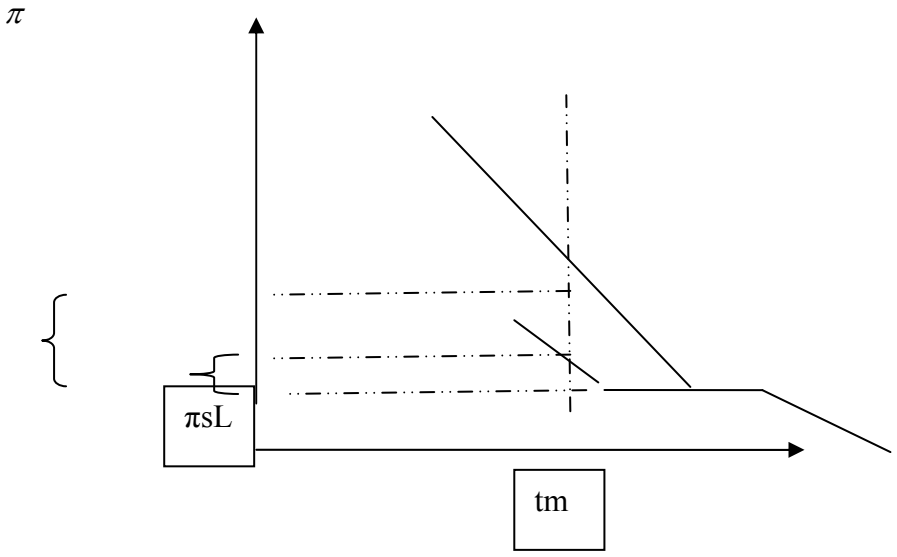
The existence of loss aversion influences the monetary decisions under three different points of view:

1) *Moderation Effect*: The policy outcome will be the status quo inflation π^s if the median voter is a pigeon. Further, given that the distance between $t^d and\, t^h$ is increasing in $z > 0$, the more the loss aversion is increasing the more likely a pigeon will be the median voter: a status quo bias in the monetary strategy – i.e. monetary inertia - will emerge. In other words more loss aversion among MPC members reduces the distances among their monetary policy positions. On the one side the doves overweight the higher costs of inflation, so they smooth their dovishness. On the other side the hawks overweight the reduction in their macro stabilization capacity, as well as the seignorage losses, and therefore their hawkishness becomes lighter. As the central bankers become more loss averse the number of pigeons increases and the inertia in the interest rate setting is likely to increase. In other words being i^* the equilibrium interest rate and i_m the median (pigeon) interest rate we have that increasing loss aversion triggers interest rate inertia, i.e. :

$$i^* = i_m = i^s if z > 0 \rightarrow \qquad (34)$$

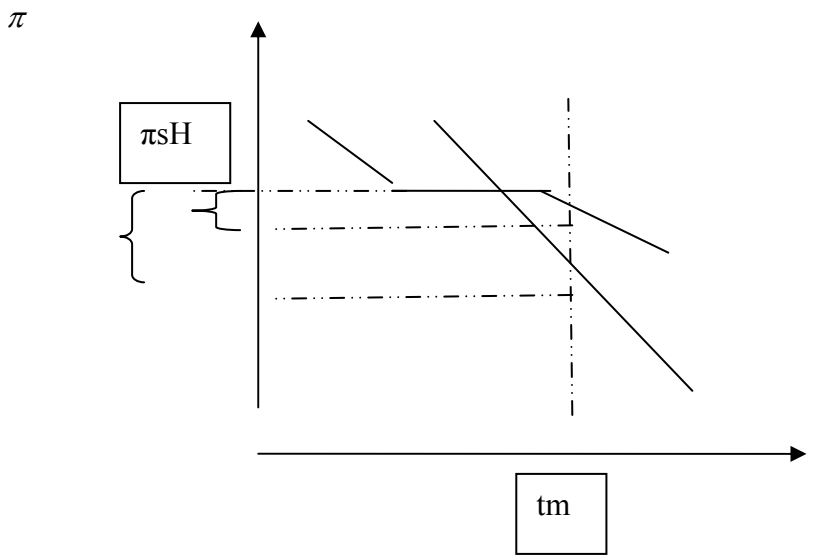
2) *Hysteresis Effect*: The status quo will influence the monetary strategy also if the median voter is either a dove or a hawk. First of all, let us assume that the status quo inflation π_L^s is too low for the median central banker (Figure 5): needless to say, she will overweight the increase in inflation costs, and the optimal inflation rate – as well as the optimal interest rate policy - follows to be relatively low.

FIGURE 5



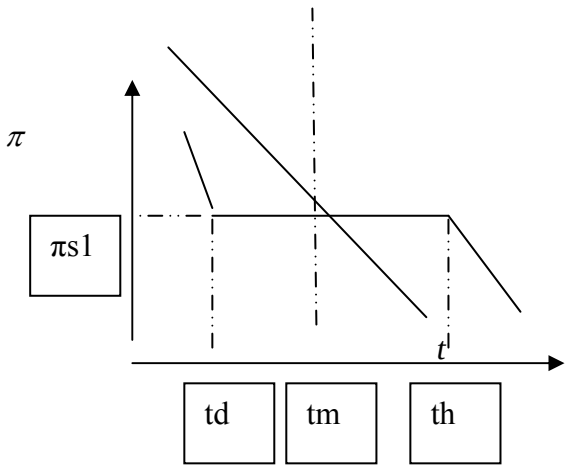
In a specular way, also the opposite is true: suppose that the status quo inflation π_H^s is too high for the same median central banker (Figure 6): in this case she will overweight the output stabilization losses, and the optimal inflation rate follows to be relatively high. In other words the status quo produces an hysteresis effect in the monetary policy decisions.

FIGURE 6



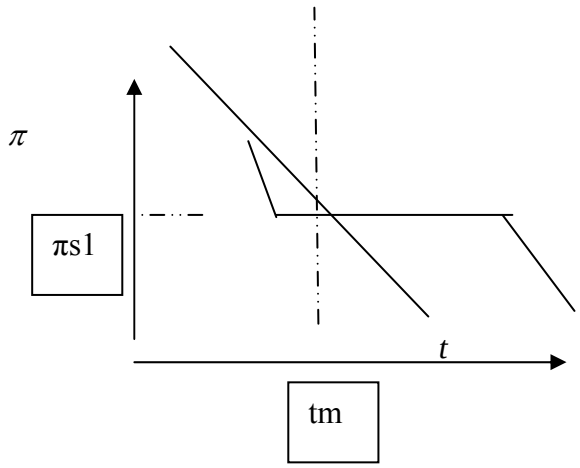
3) *Smoothing* effect: if there a shock in the conservativeness, only big shocks can trigger a change in the monetary policy stance. Let us assume to be in the status quo equilibrium π_1^s (Figure 7) and that the median central banker is a pigeon:

FIGURE 7



Suppose now that a shock τ hits the degree of conservativeness of the central bankers; for example the dovishness increases Two cases can occur. If the shock is relative low (Figure 8), the median central banker is likely to remain a pigeon; the optimal monetary policy will be the same:

FIGURE 8

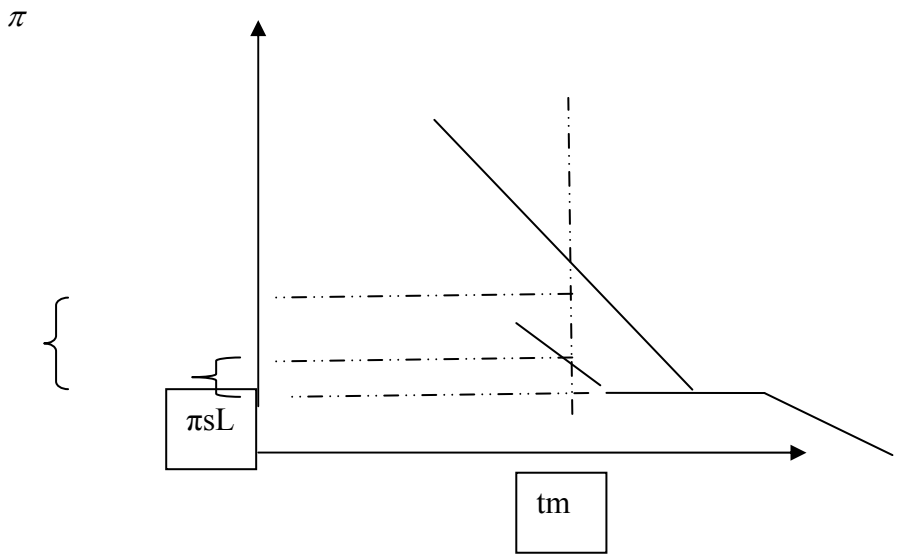


In other words:

$$i^* = i_m = i^s if \tau \to 0 \qquad (35)$$

Only if the shock is relatively the status quo inflation π_1^s becomes too low for the median central banker (Figure 9): however – as we already highlighted discussing the hysteresis effect - she will follow to overweight the increase in inflation costs, and the optimal inflation rate – as well as the optimal interest rate policy - follows to be relatively low.

FIGURE 9



All in all: as central bankers become more loss averse, both dovishness and hawkishness decreases in a stable way, triggering higher monetary policy inertia, which is independent from both the existence of frictions, the central bank governance features and the central banker preferences.

With behavioural biases in the MPC members monetary policy inertia – i.e. as usual a significant autocorrelation coefficient $\varsigma > 0$ in the interest rate path – is more likely to occur if loss aversion is a significant phenomenon, i.e. $z > 0$:

$$i^*_{m,t} = \xi i_{m,t-1} + \gamma_\pi \rho \pi_t + \frac{1}{\varphi} g_t \qquad (36)$$

6.5 POST MODERN VIEW: CENTRAL BANKING, MONETARY POLICY AND MICRO SUPERVISION

After the Great Crisis central bankers are taking on a range of new responsibilities alongside their core role of monetary policy. In many cases the central banks have mandates to pursue financial stability, gaining new powers and tools.

The enlargement of the central bank perimeter however has not been homogeneous. The expansion of goals and tools varied across countries. At least two reasons can explain this ununiformed trend. On the one side no theoretical consensus has been reached as to the optimal approach. On the other side the enlargement of central bank responsibilities has happened mainly as a needed and immediate response to the Great Crisis. In such as cases the political urgency to implement some policy decisions can likely override the opportunity to find out the best central bank architecture.

Without a theoretical benchmark and with the necessity to face conventional and unconventional trade- offs between monetary and financial stability, the heterogeneous expansion of the central bank powers reflects the difficulties in designing new interactions with different players – politicians, other regulatory agencies – that can conflict with the core monetary policy function (in the modern view the lending of last resort function joints the monetary role exclusively in temporary and extraordinary times).

How to approach to evaluation of the central bank role in new policy areas? Drawing on recent insights from economics and political economy – see the previous sections of these Notes – the crucial question is wondering how the location of a new policy inside the central bank can change the effectiveness in pursuing its main function, i.e. the monetary policy action.

In other words the housing of a given responsibility inside the central bank have to be evaluated considering the overall cost and benefit analysis. This section applies this perspective discussing the central bank involvement in micro supervision.

6.5.1 Economics

Financial liberalization caused monetary policy and supervision to be considered as stand-alone policy fields, in the sense that they were each assigned distinct objectives. Historically, the functions of monetary policy and lending of last resort have been assigned to the central bank. Financial supervision – to the extent that there was such a function – was either housed in the central bank or in a separate institution, with countries having a hybrid situation.

The separation of these policy fields led very quickly to the critical question as to whether their combination in one institution could lead to conflicts of interest. This section discusses the economics of

the role of the Central Bank Involvement in micro-supervision (CBIS). The aim is to show that the most relevant contributions of this huge literature provide non conclusive recommendations[164].

Theoretically, the central bank involvement is pursuing banking goals can be evaluated under two different aspects: macro-supervision and micro-supervision. Nowadays the central bank is generally considered the sole monetary authority, i.e. the agent designated by society to manage liquidity in order to pursue monetary policy goals. By being sources of liquidity and lenders of last resort, central banks are naturally involved in preventing and managing systemic banking crises (macro-supervision) – in either advanced, emerging or developing economies – eventually in close coordination with other public agencies entrusted with responsibility for financial stability.

But should central banks also be in charge of pursuing financial stability through prudential oversight of individual banks, i.e. micro-supervision? The question is a long standing one. It was where the actual discussion started, long before the formal distinction between macro- and micro-supervision was introduced.

On one side, micro-supervision is a task that historically was not always assigned to central bankers. Furthermore the last two decades – known as the Age of Great Moderation – were characterized by a decrease in CBIS. On the other side, in previous decades several central banks had been actively and deeply involved in pursuing tight structural control, considered part and parcel of the overall responsibility of the central bank for the management of liquidity.

Going beyond historical cyclical, patterns and focusing on the economics of the relationship between monetary and supervision policies, it is possible to disentangle the pros (*integration view*) and cons (*separation view*) of having monetary and supervisory functions under one roof.

The justification for the central bank's involvement in supervision (*integration view*) is usually supported by arguments pertaining to the informational advantages and economies of scale that derive from bringing all functions under the umbrella of the authority in charge of managing liquidity. One additional argument is that the human capital employed by central banks is presumably better equipped to manage supervisory issues. Having access to all information would help central banks, which possess higher skills, to act as more effective supervisors. In other words, setting up a supervisory authority different from the central bank is not considered efficient, i.e. CBS brings potential gains to both activities.

At the same time, the economic literature acknowledges that central bankers involved in supervision can produce greater policy failure costs (*separation view*), i.e. limited central bank involvement is better. It is important to highlight that the risk of policy failure is endogenous with respect to the distribution of power: it exists only if the supervisor is the central bank, acting as liquidity manager. The risk of policy failure can be variously motivated, shedding light on the various sources of the risk of policy failure.

[164] See Masciandaro and Quintyn 2015. See also Colliard 2015, Eisenbach et al. 2016.

First of all, if the supervisor can discretionally manage liquidity, the risk of moral hazard (and therefore forbearance) in supervised banks can increase: regulated firms know that their supervisor can bail them out (*moral hazard risk*). If the supervisor were different from the liquidity manager, this source of moral hazard would not exist. Secondly, discretionary action by the central bank can increase uncertainty in supervised markets, as the on-again/off-again rescues of financial firms in the US during the Great Crisis have demonstrated (*uncertainty risk*). If the supervisor is also the liquidity manager greater moral hazard and greater uncertainty are likely to emerge.

Thirdly, it has been said that monetary policy responsibilities can negatively affect the central bank's behaviour as supervisor, given the existence of reputational risk, as well as conflict of interest between monetary policy and supervision management (*distorted incentives risk*). Fourthly, the central banker can use his/her powers in liquidity management to please its banking constituency, rather than pursue social welfare. In this respect, the central bank can be the most dangerous case of a supervisor being captured by those being supervised, i.e. banks, given that the banking industry may be more inclined to capture supervisors which are powerful, because a captured authority with additional powers yields more possibilities that benefit the banking constituency (*capture risk*).

Finally, conjoining banking supervision and monetary policy in the hands of the central bank can create an overly powerful bureaucracy, with related risk of misconduct, thus raising fears of "democratic deficit" (*bureaucratic overpower risk*).

This overview demonstrates that the debate between integration and separation remains inconclusive. From the point of view of economics there simply is no optimal solution to the CBIS debate. This conclusion is confirmed by the empirical work undertaken in this respect, although, it should be said, econometric analyses of the topic are rare and of a recent date[165].

A new dimension was added to the CBIS discussion, when the architecture of supervision came under discussion. While unified (or integrated) supervisors were recommended in some cases, because of efficiency and effectiveness gains, the question as to whether the unified supervisor should be housed in the central bank remained open. The integration view argued that this would allow the central bank to better prevent systemic crises from arising, because the central bank would also be informed about imbalances arising in the nonbank segments of the financial sector.

The separation view argued that if all supervision was placed in the hands of the central bank, the latter would now also be responsible for supervising institutions it traditionally never dealt with, neither as lender of last resort, nor as monetary policy agent. So, the argument went, extending the supervisory reach of the central bank to over these other financial institutions would put pressure on extending its lender-of-

[165] See Masciandaro and Quintyn 2015; see also Melecky and Podpiera 2015 on central banker as supervisor and the likelihood of banking crises in the period 2007-2012.

last-resort safety net as well, hence creating additional opportunities for moral hazard and reputational risk[166].

Finally, in the last three decades an issue that got into the spotlight was that of supervisory governance. In a market economy it became quickly clear that the decision as to when and how to intervene is the key problem of the supervisor, for a number of reasons. First, a weak governance framework inherently leads to a weak supervisory process and lack of enforcement rules; putting it in another way inefficient supervisory decisions are endogenously driven by ineffective governance settings.

In order to build up effective governance architectures the economic literature highlighted the need to pay close attention to the incentive structures, remuneration arrangements, and accountability measures concerning supervisors. The proposed solutions did not focus on an all-encompassing - "one size fits all" - approach to governance but emphasized that supervisors, would benefit from the presence of rules for intervention, to avoid succumbing to pressures exerted either by politicians and financial lobbyists. At the same time the rule design can reduce the risks of bureaucratic self – interest goals of the supervisors that can harm the policy decisions. Therefore the rules vs. discretion dilemma – a classic trade off in the monetary policy debate up to the 1980s - characterized also the supervisory governance discussion.

From a governance point of view, rules could be an effective instrument to shield supervisors from all three types of capture (politics, industry, and self-interest) in the sense that they provide somewhat "objective", binding thresholds, as to how and when to intervene in preventing and/or addressing instability situations.

By the late 1990s, three interconnected drivers accelerated the discussion on the broader features of supervisory governance: first, in several of the systemic financial crises of the 1990s, the lack of supervisory independence from political influences, leading to forbearance, was cited as one of the contributing factors to the deepening of the Crisis. Secondly, the governance debate came to the surface as part of the general institutional issues. In the two decades prior to the Global Crisis, there was a tendency to move supervision out of the central bank. While maintained within the central bank, supervision explicitly or implicitly piggybacked on the central bank independence in matters of monetary policy. So, when supervision was relocated, the issue of independence became naturally the cornerstone of the discussion and it needed to be addressed explicitly.

The third driver is closely related to the second one. Central Bank Independence (CBI) started to gain more and more traction as the institutional arrangement that countered time-inconsistency in policymaking. In particular the tendency to resort to forbearance – often under political pressure – in the face of systemic banking crises, showed that time-inconsistency is also an issue in supervision.

[166] The separation view argues in favour of the Twin Peaks Model: see Schmulow 2015, Chen 2015, Godwin and Ramsay 2015.

Given the special nature of financial supervision, it soon became clear that, in order to align incentives for supervisors, independence was a necessary but not sufficient feature of governance, in the face of pressures coming from the political and the industry side. The major difference between a monetary policy agency and a financial supervisor lies in the fact that the former has a well-specified and measurable objective (maintaining low and stable inflation, often specified in the form of a percentage target), while it is difficult – if not impossible – to specify the objective of supervision in the same precise way.

So applying a contract approach in the principal-agent sense would be flawed, because any such contract is bound to be incomplete given the great range of contingencies that occur in regulation and supervision, as well as the difficulty of specifying the agent's objectives precisely. Incomplete contracts lead to problems of imperfect commitment, opening the door to problems of time inconsistency.

Hence, supervisors should be considered as government fiduciaries whose duties are defined by relational contracting: the parties do not agree on a detailed plan of action, but on general principles and procedures, on types of actions to be taken and instruments to be used. The key feature is the choice of the mechanism for adapting the contract to unforeseen contingencies. The great range of contingencies is certainly one of the reasons why politicians are in some cases reluctant to give supervisors extensive independence.

However, because this reintroduces the risk of political capture, a better alternative is to establish a detailed structure of accountability arrangements, whereby supervisors are accountable to all major stakeholders. The design of such arrangements is all the more important because well-designed accountability can help buttress agency independence. So complementarity between accountability and independence needs to be exploited to the max. Furthermore the literature stressed the need to add transparency and agency integrity as the two additional pillars of the supervisory governance framework. Consistent indexes of supervisory governance were proposed in order to measure the degree of robustness of the supervisory setting as a credibility device against the risks of forbearance.

More recently the literature focused its attention also on the internal governance rules, concerning the governing bodies procedures. The internal governance rules can influence the robustness of the decisions of the supervisory bodies via different channels, as it will be specified below. The five institutional characteristics – independence, accountability, transparency, integrity and robustness – represent the five interconnected pillars to build up an effective supervisory institution.

The more relevant internal governance rules are considered the procedures regarding the decision making process, zooming on the board effectiveness. The effectiveness of the board rules can be measured in the way it increases – directly or indirectly, i.e. via spillovers on the other four pillars - the credibility of the supervisory action. It is a matter of fact that the formulation of the supervisory decisions is made using committee structure. Therefore the more the supervision action depends on a group decision – rather than on a one policymaker choices – the more relevant will be the understanding of the collective action.

The group decision making aggregates individual viewpoints, which depend on two main different drivers: information set and preferences. On top of that, the aggregation will depend on the voting rules.

Therefore the institutional analysis has to be focused at least on three different kind of governance rules, regarding respectively the information set, the board composition and the voting rules.

Regarding the information set, the governing rules can define the possibilities of the board members to use and/or expand the available sources of information, taking into account their quality. An index of information richness can be defined.

Regarding the board composition, first of all it is relevant to know the board dimension, where an inverse association between dimension and efficiency is assumed to exist; a corresponding efficiency index can be proposed. Secondly it is interesting to investigate if the formal rules disentangle between executive and non-executive members, or specify norms on other kind of diversity (as gender diversity, or professional diversity). Here an index of board diversity can be elaborated.

Regarding the voting rules can be relevant to explore which rules the supervisory bodies apply in taking their decisions (simple majority, qualified majority). Here an index of legitimacy can be identified.

Information richness, efficiency and diversity and legitimacy are four different dimensions that can be used to describe the main features of the supervisory governing bodies. We assume that each dimension can influence the credibility of the supervisor. More precisely, we assume that the degree of credibility is associated with higher level of: a) information richness; b) efficiency (smaller board dimension); c) diversity; d) legitimacy. Table 1 summarizes the map of the governance principles and their related indexes.

Table 1 Governance Principles and their Indexes

Independence	Accountability	Transparency	Integrity	Robustness
Indexes of Independence	Indexes of Accountability	Indexes of Transparency	Indexes of Integrity	Indexes of Internal Governance: 1) Information richness; 2) Efficiency; 3) Diversity; 4) Legitimacy

At the end of the day, the review of the literature shows that the various arguments lead to conflicting predictions in terms of what the optimal involvement of the central bank in supervision should be. No consensus has been reached on what the best degree of CBS should be in principle, since it is impossible to conclude that the integration view is superior to the separation view, and vice versa. The

same conclusion can be reached if we consider the integration/separation dilemma from the point of view of monetary policy.

The natural conclusion is that cyclical patterns of CBIS that we observe in reality cannot be explained by the existence of a superior setting for delegating powers to central banks. Rather, the differing arguments supporting the integration view or the separation view seem be given variable weight by the policymakers who design and implement central bank involvement in supervision, depending on the circumstances they face. Also in this case, the attention of research shifted towards the interactions between citizens and politicians in determining the rules governing the role of the central banks as supervisors.

6.5.2 Political Economy

Which are the drivers that shape the central bank involvement in supervision? Here we analyse the political decisions that determine the central bank involvement in supervision (CBIS) using a delegation framework, which we consider an efficient way to take into account the abundant, consolidated and still growing literature on the topic.

In doing so we adopt a political economy approach, arguing that the policymaker's actual choices related to the central bank governance are conditional on the economic and institutional environment existing at a given time, which in turn determines the political weights put on the pros and cons of the CBIS.

Our framework is based on two hypotheses. First of all, gains and losses of a given central bank setting are variables computed by the incumbent policymaker, who maintains or reforms the central bank regime following his/her own preferences. Secondly, policymakers are politicians, and as such, they are held accountable at elections for how they have managed to please voters. All politicians are career-oriented agents, motivated by the goal of pleasing voters in order to win elections. The main difference among various types of politicians concerns which kinds of voters they wish to please in the first place. Therefore, CBIS is likely to change over time following political preferences, which are not automatically coincident with the social ones.

Consider an economy with rational expectations and uncertainty**.** We suppose that the citizens would like an institutional setting where the central bank involvement is the optimal one, i.e. where the potential pros and cons in having the central banker as supervisor are take into account in a complete and systematic way. Citizens care about the optimal level of separation between the monetary player – which is the central banker – and the banking supervision responsibilities according to a classic well-behaved concave function $u = U(y)$: social welfare increases with the optimal level of CBIS. Linear preferences are used:

$$U(y) = y \qquad (1)$$

In a democracy, citizens assign to the elected policymaker the task of designing the optimal level of CBIS, i.e. the setting that guarantees the overall central banker effectiveness. For the sake of simplicity, we suppose that the elected policymaker represents both the legislative and the executive powers, i.e. the interests of the majority of the Parliament and of the government in charge are perfectly aligned.

The incumbent policymaker is delegated by society to define and implement the optimal level of CBIS. The policymaker reward is based on how he/she (hereafter she) carries out her job, i.e. defining and implementing the level of CBI.

6.5.2.1 Benevolent Politician

Our policymaker is a politician. We assume that the policymaker wishes to please the citizens; alternatively, we could also assume that the policymaker aim is to please specific constituencies, i.e. the lobbies. Initially we adopt the *helping hand view* of the policymaker's type: she wishes to please citizens rather than a particular constituency or lobby (*grabbing hand view*). It will be interesting to demonstrate that, notwithstanding the policymaker wishes to please the citizens, the final outcome – the actual CBIS – can be different from the social optimal one.

The level *y* of CBIS is determined by the policymaker's ability Ω and by her effort *a*:

$$y = a + \Omega \qquad (2)$$

Let us describe the delegation framework. The sequence of events is as follows:

5) Society chooses to delegate to the policymaker the task of designing the optimal level of CBIS;
6) Next, the policymaker chooses effort *a*, before knowing her ability Ω in implementing this particular task (building up the CBIS is not a usual nor a day by day operation);
7) The policymaker implements the CBIS regime, revealing her ability Ω;
8) Citizens observe the CBIS level, but not the relationship between effort and ability, since they cannot distinguish innate talent from contingent effort, and reward the policymaker for this task.

Coming back to the policymaker, her utility function, denote by Z_{HH}, is defined as:

$$Z_{HH} = R(U) - C(a), \qquad (3)$$

where $R(U)$ is the reward function and $C(a)$ is the cost function. The political reward is function of the social utility, while the political costs are function of the effort in implementing the task. The policymaker

evaluates every task assignment while taking into account the political rewards and costs in doing so. Let us describe the three crucial features of the policymaker:

D) Ability: the ability of the policymaker is a random variable with the usual normal distribution (where we denote by Ω_{AV} the mean);

E) Political Reward: The incumbent policymaker wishes to be re-elected. The government needs to provide enough utility to the majority of voters; then her utility function is the social welfare function *U*.

In general, the policymaker wishes to please voters and her goal is the alignment of interest between her and citizens. Then each delegated task – i.e. each specific alignment – can be more or less convenient from the policymaker's point of view in terms of political gains. We denote the political value she assigns to fulfil the specific task on CBI by β – with $0 \leq \beta \leq 1$. Therefore:

$$R(U) = \beta U$$

The incentives alignment between the policymaker and citizens is a necessary and sufficient condition to find the optimal behaviour of the policymaker. One more step is necessary to find out the effective political reward. The reward will be useful if the citizens' utility exceeds the minimum threshold of utility W that they expect from an incumbent government *(*political competition condition*)*. Citizens compare government performances with the expected performances of outside politicians. The political competition condition can be defined as follows:

$$R_{HH} = \beta \Pr(U > W) \qquad (4)$$

Therefore, the usefulness of the political reward will depend on condition (4).

F) Political Costs: The policymaker knows that if the central banker is separated from the banking stability responsibility, failures in implementing banking stabilization policies may arise.

In other words, we assume that from the policymaker's point of view the political costs of implementing a CBIS regime will depend on her expectations of facing financial shocks. From the citizens' point of view, the government can be a natural scapegoat in each crisis, but she is not able to use the monetary policy tools to implement the needed banking policies.

Therefore, the policymaker's cost function can assume the following simple specification:

$$C(a) = ca^2, \qquad (5)$$

Where:

$$c = c_o + c_1 probFC$$

$prob$ represents a probability between zero and one that a financial crisis can occur. Thus, the political cost of the effort in establishing CBIS depends on how the incumbent government is blamed when the shocks occurred, i.e. on the size of reputation losses.

When a shock occurs, citizens can be more or less sensitive. From the government's point of view, the crisis likelihood *per se* is not relevant, but its political cost affects her reputation. The reputation sensibility is represented by the parameter c_1.

We will see in what follows that the size of the reputational costs can determine the difference between the optimal CBIS and the actual one. As a result, for the incumbent policymaker the political cost in building up a CBIS regime is represented by the likelihood of facing a macroeconomic crisis without the possibility of implementing the desired *ad hoc* banking policy.

Establishing the level of CBIS is a two-step process: (i) defining the policymaker effort and (ii) evaluating the level of CBIS. In defining her optimal effort a_1, the policymaker maximizes her objective function. Then her ability Ω_{HH} becomes evident, the level of CBIS can be evaluated using the CBIS equation (2) and her final political reward can be calculated using the political competition equation (4). It follows that the policymaker maximizes social welfare net of costs of executing the task:

$$Max\, Z_{HH} = R(U) - c(a_1)\,,$$

where,

$$R(U) - c(a_1) = \beta U - c(a_1)$$

Given that the level of social utility is equal to the level of CBIS, which is function of the policymaker effort, it is evident that both the rewards and the costs depend on the effort:

$$\beta(a_1 + \Omega) - ca_1^2$$

From the first order condition the optimal effort will be:

$$\frac{\delta z_{HH}}{\delta a_1} = \beta - 2ca_1 = 0$$

implying that:

$$a_1 = \frac{\beta}{2c_1}$$

Given a_1, the effective political reward of the policymaker will depend on the condition of political competition (4):

$$R_{HH} = \beta \Pr(U \geq W)$$

Voters are rational. They realise that the alternative to re-electing the incumbent policymaker is to get another politician with average ability. Given their expectations a^e on effort, it follows that:

$$W = a^e + \Omega_{AV}$$

Then:

$$R_{HH} = \beta \Pr(\Omega + a_1 \geq \Omega_{AV} + a^e)$$

$$R_{HH} = \beta \Pr(\Omega - \Omega_{AV} \geq a^e - a_1) \qquad (5)$$

Nature chooses the ability of the incumbent policymaker, Ω_{HH}. It follows that:

$$R_{HH} = \beta \Pr(\Omega_{HH} - \Omega_{AV} \geq a^e - a_1) \qquad (6)$$

When expectations are perfectly matched ($a^e = a_1$), the effective political reward will be positive if the ability of the incumbent policymaker is greater than average:

$$\Omega_{HH} > \Omega_{AV} \qquad (7)$$

The equilibrium level *y* of the CBI will be determined by the policymaker's ability Ω_{HH} and by her effort a_1:

$$y_{HH} = a_1 + \Omega_{HH} = \frac{\beta}{2c_1} + \Omega_{HH} \qquad (8)$$

Given the exogenous policymaker ability, on one hand the level of CBIS depends on how politically relevant it is for the government to build up a central bank regime pleasing the majority of voters. In other words, the policymaker's perception of the relevance of the central bank setting matters. On the other hand, the government takes into account the expected costs of facing a separation between the monetary player and the banking perimeter when a financial shock have to be addressed.

The parameter c_1 can be easily used to show under which conditions the actual level of CBIS would be different from the social optimal one. In fact, we can suppose that the citizens acknowledge the need in extraordinary times to address financial shocks using all the monetary tools, which is perfectly consistent with the aim to avoid in normal times the central bank involvement in supervision. The social optimal value of the reaction parameter c_1^{soc} is different from zero: for the sake of simplicity, we can assume that:

$c_1^{soc} = 1$.

Now, if the reputational costs for the government in facing financial shocks is particularly high, it is likely that $c_1 > c_1^{soc}$. Consequently, the actual level of CBIS designed by the policymaker will be lower than the social optimally one.

Which was the situation before the Crisis? In three decades before the 2008 financial meltdown safeguarding monetary stability became a primary goal in many advanced, emerging and less developed countries alike and CBIS was the selected institutional device to rise the commitment in avoiding the use of the monetary tools to address and fix banking problems. The expected high political gains pushed several governments all around the world to enhance the degree of CBIS in their countries, accepting to restrict their future freedom in using the monetary powers.

Then the Crisis came. It is possible to identify the potential drivers of a CBIS reform after the 2008 financial meltdown? In general, we assume that gains and losses of a CBIS regime are variables computed by the incumbent policymaker, who maintains or reforms the central bank regime, following her preferences. Therefore, any situation that influences the policymaker's gains and costs in changing the supervisory regime can produce incentives to modify the CBIS level.

First, consider the case in which society's preferences against inflation are decreasing. In our model, this would correspond to a decrease in the parameter β, which would, in turn, decreases the gains from maintaining/adopting a high level of CBIS.

Second, any situation that changes the policymaker's political costs c_1 can produce incentives to modify the degree of CBIS. The policymaker's incentives to decrease the level of CBIS in order to be able to implement monetary accommodation are likely to increase if the incumbent governments are facing financial shocks. The large need of banking bailouts, which characterised at least many economies alike in the post-crisis period, are likely to have exerted a great influence on the political costs associated with a high level of central bank separation creating thus incentives to decrease the level of CBIS.

6.5.2.2 Captured Politician

Alternatively we can use a *grabbing hand* (GH) *view* of the political actor. According to the grabbing hand approach, policymakers are motivated by the aim to please the interest of specific, well-defined voters in order to win elections. In our case, the financial industry may be considered a highly organised and powerful interest group which can influence political competition.

The financial industry is likely to be a smaller and more coherent group than the consumers of their services, and therefore politically better organised. The GH policymaker, in defining the central bank regime, depends on the financial industry view of CBI, if this can strongly determine her/his re-election (hereafter his). For the point of the policymaker any misalignment compared to public preferences in order to be consistent with lobby preferences can be considered only if a potential political reward emerges.

The preferences of the financial constituency can be written as:

$$V = (1+\delta)y_2 - f \qquad (9)$$

The parameter δ represents how different the importance of the CBIS goal for the financial constituency is compared to other citizens. The more the financial industry is interested in establishing a more independent central bank regime (**separation attitude**) the greater the parameter $\delta \geq 0$ will be. At the same time it is possible that the financial industry dislikes the separation regime. In this case its separation attitude is negative – i.e. the inflationary propensity is positive – and $\delta \leq 0$.

The parameter *f >0 (***lobbying commitment***)* represents the capturing costs. The financial industry can invest an amount of resources in campaign contributions, which can potentially change the chances of re-election of the incumbent policymaker. Campaign contributions can be contingent upon the effort of the

policymaker; for simplicity $\boldsymbol{f} = \boldsymbol{k}\boldsymbol{a}_2$. The parameter k represents the **lobbying cost** of the financial industry: the greater the necessary investment to implement campaign contributions the higher the value of the parameter will be. The alignment between the lobby's wishes and the politician's conduct is costly.

The purpose of campaign contributions is to influence the incumbent's chances of winning elections. Let us assume that the policymaker's effort $\boldsymbol{a}_2$ devoted to implementing the central bank regime is observable by financial professionals, given that they can be considered insider agents compared to other citizens.

The GH policymaker chooses his effort while taking into account the lobby goal function. The GH policymaker needs to provide enough utility to the financial lobby. He will align his function with the interests of the financial industry. The reason is simple: the GH policymaker knows that campaign contributions can reduce the political competition in his favour, although the effect on voters is stochastic.

This assumption can be simply represented by suggesting that the lobby is able to influence voters' reservation utility using campaign contributions:

$$\boldsymbol{W}^{'} = \boldsymbol{a}^{\boldsymbol{e}} + \Omega_{\boldsymbol{AV}} - \boldsymbol{M}$$

The variable **M** represents the **voting effect** of campaign contributions on voters. We can suppose that the voting effect is stochastically distributed:

$$\boldsymbol{M} = \boldsymbol{m}\boldsymbol{f}$$

Where **m** is a random variable with standardized normal distribution $(0;1)$. The campaign contributions may change the incumbent government's chances of remaining in charge modifying citizens' reservation utility. In general the effect of campaign contributions on voter sentiment is uncertain. The GH knows *ex ante* that if he pleases the financial industry he certainly gains its favour – i.e. contributions – while voter reaction is uncertain. The incumbent government being supported directly or indirectly by the financial industry can produce a mixed reaction in voter sentiment; the final effect is unknown *ex ante*. Nature determines *ex post* if the political effect of campaign contributions implemented by the financial industry is positive, neutral or negative, i.e. $0 \leq \boldsymbol{m}_{\boldsymbol{GH}} \leq 0$.

Returning to the policymaker, his utility function $\boldsymbol{Z}_{\boldsymbol{GH}}$ is defined as:

$$\boldsymbol{Z}_{\boldsymbol{GH}} = \boldsymbol{R}(\boldsymbol{V}) - \boldsymbol{C}(\boldsymbol{a}) \qquad (9)$$

The GH policymaker reward function depends on the financial industry function *V*. As usual, we denote the political value he assigns to fulfil the specific mandate on CBIS with β; therefore:

$$\boldsymbol{R(V) = \beta V}$$

We assume that from the GH policymaker's point of view, the political costs of implementing an increasing level of CBIS are the usual ones, i.e. the cost function assumes the same specification (5):

$$\boldsymbol{C(a) = ca^2} \qquad (5)$$

Therefore, given the utility function $\boldsymbol{Z_{GH}}$ of the GH government, his optimal behaviour will be the result of the following maximization:

$$\max Z_{GH} = \max\left[R(V) - c(a_2\right]$$

Where:

$$\boldsymbol{R(V) = \beta V = \beta\left[(1+\delta)y_2 - f\right] = \beta\left[(1+\delta)(a_2 + \Omega) - ka_2\right]} \qquad (10)$$

Given the cost function (5) we have:

$$\boldsymbol{R(V) - C(a_2) = \beta\left[(1+\delta)(a_2 + \Omega) - ka_2\right] - c(a_2{}^2)}$$

It follows that the GH policymaker maximizes the financial industry welfare net of costs of executing the task. From the first order condition:

$$\frac{\delta Z_{GH}}{\delta a_2} = \beta\left[(1+\delta)\right] - 2ca_2 = 0$$

The optimal effort will be:

$$a_2 = \frac{\beta(1+\delta-k)}{2c}$$

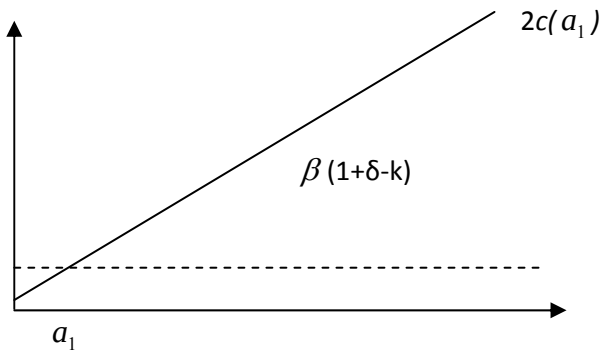


Figure 1

Figure 1 describes the marginal reward function and the marginal cost function of the policymaker (vertical axis); as in the previous case only the latter depends on effort (horizontal axis).

Given α_2, the effective political reward of the GH policymaker will depend on the condition of political competition (4):

$$R_{GH} = \beta \Pr(U \geq W')$$

Where:

$$W' = a^e + \Omega_{AV} - m_{AV} f$$

$$W' = a^e + \Omega_{AV}$$

Then:

$$R_{GH} = \beta \Pr(\Omega + a_2 \geq \Omega_{AV} + a^e)$$

$$R_{GH} = \beta \Pr(\Omega - \Omega_{AV} \geq a^e - a_1) \qquad (4c)$$

Comparing conditions (4a) and (4c) it is evident that the HH policymaker and the GH policymaker face the same condition *ex ante*. Both agents wish to pick up their optimal effect, given that they do not know their ability and in the case of the GH policymaker he does not know the final effect of lobbying activity on voters.

Nature chooses the ability of the incumbent policymaker Ω_{GH}. It follows that the effective reward will be:

$$R_{GH} = \beta \Pr(\Omega_{GH} - \Omega_{AV} \geq a^e - a_2 - m_{GH} k a_2)$$

When expectations are perfectly matched $(a^e = a_2)$ the effective political reward will be positive if the ability of the incumbent policymaker is greater than average, taking into account the *ex post* effect of campaign contributions:

$$(\Omega_{GH} > \Omega_{AV} - m_{GN} k a_2) \qquad (4d)$$

The equilibrium level *y* of CBIS will be determined by the GH policymaker's ability Ω_{GH} and by his effort α_2:

$$\boldsymbol{y}_{GH} = \boldsymbol{a}_2 + \Omega_{GH} = \frac{\boldsymbol{\beta}(1+\boldsymbol{\delta}-\boldsymbol{k})}{2\boldsymbol{c}} + \Omega_{GH} \qquad (11)$$

Finally we can compare the two policymakers. Given the ability of the government and comparing (8) and (11) we have the effect on CBI of different types of policymaker. From

$$\boldsymbol{y}_{HH} = \boldsymbol{a}_1 + \Omega_{HH} = \frac{\boldsymbol{\beta}}{2\boldsymbol{c}} + \Omega_{HH} \qquad (8)$$

$$\boldsymbol{y}_{GH} = \boldsymbol{a}_2 + \Omega_{GH} = \frac{\boldsymbol{\beta}(1+\boldsymbol{\delta}-\boldsymbol{k})}{2\boldsymbol{c}} + \Omega_{GH} \qquad (11)$$

If $\Omega_{HH} = \Omega_{GH}$ (12)

We have that:

$\boldsymbol{y}_{HH} > \boldsymbol{y}_{GH}$ if $\boldsymbol{k} - \boldsymbol{\delta} > 0$ (13)

When the financial industry is in favour of the separation regime – i.e. $\boldsymbol{\delta} \geq 0$ - the CBIS level is greater when the government is HH type rather than GH type if the lobbing cost is higher compared to the separation propensity of the financial industry. Needless to say, the HH policymaker implements an increasingly higher level of CBIS compared to the GH policymaker when the financial lobby dislikes separation - $\boldsymbol{\delta} \leq 0$.

6.5.2.3 BEHAVIORAL POLITICIAN

In the previous paragraph we assumed that the society has decided to assign the CBIS definition task to a politician, i.e. a career concerned player that chooses the policy action entailing personal benefits and costs. In general let $V(t,\pi)$ be the personal utility function of the politician:

$$V(c,y) = B(c,y) - C(c,y) \qquad (14)$$

Where $B(t,\pi)$ and $C(t,\pi)$ are respectively the individual benefits and costs.

6.5.2.3.1 Politicians and Reputation

We already know from equation (4) that the separation between the monetary player and the banking responsibility can be beneficial for the politician. Therefore we can assume that the individual benefits are increasing and concave in the separation policy:

$$\frac{\partial B(c,y)}{\partial y} > 0 \qquad (15)$$

$$\frac{\partial B^2(c,y)}{\partial y} < 0 \qquad (16)$$

At the same time from (5) we know that separation can be costly; so we can assume that the individual costs are increasing and convex:

$$\frac{\partial C(c,y)}{\partial y} > 0 \; \frac{\partial C^2(c,y)}{\partial y} \geq 0 \qquad (17)$$

Further we assume that the politicians are heterogeneous with respect to their degree of reputation sensibility; the politicians can be indexed such that more sensible politicians bear higher marginal costs and/or enjoy lower marginal benefits from the separation policy, given that obviously for a sensible politician the implementation of separation policies is costly:

$$\frac{\partial B(c,y)}{\partial c} \leq 0 \; ; \; \frac{\partial C(c,y)}{\partial c} \geq 0 \qquad (18)$$

The equilibrium is interior, i.e. the separation can't be negative:

$$\frac{\partial B(c,0)}{\partial y} > \frac{\partial C(c,0)}{\partial y} \qquad (19)$$

Therefore in equilibrium the politician optimal CBIS y_{cb} is such that the marginal benefits match the marginal costs:

$$\frac{\partial B(c,y_{cb})}{\partial y} = \frac{\partial C(c,y_{cb})}{\partial y}$$

And that:

$$\frac{\partial y_{cb}}{\partial c} < 0 \qquad (20)$$

Which is exactly the condition (9) that holds in the equilibria (8) and (11), i.e., whatever the type of politician is incumbent, the CBIS and the reputation sensibility are inversely associated.

6.5.2.3.2 Political Committee and Choices

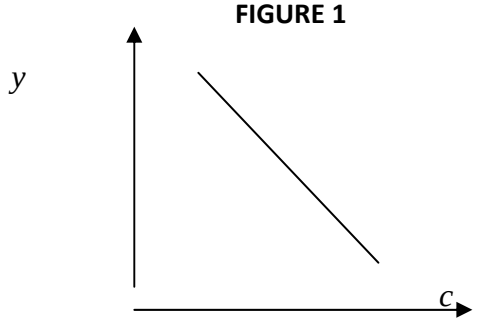
Finally we assume that a Government Board (GOB) with N members formulates the CBIS decision. The politicians, which are the members of the Board, are individuals, heterogeneous in the reputation sensibility c. We assume that:

d) Each GOB member maximizes her own goal function (14);

e) Each GOB member chooses the preferred separation policy y

f) The GOB members vote using a majority rule: therefore the separation policy outcome is the median type's optimal CBIS y_m .The optimal CBIS will be inversely associated with the reputation sensibility of the median politician c_m (Figure 1):

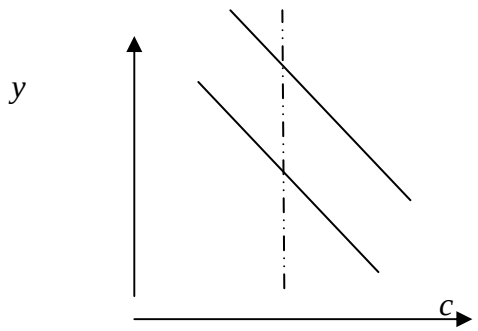
FIGURE 1



It is worth noting that:

ii) Given equation (8) and (11), any change in the macroeconomic structure will modify the optimal CBIS, given the reputation sensibility of the median politician; for example, higher probability of a financial shock, or less monetary conservativeness – i.e. preferences toward separation - will increase the optimal CBIS (Figure 2):

FIGURE 2



ii) the median type's policies is not necessarily coincident with the social optimal ones. The social planner would optimize the sum of the preferences of the individual politicians:

$$\int [B(c,y) - C(c,y)] dF(c) \quad (22)$$

Where the social optimal CBIS y_s is the policy that equalizes the average marginal benefits $B_s(y)$ with the average marginal costs $C_s(y)$:

$$B_s(y) = C_s(y) \quad (23)$$

And therefore in general it will be true that:

$y_m \neq y_s$ and $c_m \neq c_s$, (24)

i.e. the sensibility of the median politician is not necessarily equal to the average politician.

ii) We assume constant voting rules, in order to shed light on the role of the behavioural biases independently from how the GOB governance is designed.

6.5.2.3.3 Loss Aversion and Politician

Now we assume that with loss aversion, and for every CBIS policy choice, losses loom larger than gains, and both are evaluated with respect to the *status quo*. Let $z > 0$ be the parameter which captures loss aversion and let y^s the status quo policy. Increasing separation - $y > y^s$ - entails more benefits and costs, but higher separation costs yield a psychological experience of losses, which amounts to:

$$z(C(c_i, y) - C(c_i, y^s)) \quad (25)$$

In other words the loss adverse politicians overweight the risks of banking policy failures. Vice versa reducing the CBIS - $y < y^s$ - entails less benefits and costs, but with a psychological losses which amount to:

$$z(B(c_i, y) - B(c_i, y^s)) \quad (26)$$

Here the loss adverse politicians overweight the losses in terms of monetary policy effectiveness. Therefore the politician goal function with loss aversion $V(c_i, y / y^s)$ is given by the standard utility $V(c_i, y)$ minus the psychological losses due to the departures from the status quo:

$$V(c_i, y/y^s) = V(c_i, y) - z(C(c_i, y) - C(c_i, y^s)) if y > y^s \quad (27)$$

$$V(c_i, y/y^s) = V(c_i, y) - z(B(c_i, y) - B(c_i, y^s)) if y < y^s$$

The optimal conditions are as follows:

$$B(c_i, y) = (1+z)C(c_i, y^s) if y > y^s \quad (28)$$

$$(1+z)B(c_i, y) = C(c_i, y^s) if y < y^s \quad (29)$$

Now, given the status quo CBIS y^s, the conservative politician (hawk) will be characterized by a level of sensibility c^h,such that:

$$B(c_i, y^s) = (1+z)C(c_i, y^s) \quad (30)$$

While the progressive (hawk) politician will be characterized by a level of sensibility c^d,such that:

$$(1+z)B(c_i, y^s) = C(c_i, y^s) \quad (31)$$

Where $c^h < c^d$

Therefore, for each politician it will be true that, given her level of sensibility c_i , she will set her preferred CBIS y_i according to the following rule:

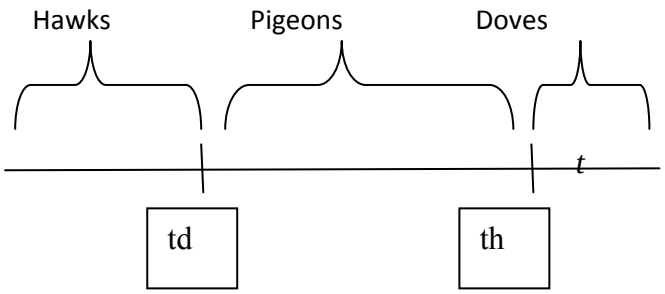
$$B(c_i, y) = (1+z)C(c_i, y^s) ic_i < c^h$$

$$(1+z)B(c_i, y) = C(c_i, y^s) if c_i > c^d \quad (32)$$

$$y = y^s if\ t^h < t < t^d$$

Therefore every GOB can be splitted in three different groups: hawks - $if c_i < t^h$ - doves - $if c_i > c^d$ and pigeons - $if\ t^h < t < t^d$ (Figure 3).

FIGURE 3



Each GOB member will express well defined CBIS preferences. Respect to the standard situation we are assuming that i) each politician will evaluate any policy in terms of changes from a CBIS status quo; ii) any negative effect of a change with respect to the CBIS status quo are thought to loom larger that positive effect of equivalent magnitude. The two assumptions are a simply application of the loss aversion principle (Kahneman and Tversky 1979, Tversky and Kahneman 1991), highlighting that if a loss/gain asymmetry hits the politicians a status quo bias is more likely to occur, as we will see in the next paragraph.

6.5.2.3.4 The Status Quo Bias in Defining the role of the Central Bank as Supervisor: When the Pigeons Win

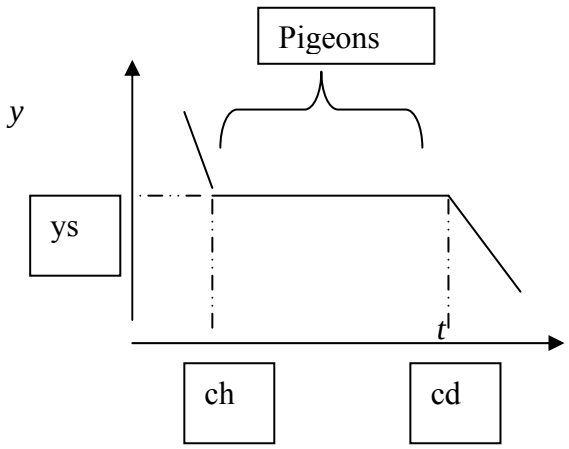
We already know that the GOB chooses the CBIS setting using a majority rule and that the consequent outcome is the median type's optimal CBIS y_m. Therefore the optimal central bank involvement in supervision will depend on the median sensibility c_m, having three possibilities: dove, pigeon and hawk. More precisely three different equilibria can arise (Figure 4):

$$y = y^s if\ c^h < c_m < c^d$$

$$y < y^s if\ c_m < c^h \qquad (33)$$

$$y > y^s if\ c_m > c^h$$

FIGURE 4

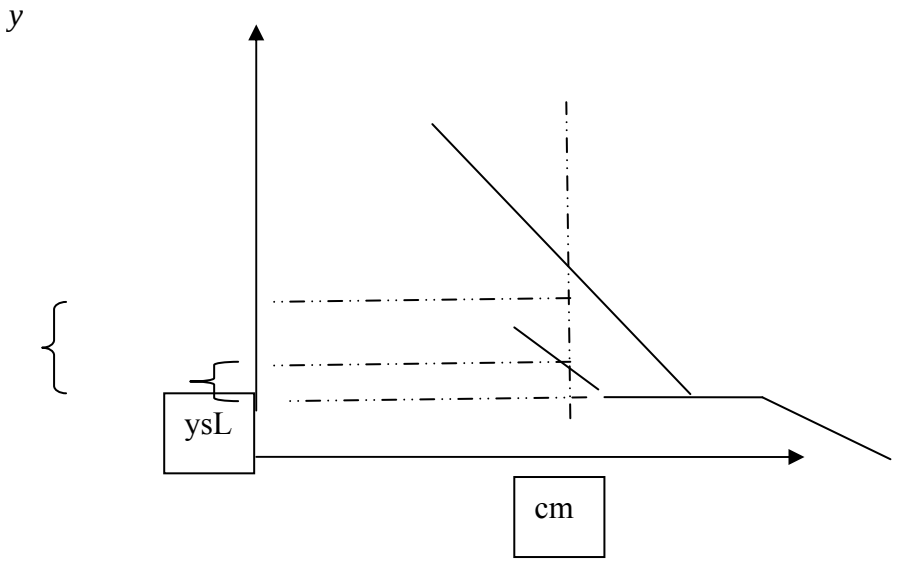


The existence of loss aversion influences the political decisions under three different points of view:

1) *Moderation Effect*: The policy outcome will be the status quo CBIS y^s if the median voter is a pigeon. Further, given that the distance between $t^h and\, t^d$ is increasing in $z > 0$, the more the loss aversion is increasing the more likely a pigeon will be the median voter: a status quo bias in the CBIS will emerge. In other words more loss aversion among GOB members reduces the distances among their policy positions. As the politicians become more loss averse the number of pigeons increases and the status quo bias is likely to increase.

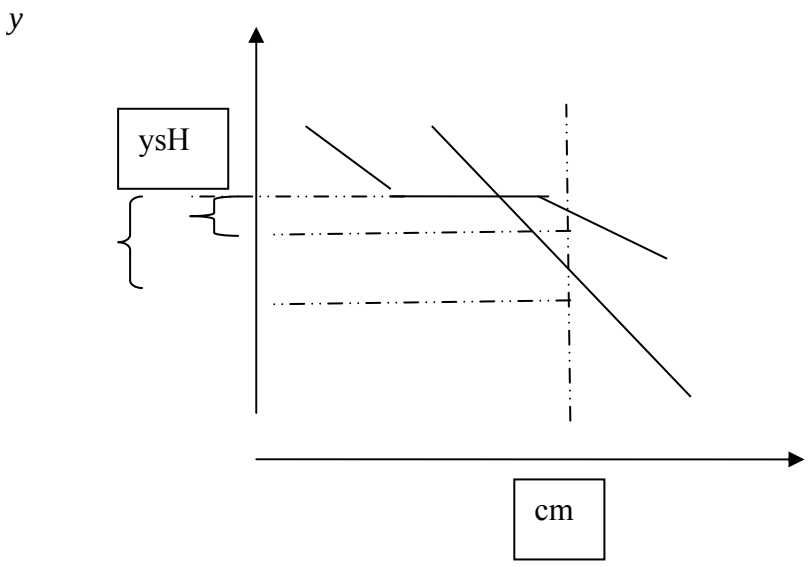
2) *Hysteresis Effect*: The status quo will influence the CBIS choices also if the median voter is either a hawk or a dove. First of all, let us assume that the status quo inflation y_L^s is too low for the median politician (Figure 5): needless to say, she will overweight the increase in the CBIS, and the optimal CBIS follows to be relatively low.

FIGURE 5



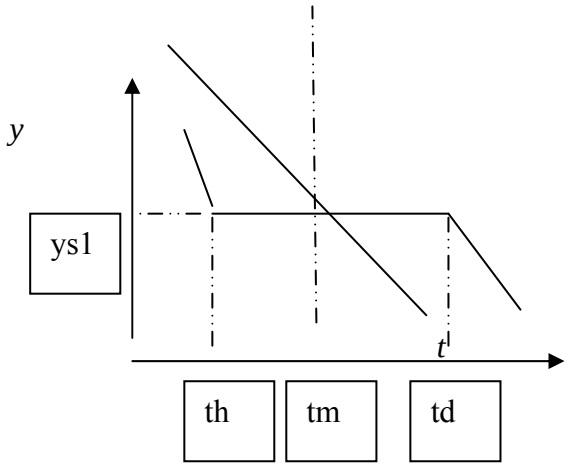
In a specular way, also the opposite is true: suppose that the status quo CBIS y_H^s is too high for the same median politician (Figure 6): in this case she will overweight the losses, and the optimal CBIS e follows to be relatively high. In other words the status quo produces an hysteresis effect in the central bank setting decisions.

FIGURE 6



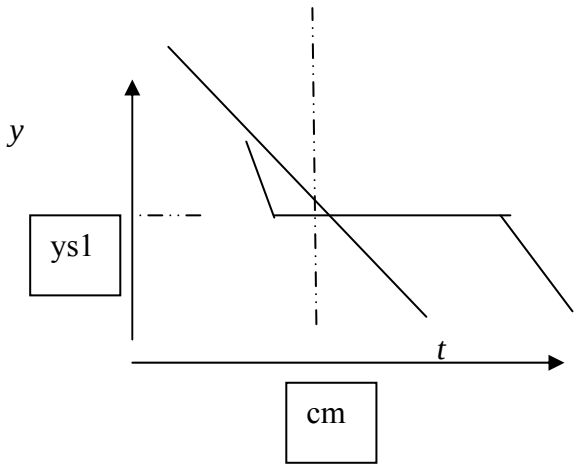
3) *Smoothing* effect: if there a shock in the reputation sensibility, only big shocks can trigger a change in the central bank setting. Let us assume to be in the status quo equilibrium y_1^s (Figure 7) and that the median politician is a pigeon:

FIGURE 7



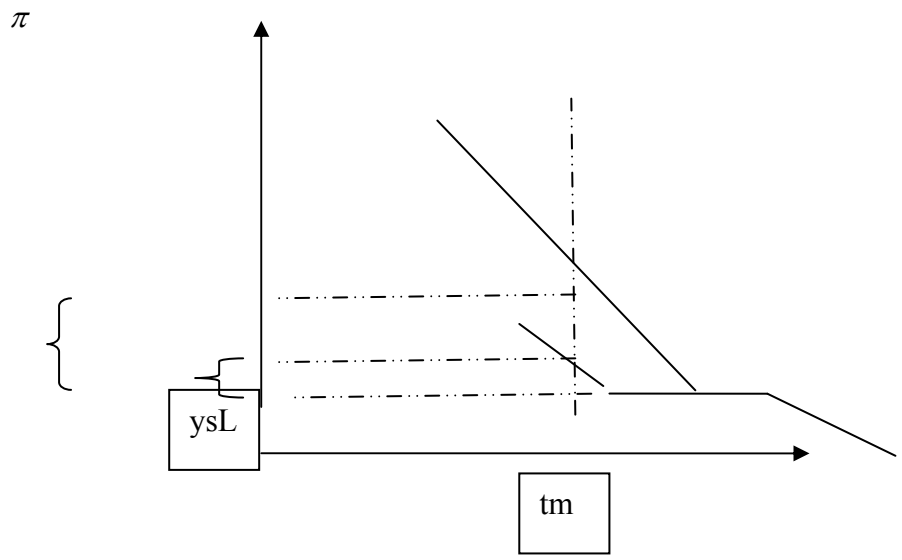
Suppose now that a shock τ hits the degree of reputation sensibility of the politicians; for example the hawkishness increases. Two cases can occur. If the shock is relative low (Figure 8), the median politician is likely to remain a pigeon; the optimal CBIS will be the same:

FIGURE 8



Only if the shock is relatively big the status quo CBIS y_1^s becomes too low for the median politician (Figure 9): however – as we already highlighted discussing the hysteresis effect - she will follow to overweight the losses, and the optimal CBIS follows to be relatively low.

FIGURE 9



All in all: as politicians become more loss averse, both dovishness and hawkishness decreases in a stable way, triggering higher institutional inertia. The behavioural model suggests that changes in the central bank involvement in supervision can be triggered not only by facts that directly influence the political cost and benefit analysis – as a financial shock does in the standard model – but also by other external factors that modify the political loss aversion, as the fact that other countries are reforming their institutional settings (peer effect).

7. REFERENCES

7.1 General Readings

ALESINA A. – TABELLINI G., 2007, *Bureaucrats or Politicians? Part I: A Single Policy Task*. American Economic Review, 97, 169-179.

ALESINA A. – PASSARELLI F., 2015, *Loss Aversion in Politics*, NBER Working Paper Series, n.21077.

ACEMOGLU D. – ROBINSON J.A., 2014, *The Rise and Decline of General Law of Capitalism*, Department of Economics Working Paper Series, MIT, n. 18.

ACEMOGLU D. – CARVALHO V.M. – OZDAGLAR A.- TAHBAZ SALEHI A. (2012), *The Network Origins of Aggregate Fluctuations*, Econometrica, 80, 1977-2016.

ACEMOGLU D. -JOHNSON S.- ROBINSON J.A., 2000, *The Colonial Origins of Comparative Development: An Empirical Investigation*, Department of Economics Working Paper Series, MIT, n. 22.

ACEMOGLU D. - ROBINSON J.A. - VERDIER T., 2012, *Can't We All Be More Like Scandinavians? Asymmetric Growth and Institutions in an Interdependent World*, Department of Economics Working Paper Series, MIT, n. 22.

AHREND R., 2010, *Monetary Ease: A Factor Behind Financial Crises? Some Evidence from OECD Countries*, Economics, Vol.4, April 14.

AHREND R.- COURNEDE B.- PRICE R.W., 2008, *Monetary Policy, Market Excesses and Financial Turmoil*, OECD Economics Department Working Papers, n.597.

AIKMAN D. – BUSH O. – TAYLOR A.M., 2016, *Monetary Versus Macroprudential Policies: Causal Impacts of Interest Rates and Credit Controls in the Era of the UK Radcliffe Report*, NBER Working Paper Series, n.22380.

AKLIN M. – KERN A., 2016, *Is Central Bank Independence Always a Good Thing?*, University of Pittsburgh and Georgetown University, mimeo.

AJELLO A. – LAUBACH T. – LOPEZ SALIDO D.- NAKATA T., 2015, *Financial Stability and Optimal Interest Rate Policy*, Federal Reserve Board, mimeograph.

ALESINA A. – ARDAGNA S., 2009*, Large Changes in Fiscal Policy: Taxes versus Spending*, Harvard Institute of Economic Research Discussion Paper Series, n. 2180.

ALESINA A. – BARBIERO O. – FAVERO C.A. – GIAVAZZI F. – PARADISI M., 2015, *Austerity in 2009 -2013*, CEPR Discussion Paper Series, n. 10347.

ALESINA A. – STELLA A., 2010, *The Politics of Monetary Policy*, NBER Working Paper Series, n.20554.

ALVAREZ F.E. – LIPPI F. – PACIELLO L., 2010, *Optimal Price Setting with Observations and Menu Costs*, NBER Working Paper Series, n.15852.

ANDREOU E. – EMINODOU S. – ZACHARIADIS M., 2016, *Inflation Expectations and Monetary Policy in Europe*, , CEPR Discussion Paper Series, n. 11306.

ANGELETOS G.M., LIAN C., 2016, *Incomplete Information in Macroeconomics: Accommodating Frictions in Coordination,* Working Paper Series, Department of Economics, MIT, .16.

ATTINASI M.G. - KLEMM A., 2014, *The Growth Impact of Discretionary Fiscal Policies*, European Central Bank Working Paper Series, n. 16.97.

BALDWIN R. – GIAVAZZI F., 2015, *The Eurozone Crisis*, VoxEU.org eBook, CEPR Press, London.

BALLS E. – HOWAT J. – STANSBURY A., 2016, *Central Bank Independence Revised*, Kennedy School of Government, Harvard University, mimeo.

BANK OF ENGLAND, 2013, *Monetary Policy Trade Offs and Forward Guidance*, August.

BANK OF INTERNATIONAL SETTLEMENTS, 2009, *Monetary Policy Frameworks and Central Bank Market Operations*, Markets Committee, May.

BANK OF INTERNATIONAL SETTLEMENTS, 2011, *Central Bank Governance and Financial Stability*, May.

BARNICHON R. – MATTHES C., 2015, *Stimulus versus Austerity: The Asymmetric Government Spending Multiplier*, CEPR Discussion Paper Series, n. 10584.

BARRDEAR J. – KUMHOF M., 2016, *The Macroeconomics of Central Bank Issued Digital Currencies*, Bank of England, Staff Working Paper Series, n.605.

BATINI N.- EYRAUD L.- WEBER A. , 2014, *A Simple Method to Compute Fiscal Multipliers*, IMF Working Paper Series, International Monetary Fund, n. 93.

BAZOT G.- BORDO M.D.- MONNET E., 2014, *The Price of Stability: The Balance Sheet Policy of the Banque de France and the Gold Standard*, NBER Working Paper Series, n.20554.

BEAN C., 2010, *The Great Moderation, the Great Panic and the Great Contraction*, European University Institute, Max Weber Lecture Series, n.2.

BEAUDRY P.- GALIZIA D. – PORTIER F., 2014, *Reconciling Hayek's and Keynes' views of Recessions*, NBER Working Paper Series, n.20101.

BECCARINI A., 2016*, Verifying Time Inconsistency of the ECB Monetary Policy by Means of a Regime – Switching Approach*, Empirica, p. 1-25.

BENIGNO P.- NISTICO' S., 2015, *Non Neutrality of Open Market Operations*, CEPR Discussion Paper Series, n. 10594.

BERARDI M., 2015, *Prices, Fundamental Values and Learning*, Centre for Growth and Business Cycle Research, Discussion Paper Series, n.214.

BERLEMANN M. – HIELSCHER K,, 2016*, Measuring Effective Monetary Policy Conservatism of Central Banks: A Dynamic Approach*, Annals of Economics and Finance, 17-1, 105-132.

BERGGREN N. – DAUNFELDT S.O. – HELLSTROM J., 2015, *Does Social Trust Speed Up Reforms? The Case of Central Bank Independence*, IFN Working Paper Series, n.1053.

BERNANKE B.S. - GERTLER M. – GILCHRIST S., 1998*, The Financial Accelerator in a Quantitative Business Cycle Framework*, NBER Working Paper Series, n. 7750.

BERNANKE B.S., 2002, *Asset Price Bubbles and Monetary Policy*, Board of Governors of the Federal Reserve System, October.

BERNANKE B.S., 2010, *Monetary Policy and the Housing Bubble*, Board of Governors of the Federal Reserve System, January.

BERNANKE B.S., 2013, *The Crisis as a Classic Financial Panic,* Board of Governors of the Federal Reserve System, January.

BIANCHI J. – MENDOZA E.G., 2015, *Optimal Time Consistent Macroprudential Policy*, BIS Working Paper Series, n. 516.

BIBOW J., 2001, *Reflections on the Current Fashion for Central Bank Independence*, Working Paper Series, The Jerome Levy Institute of Bard College, n.334.

BLANCHARD O., 2000, *What Do We Know About Macroeconomics that Fisher and Wicksell Did Not?* , NBER Working Paper Series, n. 7750.

BLANCHARD O. , 2008, *The State of Macro*, NBER Working Paper Series, n. 14259.

BLANCHARD O., 2010, *The Crisis: Basic Mechanisms, and Appropriate Policies*, , IMF Working Paper Series, International Monetary Fund, n. 80.

BLANCHARD O., 2016, *Do DSGE Models Have a Future?*, Peterson Institute for International Economics, Policy Brief Series, n.11

BLANCHARD O.- CERUTTI E. – SUMMERS L., 2015, *Inflation and Activity – Two Explorations and Their Monetary Policy Implications*, NBER Working Paper Series, n. 21726.

BLANCHARD O. - DELL'ARICCIA G. - MAURO P., 2010, *Rethinking Macroeconomic Policy*, IMF Staff Position Note, International Monetary Fund, January.

BLANCHARD O.-GIAVAZZI F. , 2001, *Macroeconomic Effects of Regulation and Deregulation in Goods and Labour Markets*, NBER Working Paper Series, n. 8120.

BLANCHARD O. – OSTRY J.- GHOSH A.- CHAMON M., 2015, *Are Capital Inflows Expansionary or Contractionary? Theory, Policy Implications, and Some Evidence*, NBER Working Paper Series, n. 21619.

BLINDER A. S., 2010, *Teaching Macro Principles after the Crisis*, CEPS Working Paper Series, n.207.

BLOOM N. – FLOETOTTO M. – JAMOVICH N. – SAPORTA EKSTEN J. – TERRY S., 2014, *Really Uncertain Business Cycles*, Center for Economic Studies, Working Paper Series, n.18.

BLOT C. – CREEL J. – HUBERT P. – LABONDANCE F. – SARACENO F., 2015, *Assessing the Link between Price and Financial Stability*, Journal of Financial Stability, Vol.16, 71-88.

BOETTKE P.J. – NEWMAN P., 2016, *The Consequences of Keynes*, George Mason University, mimeo.

BOHME R., CHRISTIN N., EDELMAN B., MOORE T., 2015, *Bitcoin: Economies, Technology, and Governance*, Journal of Economic Perspectives, Vol.29, 213-238.

BOISSAY F.- COLLARD F.- SMETS F., 2016, *Booms and Banking Crises*, BIS Working Papers, n.545.

BORDO M.D., 1993, *The Gold Standard, Bretton Woods and Other Monetary Regimes: An Historical Appraisal*, NBER Working Paper Series, n. 4310.

BORDO M.D., 2010, *Long Term Perspectives on Central Banking*, Norges Bank Symposium, November.

BORDO M.D. , 2012*, The Lender of Last Resort: Alternative Views and Historical Experience*, FRB Richmond Economic Review, vol.76, n.1.

BORDO M.D. – HAROLD J., 2015, *Capital Flows and Domestic and International Order: Trilemmas from Macroeconomics to Political Economy and International Relations*, NBER Working Paper Series, n. 21017.

BORDO M.D. – HUMPAGE O.F., 2014, *Federal Reserve Policy and Bretton Woods*, NBER Working Paper Series, n.3367.

BORDO M.D. – KYDLAND F.E., 1990, *The Gold Standard as a Rule*, NBER Working Paper Series, n.3367.

BORDO M.D. – LANDON LANE J., 2013*, Does Expansionary Monetary Policy Cause Asset Price Booms; Some Historical and Empirical Evidence*, NBER Working Paper Series, n.19585.

BORDO M.D. – LANDON LANE J. – REDISH A., 2004*, Good versus Bad Deflation: Lessons from the Gold Standard Era*, NBER Working Paper Series, n.10329.

BORDO M.D. – MEISSNER C.M.,2015, *Growing Up to Stability? Financial Globalization, Financial Development and Financial Crises*, NBER Working Paper Series, n.21287.

BORDO M.D. – MEISSNER C.M.,2016, *Fiscal and Financial Crises,* NBER Working Paper Series, n.22059.

BORDO M.D. – ROCKOFF H.,2013, *Not Just the Great Contraction: Friedman and Schwartz's a Monetary History of the United States 1867 to 1960*, NBER Working Paper Series, n.18828.

BORDO M.D. – SCHWARTZ A.J., 1997, *Monetary Policy Regimes and Economic Performances: The Historical Record*, NBER Working Paper Series, n. 6210.

BORDO M.D. – SCHWARTZ A.J., 2003, *IS LM and Monetarism*, NBER Working Paper Series, n. 9713.

BORDO M. – SIKLOS P.,2015, *Central Bank Credibility before and after the Crisis*, NBER Working Paper Series, n. 21710.

BORIO C., 2006, *Monetary and Prudential Policies at the Crossroads? New Challenges in the New Century*, BIS Working Paper Series, n.216.

BORIO C., 2014a*, Monetary and Financial Stability: What Role in Prevention and Recovery?*, Capitalism and Society, Vol.9, n.2, article 1.

BORIO C., 2014b, *The International Monetary and Financial System: Its Achilles Heel and What to Do about It*, BIS Working Paper Series, n.456.

BORIO C. – LOWE P., 2002, *Asset Prices, Financial and Monetary Stability: Exploring the Nexus*, BIS Working Paper Series, n.114.

BORIO C. – WHITE W.R., 2003, *Whither Monetary and Financial Stability: the Implications of Evolving Policy Regimes*, Proceedings, Federal Reserve Bank of Kansas City, 131-211.

BRUNNERMEIER M.K. – EISENBACH T.M. – SANNIKOV Y., 2012, *Macroeconomics with Financial Frictions: a Survey*, NBER Working Paper Series, n. 10973.

BRUNNERMEIER M.K – SCHNABEL I., 2015, *Bubbles and Central Banks: Historical Perspectives*, CEPR Discussion Paper Series, n. 10528.

BRUNNERMEIER M.K. – SANNIKOV Y., 2016, *Macro, Money and Finance: A Continuous Time Approach*, NBER Working Paper Series, n. 22343.

BUITER W., 2008, *Can Central Banks Go Broke?*, CEPR, Policy Insight Series, n.24.

BUITER W.H., 2014, *Central Banks: Powerful, Political and Unaccountable?*, CEPR Discussion Paper Series, n. 10223.

BUNEA D., KARAKITSOS P., MERRIMAN N., STUDENER W., 2016, *Profit Distributions and Loss Coverage Rules for Central Banks*, ECB Occasional Paper Series, n. 169.

BURDEKIN R.C.K., LANEY L.O., 2016, *Fiscal Policymaking and the Central Bank Institutional Constraint Una Vez Màs: New Latin American Evidence*, Public Choices, forthcoming.

BYRNE D.Y. – FERNALD J.G. – REINSDORF M.B., 2016, *Does the United States have a Productivity Slowdown or a Measurement Problem?* , Finance and Economics Discussion Series, Federal Reserve Board, n.17.

CABALLERO R.J.-FARHI E.-GOURINCHAS P.O., 2015, *Global Imbalances and Currency Wars at the ZLB* , NBER Working Paper Series, n. 10973.

CABALLERO R.J.-FARHI E.-GOURINCHAS P.O., 2016, *Safe Asset Scarcity and Aggregate Demand*, NBER Working Paper Series, n. 22044.

CALDARA D.- FUENTES-ALBERO C. – GILCHRIST S. – ZAKRAJSEK E., 2016*, The Macroeconomic Impact of Financial and Uncertainty Shocks,* NBER Working Paper Series, n. 22058.

CANZONERI M.B.- COLLARD F.- DELLAS H. – DIBA B., 2015, *Fiscal Multipliers in Recessions*, CEPR Discussion Paper Series, n. 10353.

CECCHETTI S.G., 2013*, Central Bank Independence: a Path Less Clear,* Speech, International Conference, Bank of Mexico, October.

CECCHETTI S.G.-FLORES LAGUNES A.-KRAUSE S., 2004*, Has Monetary Policy Become More Efficient? A Cross Country Analysis,* NBER Working Paper Series, n. 10973.

CECCHETTI S.G.-FLORES LAGUNES A.-KRAUSE S., 2006*, Assessing the Sources of Changes in the Volatility of Real Growth,* NBER Working Paper Series, n. 11946.

CERUTTI E.- CLAESSENS S.- LAEVEN L., 2015, *The Use and Effectiveness of Macroprudential Policies: New Evidence*, IMF Working Paper Series, n. 61.

CESA BIANCHI A. – REBUCCI A., 2016, *Does Easing Monetary Policy Increase Financial Stability?,* NBER Working Paper Series, n. 22283.

CHARI V.V. – KEHOE P.J. – Mc GRATTAN E.R., 2008, New Keynesian Models: Not Yet Useful for Policy Analysis, Working Paper Series, Research Department, Federal Reserve Bank of Minneapolis, n.664

CHEN C.H., 2015*, Twin-Peak Financial Regulatory Regime in China: A Desirability Analysis*, LSN Research Paper Series, n.6.

CHEN S. –KIM M. – OTTE M. – WISEMAN K. – ZDZIENICKA A., 2015, *Private Sector Deleveraging and Growth Following Bust*, IMF Working Paper Series, n. 35.

CHORTAREAS G. – LOGOTHETIS V. – MAGKONIS G. – ZEKENTE K.M., 2016, *The Effect of Banking Supervision on Central Bank Preferences: Evidence from Panel Data*, Economics Letters, forthcoming.

CHUNG H.T.- HERBST E.- KILEY M.T., 2014, *Effective Monetary Policy Strategies in New Keynesian Models: A Re-Examination,* NBER Working Paper Series, n.20611.

CLARIDA R., 2014, *Monetary Policies in Open Economies: Practical Perspectives for Pragmatic Central Bankers*, NBER Working Paper Series, n.20545.

CLARIDA R., GALI' J. – GERTLER M., 1999, *The Science of Monetary Policy: A New Keynesian Perspective, Journal of Economic Perspectives*, Vol. 37, pp. 1661-1707.

COCHRANE J., 2015, *Do Higher Interest Rates Raise or Lower Inflation?*, Chicago Booth, mimeo.

COLLIARD J.E., 2015, *Optimal Supervisory Architecture and Financial Integration in a Banking Union*, ECB Working Paper Series, 1786.

CROWLEY J., 2015, *Central Bank and Commercial Bank Balance Sheet Before, During and After the Global Financial Crisis*, IMF Working Paper Series, n. 47.

DAVIS S.J. - KAHN J.A., 2008*, Interpreting the Great Moderation: Changes in the Volatility of Economic Activity at the Macro and Micro Levels*, Federal Reserve Bank of New York, Staff Report, n.334.

DE FIGUEIREDO J. – STIGLITZ E.H,, 2015, *Democratic Rulemaking*, NBER Working Paper Series, n.21765.

DE GRAUWE P. – YUEMEI J.I, 2016, *International Correlation of Business Cycles in a Behavioral Macroeconomic Model*, CEPR Discussion Paper Series, n. 11257.

DE HAAN J. – QUINTYN M. – MASCIANDARO D., 2008, Does Central Bank Independence still Matter? *European Journal of Political Economy,* 24(4), 717-721.

DEHMEJ S. – GAMBACORTA L., 2015, *Macroprudential Policy in a Monetary Union,* November 2015, mimeo.

DELL'ARICCIA G. – LAEVEN L. – SUAREZ G., 2016, *Bank Leverage and Monetary Policy's Risk Taking Channel; Evidence from the United States*, CEPR Discussion Paper Series, n. 11230.

DELLAS H. – TAVLAS G.S., 2016, Friedman, *Chicago and Monetary Rules, Becker Friedman Institute for Research in Economics*, Working Paper Series, n.8.

DE PAOLI B. – PAUSTIAN M., 2013, *Coordinating Monetary and Macroprudential Policies*, FRBNY Staff Report, n. 653.

DIAMOND D.W.- RAJAN R., 2009, *The Credit Crisis: Conjectures about Causes and Remedies*, NBER Working Paper Series, n.14739.

DINCER N.N. - EICHENGREEN B., 2013, *Central Bank Transparency and Independence: Updates and New Measures*, Bank of Korea Working Paper Series, n.21.

DIXON R. – LIM G.C. – VAN OURS J.C., 2016, *Revisiting Okun's Relationship*, Melbourne Institute Working Paper Series, n.14.

DOROFTEI I.M, 2013, *The Lessons of the Currency School – Banking School Dispute for the Present Post-Crisis Economy*, *Procedia Economics and Finance*, n.6, 48-56.

DUDLEY W.C., 2015, *Remarks at the Fed at a cross roads: Where to Go Next?*, Brookings Institution, Washington D.C., October 15th.

DZIUDA W., LOEPER A., 2016, *Dynamic Collective Choice with Endogenous Status Quo*, Journal of Political Economy, vol.124, n.4.

EGGERTSSON G.B. – KRUGMAN P. , 2010, *Debt, Deleveraging and the Liquidity Trap*, Princeton University, mimeo.

EICHENGREEN B., 2015*, Deflation and Monetary Policy*, Bank of Korea, WP Series, n.25.

EICHEHGREEN B. – TEMIN P., 2010, *Fetters of Gold and Paper*, NBER Working Paper Series, n.16202.

EICHENGREEN B. – O' ROURKE K.H., 2009, *A Tale of Two Depressions*, Advisory Perspectives, April.

EIJFFINGER, S.C.W, HOEBERICHTS M., 1998, *The Trade Off between Central Bank Independence and Conservativeness*, Oxford Economic Papers, 50, 397-411.

EIJFFINGER S.-MASCIANDARO D. , 2014, *Modern Monetary Policy and Central Bank Governance: A Story of Two Tales*, Research Paper Series, Baffi Centre, Bocconi University, n.157.

EISENBACH T.M., LUCCA D.O. – TOWNSEND R.M., 2016, *The Economics of Bank Supervision*, NBER Working Paper Series, n. 22201.

ENGEL C., 2015, *International Coordination of Central Bank Policy*, NBER Working Paper Series, n. 20952.

ESPINOSA VEGA M.A.- RUSSELL S., 2015, *Interconnectedness, Systemic Crises and Recessions*, IMF Working Paper Series, n. 46.

FAIR R.C., 2012, *Has Macro Progressed?*, Journal of Macroeconomics, 34, 2-10.

FARMER R.E.A. – PLATONOV K., 2016, *Animal Spirits in a Monetary Model*, CEPR Discussion Paper Series, n. 10635.

FARVAQUE E. – HERICOURT J. – LAGADEC G., 2008, *Central Bank Independence and Ageing, Munich Personal RePEc Archive*, January.

FATAS A. – SUMMERS L. H., 2016, *The Permanent Effect of Fiscal Consolidation*, NBER Working Paper Series, n.22374.

FAURE S. – GERSBACH H., 2016, *Money Creation, Monetary Policy and Capital Regulation*, CEPR Discussion Paper Series, n. 11368.

FAVARETTO F. – MASCIANDARO D., 2015, *Behavioural Economics and Monetary Policy*, Research Paper Series, Baffi Centre, Bocconi University, n.165.

FERGUSON N.- SCHAAB A.- SCHULARICK M., 2015, *Central Bank Balance Sheets: Expansion and Reduction since 1900*, CEPR Discussion Paper Series, n. 10635.

FISHER S., 2015, *Central Bank Independence*, 2015 Herbert Stein Memorial Lecture, National Economists Club, Washington D.C., mimeo.

FRIEDEN J., 2014*, The Political Economy of Adjustment and Rebalancing*, Department of Government, Harvard University, mimeo.

GABAIX X., 2015, *Behavioral Macroeconomics Via Sparse Dynamic Programming*, CEPR Discussion Paper Series, n. 11026.

GADEA RIVAS M.D.- GOMEZ LOSCOS A. – PEREZ QUIROS G., 2014, *The Two Greatest. Great Recession vs Great Moderation*, Working Paper Series, Banco de Espana, 1423.

GALI' J., 2012, *Notes for a New Guide to Keynes (I): Wages, Aggregate Demand, and Employment*, NBER Working Paper Series, n.18651.

GALI' J., 2014, *The Effects of Money Financed Fiscal Stimulus*, CEPR Discussion Paper Series, n. 10165.

GARIN J.- LESTER R.-SIMS E., 2015, *On the Desirability of Nominal GDP Targeting*, NBER Working Paper Series, n.18651.

GARIN J.- LESTER R.-SIMS E., 2016, *Raise Rates to Raise Inflation? Neo-Fisherianism in the New Keynesian Model,* NBER Working Paper Series, n.22177.

GARIN J.- LESTER R.-SIMS E., 2016, *Are Supply Shocks Contractionary at the ZLB?,* NBER Working Paper Series, n.22311.

GARRISON R.W. 2005, *The Austrian School*, in B. Snowdon and H.R. Vane, Modern Macroeconomics, Cheltenham, Edward Elgar.

GARRONE G.- MARCHIONATTI R., 2004, *Keynes on Econometric Method*, Working Paper Series, Department of Economics, University of Torino, n.1.

GARCIA SCHMIDT M. – WOODFORD M., 2015, *Are Low Interest Rates Deflationary? A Paradox of Perfect Foresight Analysis*, Institute for New Economic Thinking WP Series, n.18.

GERDESMEIER D. – MONGELLI F.P. – ROFFIA B., 2007, *The Euro System, the US Federal Reserve and the Bank of Japan*, ECB, Working Paper Series, n.742.

GERAATS P., 2013, *Monetary Policy Transparency*, University of Cambridge, mimeo.

GERLACH S. – SCHNABEL G., 1999, *The Taylor Rule and Interest Rates in the EMU Area*, BIS Working Papers, Bank for International Settlement, n.73.

GERTLER M., KIYOTAKI N., PRESTIPINO A., 2016, *Wholesale Banking and Bank Runs in Macroeconomic Modelling of Financial Crises*, FRB International Finance Discussion Paper Series, n. 1156.

GIANNINI C., 2004, *The Age of Central Banks*, Edward Elgar, Cheltenham, UK.

GILCHRIST S. –ZAKRAJSEK E., 2015, *Customer Markets and Financial Frictions: Implications for Inflation Dynamics*, mimeo.

GODWIN A.- RAMSAY I., 2015, *Twin Peaks*, CIFR Research Working Paper Series, n. 74.

GOODFRIEND M.- KING R.G., 1997, *The New Neoclassical Synthesis and the Role of Monetary Policy*, mimeo.

GOODHART C.A.E., 2010, *The Changing Role of Central Banks*, BIS Working Papers, Bank for International Settlement, n.326.

GONCALVES C.E., 2015, *Taylor Visits Africa*, IMF Working Paper Series, n. 258.

GOPINATH G., 2015, *The International Price System*, mimeo.

GORDON G.B, 2016, *The History and Economics of Safe Assets*, NBER Working Paper Series, n.22210.

GORDON G.B. – TALLMAN E.W., 2016, *How Did Pre-Fed Banking Panics End?*, NBER Working Paper Series, n.18651.

GORDON R.J., 2005, *What Caused the Decline in the US Business Cycle Volatility?*, The Changing Nature of the Business Cycle, RBA Annual Conference, Reserve Bank of Australia.

GORTON G.B., 2016, *The History and Economics of Safe Assets*, NBER Working Paper Series, n.22210.

GRAY S. – PONGSAPARN R., 2015, *Issuance of Central Bank Securities: International Experiences and Guidelines*, IMF Working Paper Series, n. 106.

GRILLI, V., MASCIANDARO, D. AND TABELLINI, G., 1991, Political and monetary institutions and public financial policies in the industrial countries. *Economic Policy, 6*(13), 342-392.

GRUBER J.W. – KAMIN S.B., 2015, *The Corporate Saving Glut in the Aftermath of the Global Financial Crisis*, International Finance Discussion Papers, Board of Governors of the Federal Reserve System, n.1150.

GURKAYNAK R.- KANTUR Z. – TAS M. – YILDIRIM S., 2015, *Monetary Policy in Turkey after Central Bank Independence,* CESIFO Working Paper Series, n.81.

GYLFASON T.- TOMASSON H. – ZOEGA G., 2015*, Around the World with Irving Fisher*, CESIFO Working Paper Series, n.5227.

HALL R.E. , 1976, *Notes on the Current State of Empirical Macroeconomics*, mimeo.

HALL R.E.-REIS R., 2015, *Maintaining Central Bank Financial Stability Under New Style Central Banking*, , NBER Working Paper Series, n.18651.

HANSEN G.D – OHANIAN L.E., 2016, *Neoclassical Models in Macroeconomics*, NBER Working Paper Series, n.22122.

HARWICK C., 2015, *Money and its Institutional Substitutes*, George Mason University, Department of Economics, mimeo.

HELLWIG M., 2015*, Financial Stability and Monetary Policy*, Working Paper Series, Max Planck Institute for Research on Collective Goods, n.10.

HENDRICKSON J. – BECKWORTH D., 2016, *Nominal GDP Targeting and the Taylor Rule on a Even Playing Field*, mimeo.

HOFFMANN A. – SCHNABL G., 2016, *Adverse Effect of Ultra Loose Monetary Policies on Investment, Growth and Income Distribution,* CESIFO Working Paper Series, n.5254.

HOFMANN B. – BOGDANOVA B., 2012, *Taylor Rule and Monetary Policy: A Global "Great Deviation"?,* BIS Quarterly Review, September, 37-49.

HOOVER K., 2015, *The Genesis of Samuelson and Solow's Price-Inflation Phillips Curve*, DUKE Working Paper Series, vol.8, n.1

HOWELLS P. – MARISCAL I., 2011, *Recent Development in Monetary Policy*, Center for Global Finance, UWE, Bristol.

IRWIN D.A., 2014, *Adam Smith's "Tolerable Administration of Justice" and the Wealth of Nations*, , NBER Working Paper Series, n. 20636.

ISSING O., 2003, *Monetary and Financial Stability: Is There a Trade Off?*, BIS Papers, n.18, 16-23.

ITO T., 2014, *We Are All QE- sians Now*, Discussion Paper Series, IMES, Bank of Japan, n.5.

JACOME L.I., 2015, *Central Banking in Latin America: From the Gold Standard to the Golden Years*, IMF Working Paper Series, n.60.

JAROCINSKI M. – SMETS F.R., 2008, *House Prices and the Stance of Monetary Policy*, Review, Federal Reserve Bank of St. Louis, July/August, 339-366.

JORDA O. – SCHULARICK M. – TAYLOR A.M., 2014, *The Great Mortgaging: Housing Finance, Crises and Business Cycles*, NBER Working Paper Series, n. 20501.

JORDA O. – SCHULARICK M. – TAYLOR A.M., 2015a, *Leveraged Bubbles*, CEPR Working Paper Series, n. 5489.

JORDA O. – SCHULARICK M. – TAYLOR A.M., 2015b, *When Credit Bites Back: Leverage, Business Cycles and Crises*, Institute for New Economic Thinking, Working Paper Series, n. 20.

JUSELIUS M. – BORIO C. – DISYATAT P. – DREHMANN M., 2016*, Monetary Policy, the Financial Cycle and Ultra – Low Interest Rates*, BIS Working Paper Series, n. 569.

KAHN G.A., 2010, *Taylor Rule Deviations and Financial Imbalances*, Federal Reserve Bank of Kansas City, Economic Review, Second Quarter, 63-99.

KHAN A., 2016, *Central Bank Governance and the Role of Nonfinancial Risk Management*, IMF Working Paper Series, n. 34.

KENNY G.- MORGAN J., 2011, *Some Lessons from the Financial Crisis for the Economic Analysis*, Occasional Paper Series, European Central Bank, n.130.

KIM S. – MEHOROTRA A., 2015, *Managing Price and Financial Stability Objectives – What Can Learn from the Asia – Pacific Region?*, BIS Working Papers, n.533.

KIREYEV A., 2015, *How to Improve the Effectiveness of Monetary Policy in the West Africa Economic and Monetary Union?*, IMF Working Paper Series, n.99.

KORHONEN I. – NUUTILAINEN R., 2016, *A Monetary Policy Rule for Russia, or Is It Rules?*, Bank of Finland Research Discussion Papers, n.2., 2016.

KRAAY A., 2015, *Weak Instruments in Growth Regressions: Implications for Recent Cross – Country Evidence on Inequality and Growth*, World Bank Policy Research Working Paper Series, n.7494

ISTREFI K.- PILOIOU A., 2014, *Economic Policy Uncertainty and Inflation Expectations*, Banque de France Working Paper Series, n.511.

LANE T., 2016, *Monetary Policy and Financial Stability*, HEC Montreal, February, mimeograph.

LASEEN S.- PESCATORI A. – TURUNEN J., 2015, *Systemic Risk: A New Trade Off for Monetary Policy?*, IMF Working Paper Series, n. 142.

LEEPER E.M. – LEITH C., 2016, *Understanding Inflation as a Joint Monetary – Fiscal Phenomenon*, mimeo, January.

LEIJONHUFVUD A., 1973, *Life Among the Econ*, Western Economic Journal, 11(3), 327-337.

LEVINE R., 2010, *An Autopsy of the U.S. Financial System*, NBER Working Paper Series, n.15956.

LEWIS P.A. – WAGNER R.E. , 2016, *New Austrian Macro Theory: a Call for Inquiry*, Review of Austrian Economics, forth.

LIMA D. – LAZOPOULOS I. – GABRIEL V., 2016, *The Effect of Financial Regulation Mandate on Inflation Bias: A Dynamic Panel Approach,* Discussion Papers in Economics, University of Surrey, n.6.

LO S. – ROGOFF K. , 2015*, Secular Stagnation, Debt Overhang and other Rationales for Sluggish Growth*, BIS Working Papers, n.482.

LOMBARDI D.-MOSCHELLA M., 2016*, Domestic Preferences and European Banking Supervision: Germany, Italy and the SSM*, West European Politics, 1-21.

LOMBARDI D.-MOSCHELLA M., 2016b*, The Symbolic Politics of Delegation: Macroprudential Policy and Independent Regulatory Agencies* , New Political Economy, 1-17.

LOTHIAN J.R. – TAVLAS G.S., 2016, *How Friedman and Schwartz Became Monetarists*, Working Paper Series, Becker Friedman Institute, University of Chicago, n. 16.

LOVELL M.-LUCAS R.-MORTENSEN D. – SHILLER R. – WALLACE N., 2011*, Rational Expectations: Retrospect and Prospect,* CHOPE Working Paper Series, Center for the History of Political Economy, Duke University, n. 10.

LUCAS R.E., 2011, *The US Recession of 2007-201?*, Milliman Lecture, University of Washington, May, mimeo.

LUCAS R.E., 2014, *Liquidity: Meaning*, *Measurement and Management*, Review, Federal Reserve Bank of St. Louis, 96(3), 199-212.

LUZZETTI M.N.-OHANIAN L.E., 2010, *The General Theory of Employment, Interest and Money after 75 Years: The Importance in Being in the Right Place at the Right Time*, NBER Working Paper Series, n.16631.

MAHONEY P., 2016, *Adam Smith, Prophet of Law and Economics,* Law and Economics Research Paper Series, University of Virginia School of Law, n. 5.

MAIBO S.M.- GALLEGOS C.A., 2014*, Interest Rate Caps Around the World: Still Popular, but a Blunt Instrument*, World Bank Policy Research Working Paper Series, n. 7070.

MANKIW N.G., 2006, *The Macroeconomist as Scientist and Engineer*, NBER Working Paper Series, n.12349.

MASLOWSKA A., 2011a, *Quest for the Best: How to Measure Central Bank Independence and Show Its Relationship with Inflation,* AUCO Czech Economic Review, vol. 5(2), 132-161.

MASLOWSKA A., 2011b, *Does Central Bank Independence Matter? An Examination using the Taylor Rule,* Homo Oeconomicus, vol. 27(4), 419-442.

MASLOWSKA JOKINEN A. – MATYSEK JEDRYCH A, 2016, *Institutional Determinants of Financial Safety Net Effectiveness,* National Bank of Poland Working Paper Series, n.240.

MASCIANDARO D. – QUINTYN M. , 2015, *The Governance of Financial Supervision: Recent Developments,* Journal of Economic Surveys, forth.

MASCIANDARO D. – ROMELLI D., 2015, *Ups and Downs. Central Bank Independence from the Great Inflation to the Great Recession*, Financial History Review, December, 1-31.

MASCIANDARO D. – VOLPICELLA A., 2015, *Macroprudential Policies and Central Banks: Facts and Drivers*, Journal of International Money and Finance, forth.

MAURO P. – ZILINSKY J., 2015, *Fiscal Tightening and Economic Growth: Exploring Cross Country Correlations*, Working Paper Series, Peterson Institute for International Economics, n.15.

MELECKI M. – PODPIERA A.M., 2015, *Placing Bank Supervision in the Central Bank*, World Bank Policy Research Paper Series, n. 7320.

MERROUCHE O.- NIER E., 2014, *The Global Financial Crisis – What Drove the Build-Up?*, CEPR Discussion Paper Series, n. 10015.

MIAN A.R.- SUFI A. – TREBBI F., 2012, *Resolving Debt Overhang: Political Constraints in the Aftermath of Financial Crises*, NBER Working Paper Series, n.17831.

MITCHENER K.J. – RICHARDSON G. , 2016, *Network Contagion and Interbank Amplification During the Great Depression*, CEPR Discussion Paper Series, n. 10015.

MISHKIN F.S. – WHITE E.N., 2014, *Unprecedented Actions: The Federal Reserve's Response to the Global Financial Crisis in Historical Perspective*, NBER Working Paper Series, n.20737.

MOHAR R. – KAPUR M., 2014, *Monetary Policy Coordination and the Role of Central Banks*, IMF Working Paper Series, n.70.

MOSCATI I., 2016, *How Economist Came to Accept Expected Utility Theory. The Case of Samuelson and Savage*, Economic Perspectives, forthcomings.

NAKATA T. – SCHIMDT S., 2016, *The Risk Adjusted Monetary Policy Rule*, Finance and Economics Discussion Series, Federal Reserve Board, n.61.

NIER E.W., 2009, *Financial Stability Frameworks and the Role of Central Banks: Lessons from the Crisis*, IMF Working Paper Series, n.70.

NELSON E., 2004, *The Great Inflation of the Seventies: What Really Happened?*, Federal Reserve Bank of St. Louis, Working Paper Series, n.1.

ONDER A.S. – TERVIO M., 2014, *Is Economics a House Divided? Analysis of Citation Networks*, mimeo.

OPPERS S.E. 2002, *The Austrian Theory of Business Cycles: Old Lessons for Modern Economic Policy?*, IMF Working Paper Series, n.2.

ORPHANIDES A., 2010, *Monetary Policy Lessons from the Crisis*, CEPR Discussion Paper Series, n. 7891.

PERSSON T., TABELLINI G., 1997, *Political Economics and Macroeconomic Policy*, IGIER Working Paper Series, Bocconi University, n. 121.

PIAZZESI M. – SCHNEIDER M., 2016, *Housing and Macroeconomics*, , NBER Working Paper Series, n. 22354.

PINOTTI P., 2014, *The Causes and Consequences of Organized Crime: Preliminary Evidence across Countries*, Bocconi University, mimeo.

POSEN A., 2009, *Finding the Right Tool for Dealing with Asset Price Booms*, MPR Monetary Policy and the Markets Conference, London, mimeo.

RASKIN M. – YERMACK D., 2016, *Digital Currencies, Decentralized Ledgers and the Future of Central Banking*, NBER Working Paper Series, n. 22238.

REIS R., 2015, *Different Types of Central Bank Insolvency and the Central Role of Seignorage*, NBER Working Paper Series, n. 22415.

REIS R., 2016, *QE in the Future: The Central Bank Balance Sheet in a Fiscal Crisie*, NBER Working Paper Series, n. 21226.

RIERA – CRICHTON D.- VEGH C.A. – VULETIN G., 2014, *Procyclical and Countercyclical Fiscal Multiplier: Evidence from OECD Countries*, NBER Working Paper Series, n. 20533.

RIBONI A., RUGE-MURCIA F.J., 2010, Monetary Policy by Committee: Consensus, Chairman Dominance, or Simple Majority?, *Quarterly Journal of Economics*, 125(1), 363-416.

ROGOFF K., 2013, *Comment on "International Policy Coordination: Present, Past and Future" by John B. Taylor* , BIS Working Paper Series, n.437.

ROMER C.D.- ROMER D.H., 2013, *The Missing Transmission Mechanism in the Monetary Explanation of the Great Depression*, NBER Working Paper Series, n.18746.

ROMELLI D., 2015, *Three Essays on Central Banking*, Université de Cergy – Pontoise, PhD Thesis, December, mimeo.

SARGENT T.J., 2010, *Where to Draw Lines: Stability versus Efficiency*, September, mimeo.

SCHMULOW A.D., 2015, Twin Peaks: *A Theoretical Model*, CIFR Research Working Paper Series, n. 1.

SCHWARTZ A.J., 1995, *Why Financial Stability Depends on Price Stability*, Economic Affairs, n.154, 21-25.

SERGEYEV D., 2016, *Optimal Macroprudential and Monetary Policy in a Currency Union*, mimeo.

SETTERFIELD M – KIM Y.K., 2015, Debt Servicing, Aggregate Consumption and Growth, Working Paper Series, Institute for New Economic Thinking, n. 30.

SMETS F., 2014, *Financial Stability and Monetary Policy: How Closely Interlinked?*, International Journal of Central Banking, June, 263-300.

SNOWDON B. – VANE H.R., 2005, *Modern Macroeconomics*, Cheltenham, Edward Elgar.

STEIN J.C. – SUNDERAM A., 2015, *Gradualism in Monetary Policy: A Time Consistency Problem*?, NBER Working Paper Series, n. 21569.

STELLA P. – LONNBERG A., (2008), *Issues in Central Bank Finance and Independence*, IMF Working Paper Series, n.37.

STELLA P., (2009), *The Federal Reserve Balance Sheet; What Happened and Why it Matters*, IMF Working Paper Series, n.120.

STIGLITZ J.E., 2014, *Reconstructing Macroeconomic Theory to Manage Economic Policy*, mimeo.

STRAUSZ R., 2011, *The Political Economy of Regulatory Risk, Humboldt University, Institute for Microeconomic Theory,* Berlin, mimeo.

SUTCH R., 2014, *The Liquidity Trap, the Great Depression, and Unconventional Policy: Reading Keynes at the Zero Lower Bound*, BEHL Working Paper Series, Berkeley, n.5.

SVENSSON L.E.O., 2010*, Inflation Targeting*, Handbook of Monetary Economics, 3(22), 1232- 1302.

SVENSSON L.E.O., 2015, *Forward Guidance*, CEPR Discussion Paper Series, n. 10669.

TABELLINI G., 2007*, Institutions and Culture*, IGIER Working Paper Series, Bocconi University, n. 330.

TAISUKE N. – SCHMIDT S., 2015, *Conservatism and Liquidity Trap*, Working Paper Series, European Central Bank, n. 1816.

TAYLOR A., 2015, *Credit, Financial Stability and the Macroeconomics*, , NBER Working Paper Series, n. 21039.

TAYLOR J.B., 1993, *Discretion versus Policy Rules in Practice*, Carnegie-Rochester Conference Series on Public Policy, Vol.39, 195-214.

TAYLOR J.B., 1998, *Applying Academic Research on Monetary Policy Rules: An Exercise in Translational Economics*, in Papers in Money, Macroeconomics and Finance, The Manchester School, Manchester, 1-16.

TAYLOR J.B., 2007, *Housing and Monetary Policy*, Jackson Hole Paper, mimeograph.

TAYLOR J.B., 2009, *The Financial Crisis and the Policy Responses: An Empirical Analysis of What Went Wrong,* NBER Working Paper Series, n. 14631.

TAYLOR J.B., 2011, *The Cycle of Rules and Discretion in Economic Policy,* National Affairs, Spring, 55-65.

TAYLOR J.B., 2013, *International Monetary Policy Coordination: Past, Present and Future*, BIS Working Paper Series, n.437.

TAYLOR J.B., 2015, *Requirements for the FED to Describe its Strategy*, Testimony Before The Committee on Banking, Housing, and Urban Affairs, United States Senate, March 3.

TAYLOR J.B., 2016, *The Staying Power of Staggered Wage and Price Setting Models in Macroeconomics*, NBER Working Paper Series, n. 14631.

TELES P. – UHLIG H., 2013, *Is Quantity Theory still Alive?*, Working Paper Series, European Central Bank, n. 1605.

TEULINGS C. – BALDWIN R., 2015, *Secular Stagnation: Facts, Causes and Cures*, VoxEU.org eBook, CEPR Press, London.

UEDA K. – VALENCIA F., 2012, *Central Bank Independence and Macroprudential Regulation*, IMF Working Paper Series, n.101.

UHLIG H., 2011, *Economics and Reality*, MFI Working Paper Series, Department of Economics, University of Chicago, n.6.

VERONA F.- MARTINS M.M. – DRUMOND I., 2014, *Financial Shocks and Optimal Monetary Policy Rules*, Research Discussion Papers, Bank of Finland.

VILLAVERDE J.F. – SANCHES D., 2016, *Can Currency Competition Work*?, Penn Institute for Economic Research, Working Paper Series, n.16.

VILLAVICENCIO A. – SAGLIO S. , 2013, *Modelling Downward and Upward Flexibility at the Macroeconomic Level*, French National Center for Scientific Research, April.

VREDIN A., 2015*, Inflation Targeting and Financial Stability*, BIS Working Paper Series, n. 503.

WALLER C.J., 2015*, Microfoundations of Money: Why They Matter*, Review, Federal Reserve Bank of St. Louis, Fourth Quarter, 97(4), 289-301.

WALSH C.E., 2015, *Goals and Rules in Central Bank Design*, CESIFO Working Paper Series, n.5293.

WARMEDINGER T., CHECHERITA WESTPHAL C., DE COS P.H., 2015, *Fiscal Multipliers and Beyond*, ECB Occasional Paper Series, n. 162.

WEIL D.N., 2015, *Capital and Wealth in the 21th Century*, NBER Working Paper Series, n. 20533.

WHITE L.H., 2014, *Dollarization and Free Choice in Currency*, Working Paper Series, Department of Economics, George Mason University, n.14.

WHITE L.H., 2015, *Hayek and Contemporary Macroeconomics*, Working Paper Series, Department of Economics, George Mason University, n.5.

WILLIAMS J.C., 2015, *Monetary Policy and the Independence Dilemma*, FRBFS Economic Letters, May 11, n.15.

WOODFORD M., 2001, *The Taylor Rule and Optimal Monetary Policy*, AEA Papers and Proceedings, 232-237.

WOODFORD M., 2012, *Inflation Targeting and Financial Stability,* NBER Working Paper Series, n. 17977.

WOODFORD M,, 20016, *Quantitative Easing and Financial Stability*, NBER Working Paper Series, n. 22285.

WREN-LEWIS S., 2016, *Unravelling the New Classical Counter Revolution*, Review of Keynesian Economics, n.1, 20-35.

WREN-LEWIS S. – MOREIRA A., 2016, *Saltwater vs Freshwater: A Small Survey of Postgraduate Macro Courses*, mimeo.

YELLEN J., 2015a, *Remarks at Normalizing Monetary Policy: Prospects and Perspectives, The New Normal Monetary Policy,* Research Conference, Federal Reserve Bank of San Francisco, March 27.

YELLEN J.M 2015b, *Open Letter on Fed Oversight Reform and Modernization (FORM) Act*, Board of Governors, Federal Reserve System, November 16.

YERMACK D., 2014, *Is Bitcoin a Real Currency? An Economic Appraisal*, NBER Working Paper Series, n. 21066.

YU Q., FAN H. – WU X., 2015, *Global Saving Glut, Monetary Policy and Housing Bubble: Further Evidence*, School of Public Policy and Management, Tsinghua University, Working Paper Series, n.3

7.2 Policy Readings

* Further readings on the Great Recession and its aftermath:

BANK FOR INTERNATIONAL SETTLEMENTS, *Annual Report*, 2008-2016.

M. DESAI, *Hubris*, Part III, Yale University Press, 2015.

S.FISHER, *Reflections on Macroeconomics Then and Now*, 32nd Annual National Association for Business Economics, Economic Policy Conference, Washington, D.C., March 2016.

GORDON R.J., *The Demise of US Economic Growth: Restatement, Rebuttal, and Reflections*, mimeo, January 2014.

R. HETZEL, *The Great Recession*, Chapters: 1 and 2; from 8 to 19; Cambridge University Press, 2012.

M.KING, *The End of Alchemy: Money, Banking and the Future of the Global Economy*, Norton, 2016.

L. RACHEL, T.D. SMITH, *Secular Drivers of the Global Real Interest Rate*, Staff Working Paper, Bank of England, December, n.571.

* Further readings on the European monetary policy:

U.BINDSEIL, C. DOMNICK, J. ZEUNER, *Critique of Accommodating Central Bank Policies and the "Expropriation of the Saver"*, ECB, Occasional Papers, n.161, May 2015.

M. CIHAK, T. HARJES, E. STAVREV, *Euro Area Monetary Policy in Uncharted Waters*, IMF Working Paper Series, n. 185, August 2009.

P. COVA, G. FERRERO, *The Eurosystem's Asset Purchase Programmes for Monetary Policy Purposes*, Bank of Italy, Occasional Papers, n.270, April 2015.

DEUTSCHE BUNDESBANK, *Inflation Expectations: Newer Instruments, Current Developments and Key Determinants*, Monthly Report, June 2015.

EUROPEAN CENTRAL BANK, *The Monetary Policy of the ECB*, Frankfurt am Main, 2011.

R. HETZEL, *A Monetarist Critique of ECB Monetary Policy in the Great Recession*, Federal Reserve Bank of Richmond, February, 2015.

Y.D. KANG, *Policy Responses of the ECB in Managing the Euro Crisis and its Evolutionary Role*, KIEP Research Paper Series, n. 12.

D.W. KANG, N. LIGTHART, A. MODY, *The European Central Bank: Building a Shelter in a Storm*, Griswold Center for Economic Policy Studies Working Paper n.248, Princeton University, December, 2015.

S. MICOSSI, *The Monetary Policy of the ECB (2002 to 2015)*, CEPS Special Report, n.109, 2015.

A. ORPHANIDES, *European Headwind: ECB Policy and Fed Normalization*, MIT Sloan School Working Paper Series, n-5119, 2014.

C.PATTIPEILOHY, J.W. VAN DEN END, M.TABBAE, J. FROST, J. DE HAAN, *Unconventional Monetary Policy of the ECB during the Financial Crisis*, DNB Working Paper Series, n.381, 2012.

* Further readings on the US monetary policy:

L. BALL, *The Fed and Lehman Brothers: Introduction and Summary*, NBER Working Paper Series, n.22410, 2016.

C.BINDER, *Rewriting the Rules of the FED for Broad and Stable Growth*, Roosevelt Institute, mimeo.

J.BULLARD, Permazero, FED of St. Louis, November 12, mimeo, 2015.

J.BULLARD, K.L. KLIESEN, *Three Challenges to Central Bank Orthodoxy*, FED of St. Louis, Review, 98(1), 1-16, 2016.

C.W. CALOMIRIS, *Reforming the Rules That Govern the FED*, Columbia University, mimeo, 2013

W.R. CLINE, *Quantity Theory of Money Redux? Will Inflation Be the Legacy of Quantitative Easing?* Peterson Institute for International Economics, mimeo, 2015.

D.A. COOKE, W.T. GAVIN, *The Ups and Downs of Inflation and the Role of FED Credibility*, The Regional Economist, FED of St. Louis, 5-9. April 2014.

J.E. IHRIG, E.E. MEADE, G.C. WEINBACH, *Rewriting Monetary Policy 101: What's the FED's Preferred Post-Crisis Approach to Raising Interest Rates?*, Journal of Economic Perspectives, vol.29, n.4, 177-198, 2015.

P.IRELAND, *Shifting Perspectives on the Dual Mandate*, Boston College, 2014, mimeo.

A.KAHN, *Taylor Rules or Target Rules?*, The Macro Bulletin, FED of Kansas City, August, 1-4, 2015.

N. KOCHERLAKOTA, *Monetary Policy Renormalization*, FED of Philadelphia, December, 2015.

A. ORPHANIDES, *Fear of Liftoff: Uncertainty, Rules, and Discretion in Monetary Policy Normalization*, Review, FED of St. Louis, Third Quarter, 173-195, 2015.

C.M. REINHART, K.S. ROGOFF, *Shifting Mandates: The Federal Reserve's First Centennial*, NBER Working Paper Series, n.18888, 2013.

S.D.WILLIAMSON, *Monetary Policy Normalization in the United States*, FED of St. Louis, Second Quarter, 87-108, 2015.

* Further readings on the UK monetary policy:

BANK OF ENGLAND, *Monetary Policy Trade-Offs and Forward Guidance*, August 2013.

G.OSBORNE, Remit for the Monetary Policy Committee, HM Treasury, 18 March 2015.

* Further readings on the Japanese monetary policy:

A. DE MICHELIS – M.M. IACOVIELLO, Raising an Inflation Target: The Japanese Experience with Abenomics, FRB International Finance Discussion Paper Series, n. 1168, 2016.

H. UGAI, *Transmission Channel and Welfare Implications of Unconventional Monetary Easing Policy in Japan*, TCER Research Paper Series, n.102, 2015.

* Further readings on the Chinese monetary policy:

R. NUUTILAINEN, *Contemporary Monetary Policy in China: A Move Towards Price Based Policy*, BOFIT Discussion Paper Series, n.10, 2015.

* Further readings on monetary policy and central banking after the Great Recession:

R.G. ANDERSON – M.D. BORDO – J.V. DUCA, *Money and Velocity During Financial Crises: From the Great Depression to the Great Recession*, NBER Working Paper Series, n.22100, 2016.

J. ASHWORTH – C.A.E. GOODHART, *Measuring Public Panic in the Great Financial Crisis*, Vox, CEPR's Policy Portal, 28 April, 2015.

L. BALL, *The Case for a Long Run Inflation Target of Four Percent*, IMF Working Paper Series, n.92, 2014.

T. BAYOUMI, G. DELL'ARICCIA, K. HABERMEIER, T. MANCINI GRIFFOLI, F. VALENCIA, *Monetary Policy in the New Normal*, IMF Staff Discussion Note, n.3, 2014.

M. BECH – A. MALKHOZOV, *How Have Central Banks Implemented Negative Interest Rates?,* BIS Quarterly Review, March, 31-44, 2016.

O. BLANCHARD – E. CERUTTI E. – L. SUMMERS, *Inflation and Activity – Two Explorations and Their Monetary Policy Implications*, NBER Working Paper Series, n. 21726, 2015.

C.E.V. BORIO – A. ZABAI, *Unconventional Monetary Policies: A Re- Appraisal*, BIS Working Paper Series, n. 570, 2016.

C.T. CARLSTROM – T.S. FUERST, *The Natural Rate of Interest in Taylor Rules, Economic Commentary*, Federal Reserve Bank of Cleveland, N.1, March, 2015.

J.H. COCHRANE, *Do Higher Interest Rates Raise or Lower Inflation?*, Chicago Booth, mimeo, October 2015.

W.J. DEN HAAN, *Quantitative Easing*, A VoxEU Book, CEPR Press, 2016

M. DRAGHI, *How Central Banks Meet the Challenge of Low Inflation*, SUERF Conference, Deutsche Bundesbank, February, 2016.

P. GERTLER, - B. HOFMANN, *Monetary Facts Revised*, BIS Working Paper Series, n. 566.

M. HATCHER M. – P. MINFORD, *Stabilization Policy, Rational Expectations and Price Level versus Inflation Targeting: a Survey*, CEPR Discussion Paper Series, n.9820, 2014.

R.L. HETZEL, *Nominal GDP: Target or Benchmark?*, Economic Brief, Federal Reserve Bank of Richmond, 1-6, April 2015.

A. HORNSTEIN, J.JOHNSON, K. RHODES, *Inflation Targeting: Could Bad Luck Explain Persistent One-Sided Misses?*, Economic Brief, Federal Reserve Bank of Richmond, 1-7, September 2015.

M. Mc LEAY, A. RADIA, R. THOMAS, *Money Creation in the Modern Economy*, Bank of England, Quarterly Bulletin, First Quarter, 14-27.

C. PATTIPEILOHY, *A Comparative Analysis of Development in Central Bank Balance Sheet Composition*, BIS Working Paper Series, n. 559.

J.TAYLOR – WIELAND V., 2016, *Finding the Equilibrium Interest Rate in a Fog of Policy Deviation*, CEPR Discussion Paper Series, n. 11264.

J.C.WILLIAMS, *Inflation Targeting and the Global Financial Crisis*, Federal Reserve Bank of Francisco, October, 2014.

* Further readings on lending of last resort after the Great Recession:

D.DOMANSKI, R. MOESSNER, W.NELSON, *Central Banks as Lender of Last Resort: Experiences during the 2007-2010 Crisis and Lessons for the Future*, Finance and Economics Discussion Series, Federal Reserve Board, n.110, 2014.

M.DOBLER, S. GRAY, D. MURPHY, B. RADZEWICZ-BAK, *The Lender of Last Resort Function after the Global Financial Crisis*, IMF Working Papers, n.16, 2016.

R.S. GROSSMAN, *Banking Crises*, CESifo Working Paper Series, n.5900, 2016.

P. TUCKER, *The Lender of Last Resort and Modern Central Banking: Principles and Reconstruction*, Bank of International Settlements, pp.10-42, 2014.

* Further readings on macro prudential policy after the Great Recession:

I. AGUR, M. DEMERTZIS, *Will Macroprudential Policy Counteract Monetary Policy's Effects on Financial Stability?*, IMF Working Papers, n.283, 2015.

J. CARUANA, Monetary Policy in a World of with Macroprudential Policy, Saarcfinance Governors' Symposium, Kerala, June, 2011.

E. CERUTTI – R.CORREA – E. FIORENTINO – E. SEGALLA*, Changes in Prudential Policy Instruments: a New Cross Country Database*, FRB International Finance Discussion Paper Series, n. 1168, 2016.

S.DEHMEJ – L.GAMBACORTA, *Macroprudential Policy in a Monetary Union,* November 2015, mimeo.

W.C. DUDLEY, *Is the Active Use of Macroprudential Tools Institutionally Realistic?,* Federal Reserve Bank of New York, mimeo, October 3, 2015.

D. KOHN, *Institutions for Macroprudential Regulation: The UK and the US*, Speech, Harvard Kennedy School, April, 2014.

D. KOHN, *Implementing Macroprudential and Monetary Policies: The Case for Two Committees,* Speech, Federal Reserve Bank Boston, October, 2015.

T. LANE, *Monetary Policy and Financial Stability – Looking for the Right Tools*, Bank of Canada, mimeo, February 2016.

P.ALESSANDRI – F. PANETTA, Prudential Policy at Times of Stagnation: A View from the Trenches, Banca d'Italia, Occasional Papers, n.300, 2015.

D. SCHOENMAKER, *Macroprudentialism,* VoxEu.org ebook, CEPR Press, 2014.

D. SCHOENMAKER – P. WIERTS, *Macroprudential Supervision: From Theory to Policy*, National Institute Economic Review, n.235, February, 2016.

A.SILVO, *The Interaction of Monetary and Macroprudential Policies in Economic Stabilization*, Bank of Finland Research Discussion Papers, n.1., 2016.

L.E.O. SVENSSON, *Cost – Benefit Analysis of Leaning Against the Wind: Are Costs Larger Also Less Effective Macroprudential Policy?*, NBER Working Paper Series, n.21902, 2016.

TRESSEL T. – ZHANG Y.S, Effectiveness and Channels of Macroprudential Instruments: Lessons from the Euro Area, IMF Working Papers, n.4, 2016.

* Further readings on bank resolution after the Great Recession:

E. FAIA, B. WEDER DI MAURO, *Cross Border Resolution of Global Banks*, mimeo, 2016.

* Further readings on international monetary policy coordination after the Great Recession:

E.FARHI, *A Model of the International Monetary System*, NBER Working Paper Series, n.22295, June, 2016.

J. A. FRANKEL, *International Coordination*, NBER Working Paper Series, n.21878, January, 2016.

A. KRAMPF, *The consolidation of the Anglo-Saxon/European Consensus on Price Stability*, KFG Working Paper Series, n.47, October, 2012.

H. REY, *Dilemma not Trilemma: The Global Financial Cycle and Monetary Policy Independence*, NBER Working Paper Series, n.21162, May, 2015.

J.B. TAYLOR, *International Monetary Policy Coordination: Past, Present and Future*, BIS Working Paper Series, n.437, 2013.