

Contents

Introduction

1. Long run models

1.1 Italy

1.2 USA

2. Short run models

2.1 Italy

3.2 USA

Conclusion

References

Introduction

The aim of this paper is to employ short run and long run macroeconomic model to see whether they are in line with key economic changes in selected countries (Italy and the USA).

Naturally, it is important to highlight significant economic changes in the abovementioned economies. The focus period of the study is 2001 – 2010.

Finally a specific economic policy will be analyzed as a case study. This case study involves open market operation of the European Central Bank and its impact on the economy of the USA and Italy.

There are various macroeconomic models that deal with short run economic fluctuations and long run economic growth (Mankiw, 2009). In this study I will focus on two separate cases: small open economy in the long run (Italy) and large open economy in the long run.

1. Long run models

1.1 Italy

According to Ribba (2006) Italy is considered to be small open economy. The openness of economy is measured by various indicators. Most of the empirical studies use trade as a share of as a measure of openness (Shamsadini et al, 2010). As it can be seen in the Italy is an open economy with openness equal to 60% of the GDP, compared to 31% and 54% in Japan in Russia accordingly (Figure 1).

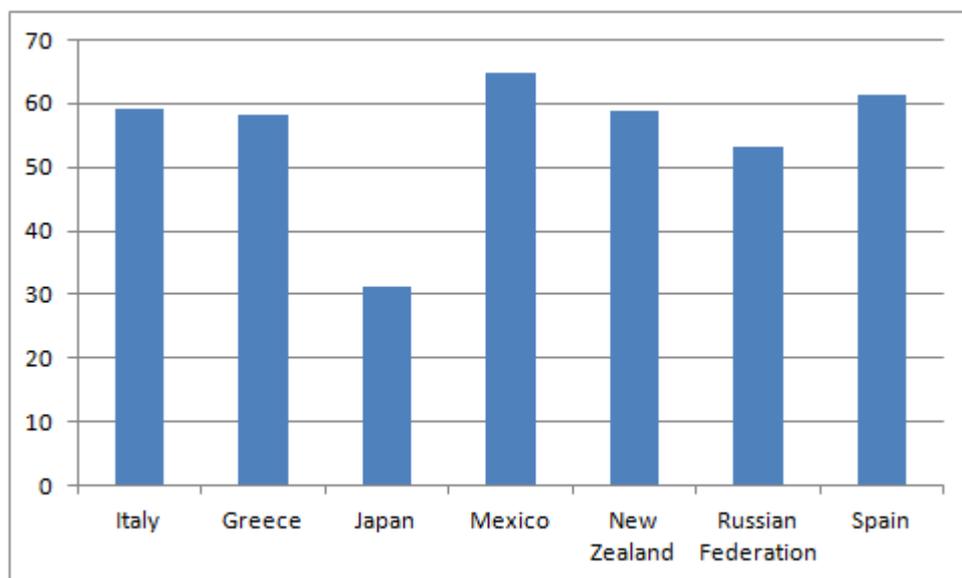


Figure 1 - Trade as a share of GDP, 2011

There is fundamental macroeconomic distinction between closed and open economy. Spending in an open economy doesn't match its production of goods and services as an open country can increase its spending by borrowing from abroad. Moreover output can be above spending as an open economy can be a net lender as well (Mankiw, 2009). In order to see this it is important to focus on national accounting model.

The national income in closed economy is given by:

$$Y=C+I+G;$$

where C is consumption, I is investment and G is government spending.

Altering national income to open economy macroeconomic theory introduces exports (E) and imports (M):

$$Y = C+ I+ G+ X-M \text{ or } Y= C+I+G+NX$$

National savings in Italy, which is an open economy, consist of private savings ($Y-T-C$) and public savings ($Y-G$). Therefore: $S=I+NX$ or $S-I=NX$ where $S-I$ denote net capital outflow and NX is trade balance of a country. In case when $S>I$ is increase in foreign purchases of home assets which means claim on future output of home country.

To formulate a model for a small open economy I use four assumptions:

First, production of goods and services in the small open economy consists of three sectors, consumption goods, investment goods, and government services.

Second, production function of each of the sectors includes capital and labor in different proportions in linear homogeneous production functions (Hodrick, 1980):

$$Y=F(K,L)$$

Third, investment (I) is inversely related to the interest rate: $I=I(r)$

Fourth, consumption is positively lined with disposable income:

$$C=C(Y-T)$$

Which yields:

$$NX=(Y-C-G)-I; NX = S-I; NX = Y-C(Y-T)-G-I(r^*)$$

where r^* denotes world interest rate. As Italy is a small open economy with perfect capital mobility the interest rate in Italy (r) is equal to the world interest rate (r^*) (Figure 2).

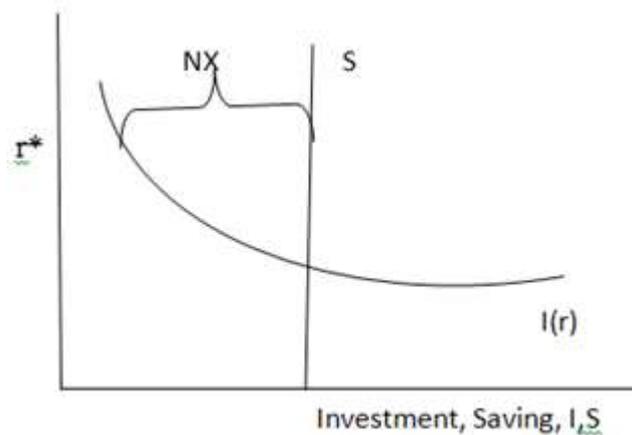


Figure 2 - Saving and Investment in Italy, small open economy

According to Barnett and Brooks (2010) when government implement fiscal policy at home or increases G it leads to decrease in national savings, as Italy takes world interest rate as given investment stays at the same level unchanged. Using macroeconomic data for Italy I can test the validity of fiscal policy at home on Italy. As it can be seen in the scatterplot there is negative relationship between G and S (Figure 3). The Italian macroeconomic data perfectly fits theory of fiscal policy at home in a small open economy. Implementation of fiscal policy that causes reduction in savings (S) shifts saving curve and leads to trade deficit (Figure 4). This is confirmed by existing macroeconomic data for Italy during 2001 – 2010 (Figure 5). As savings in Italy decreased from 40 billion dollars to below zero during 2001 – 2010 net export (NX) has followed the same pattern.

In another case when fiscal policy takes place outside of Italy and other countries increase their government expenditures. It leads to reduction in global

saving level and interest rate increases. Thus it further initiates reduction in investment and creates trade surplus (Figure 6).

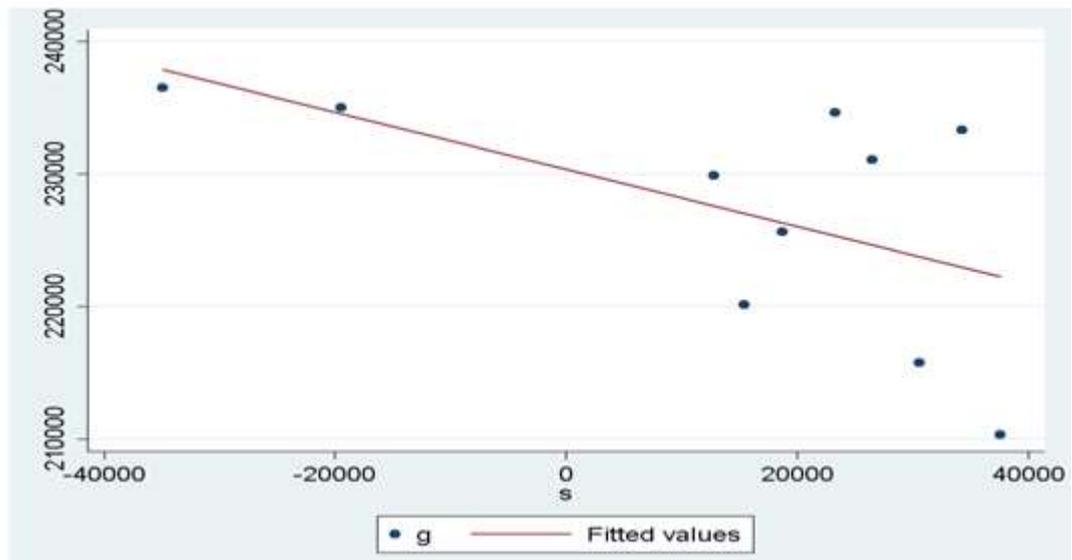


Figure 3 - Government expenditure (G) and saving (S) scatterplot

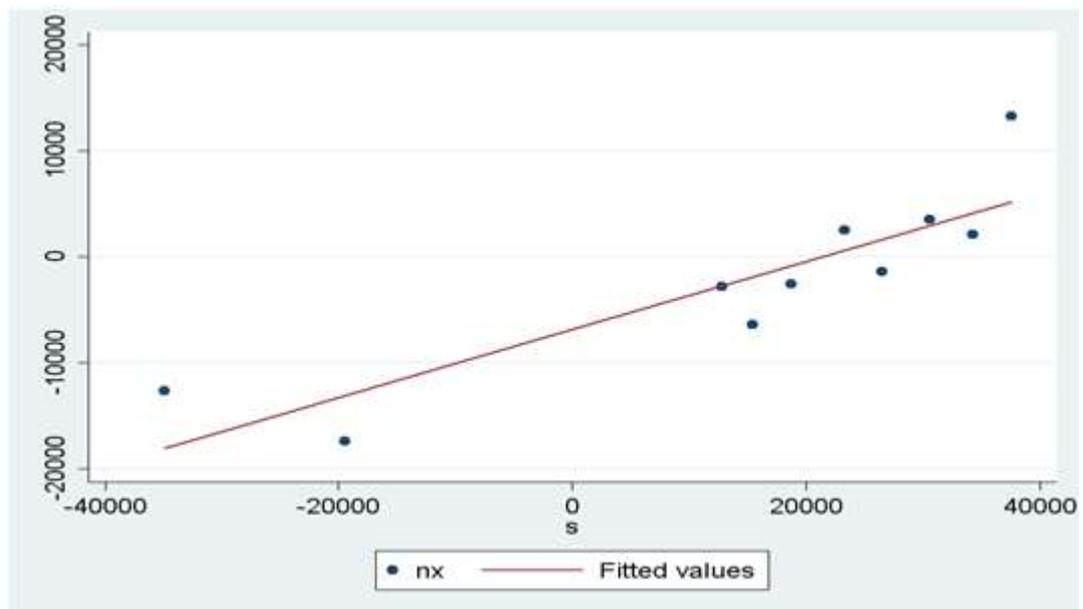


Figure 4 - Net export (NX) and saving (S) scatterplot

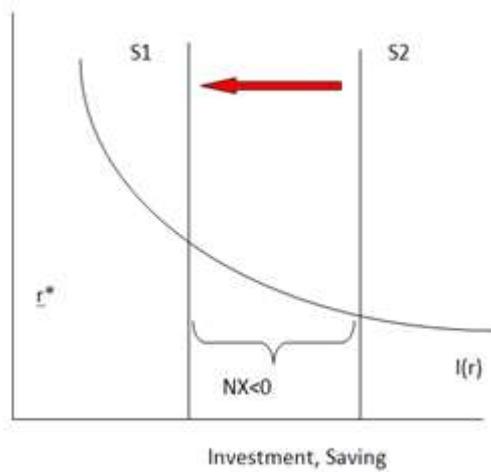


Figure 5 - Fiscal expansion in Italy

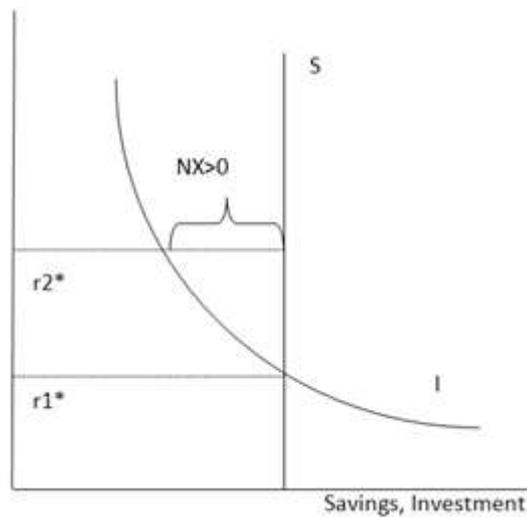


Figure 6 - Fiscal expansion outside of Italy

1.2 USA

In line with finding of Cooper (1985) the economy of the USA is a large open economy. It constitutes 23% of global production and is more than 2 times greater than the second largest economy (Japan) (Figure 7). Another argument in favor fact that the USA is a large open economy is a number of studies that found that inflation rates in the USA are important determinants of inflation volatility in other countries (Cheung and Yuen, 2001). However Mankiw (2009) argues that macroeconomic analysis of the USA must be carried out implementing a mix of closed economy and small open economy.

In presence of assumption of closed economy the loanable market equilibrium in the USA can be expressed as (Figure 6b). Equilibrium interest rate is determined when the $S=I$ in the loanable market. In case of increase in savings the S curve shifts to the left causing increase in interest rate. As interest rate in the economy of the USA determines the investment level, former starts to decrease.

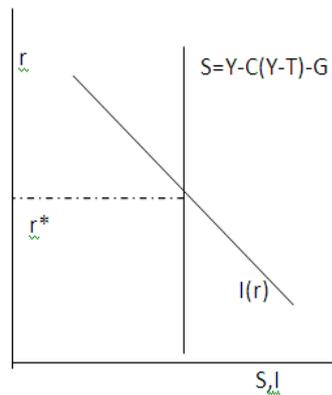


Figure 7 - Loanable market equilibrium in closed economy

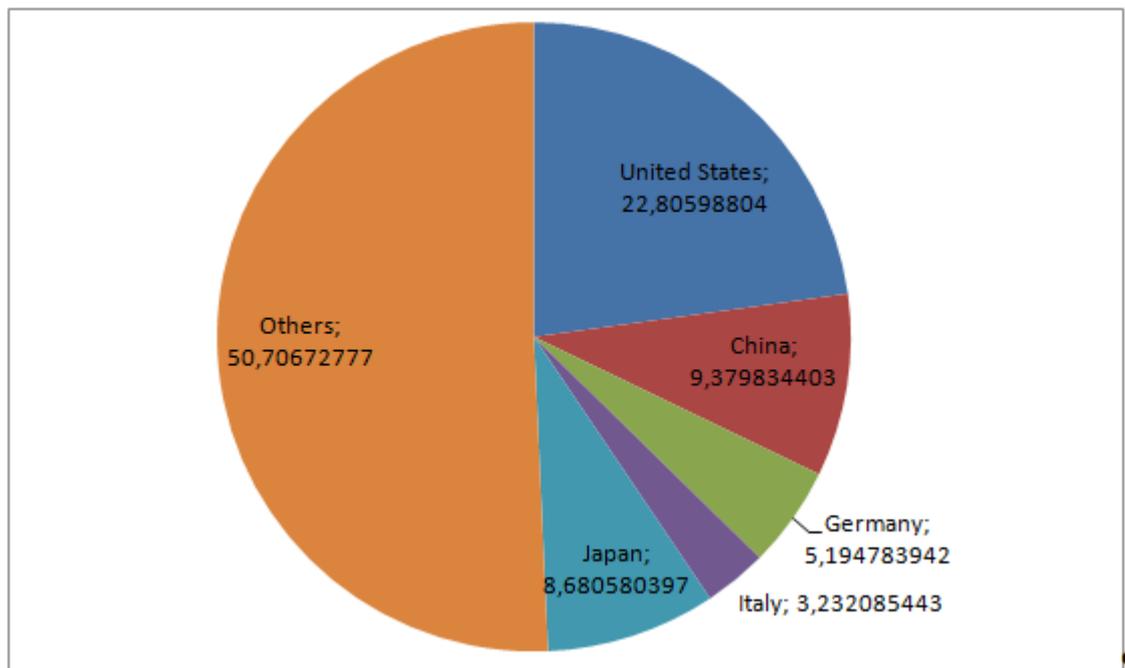


Figure 8 - Major global economies by their respective shares, 2011

2. Short run models

Long run economic models do not reveal that GDP and GDP per capita grow cyclically. Economic growth in Italy and the USA has not been stable during 2001 – 2010. Both countries experienced significant economic slowdowns in 2007-2009 when the GDP growth rate fell significantly below zero (Figure 8). In economic studies such fluctuations in economic growth and other macroeconomic indicators are called business cycles (Mankiw, 2009). Among the most successful business cycle models are Okun's Law and Philips curve. Many studies have successfully recovered the results in cross country studies and Okun's Law became part of macroeconomic textbook models (Ball et al, 2012). The inverse relationship between economic growth and unemployment level is determined by Okun's Law (Figure 9).

2.1 Italy

In this section I will estimate Okun's Law for the Italian economy. A number of other studies have focused on estimation of this economic relationship within Europe and for selected countries (Stock, 2010). McKinsey (2011) doesn't recover the Okun's Law in his cross country econometric studies. The author concludes that relationship doesn't hold due to labor market mismatches. The Okun's Law can be expressed as:

$$\text{Unemp}_i = a_1 + a_2 * \text{RGDP}_G + e_i,$$

Where unemp – is change in unemployment rate, RGDP_G is real GDP growth, e – error term.

The visual representation of the Okun's Law shows that overall the economic relationship between unemployment and GDP growth holds in Italy during 2001 – 2010. It should be noted that during that period an outlier has been

detected when unemployment rate was 7.8% and economic growth was significantly below zero. This is explained by the recession in the global economy in 2008 (Figure 10, right panel).

2.2 USA

Okun's Law has been successfully used in a number of economic studies devoted to the unemployment problem in the USA (Owyang and Sekhposyan (2012). Owyang and Sekhposyan (2012) estimate Okun's Law for the USA using quarterly data covering 1947 – 2011 and incorporate a number of recession dummies. The authors recover the results of Okun (1962) and Plosser and Schwert (1979). I follow the estimation of Okun (1962) and estimate the Okun's Law for the USA using annual data for 1980 – 2010. As it can be seen there is strong negative link between the unemployment change and output growth in the USA (Figure 10, left panel).

Econometric estimation through implementing OLS method shows that the statistical relationship between change in unemployment and GDP growth is:

$$\text{Change in unemployment} = 7.07 - 0.26 * \text{GDP_Growth}$$

Another model of aggregate demand that explains output changes in the short run is the IS-LM model (Mankiw, 2009). The IS-LM model consists of two parts: IS – representing goods market and LM – money market. Following previous section on long run models I derive planned expenditure as:

$$PE = C + I + G \quad (1)$$

$$C = C(Y - T) \quad (2)$$

$$I = I^* \quad (3)$$

$$G = G^* \quad (4)$$

$$T = T^* \quad (5)$$

Combining (2), (3), (4) and (5) in (1) gives:

$$PE=C(Y-T^*)+I^*+G^* \quad (6)$$

Economic equilibrium is achieved when $PE=Y$ or planned expenditure matches actual (Figure 11).

Investment in the economy is a function of interest rate (Dupor, 2001): $I=I(r)$ (7).

Hence the IS curve for Italian and US economy can be graphically derived based on equations (6) and (7) (Figure 12).

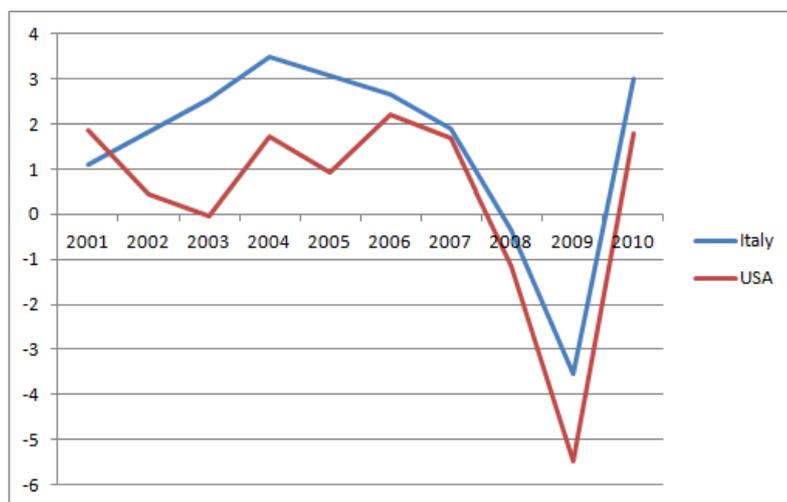


Figure 9 - GDP growth rate in Italy and the USA, 2001- 2010

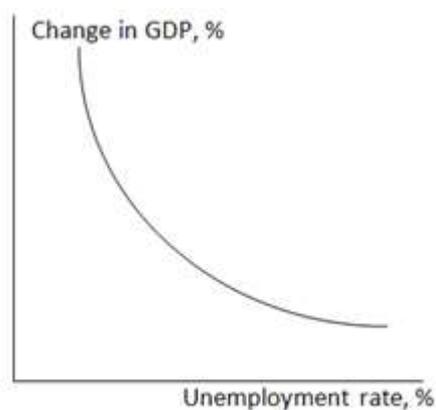


Figure 10 - Okun's Law

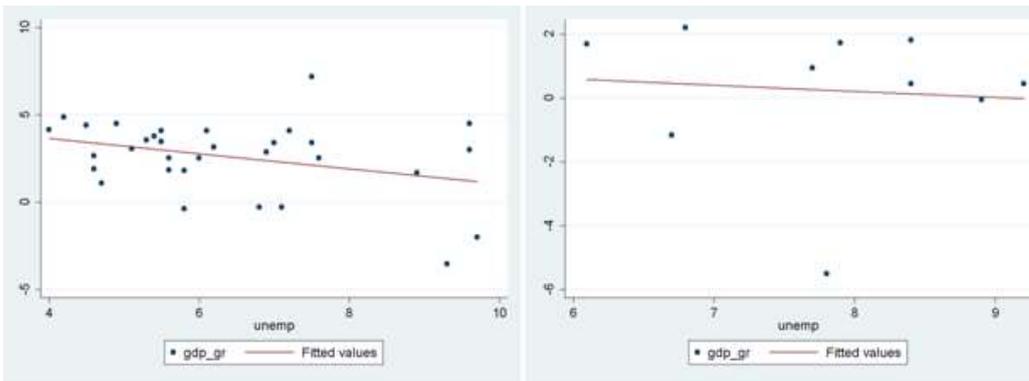


Figure 11 - Okun's Law in the USA (left panel) and Italy (right panel), selected year

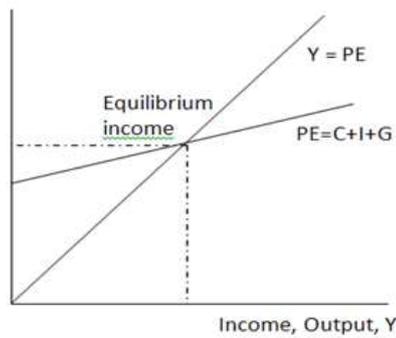


Figure 12 - Keynesian Cross

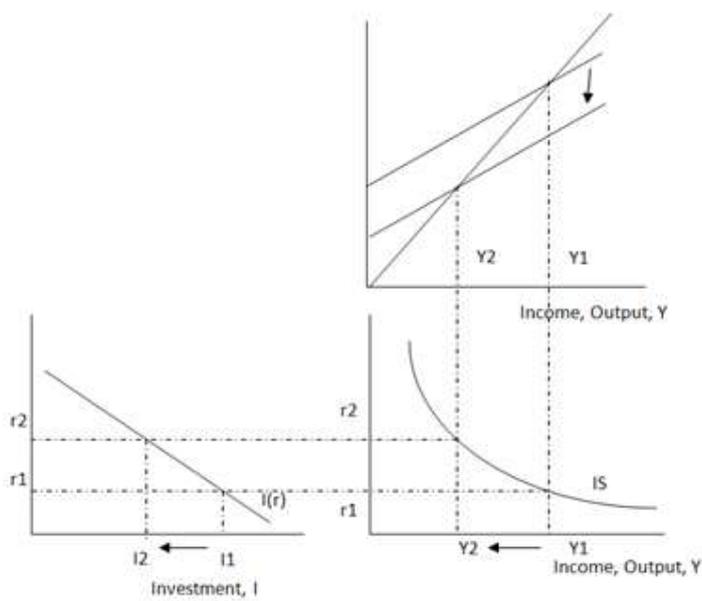


Figure 13 - Derivation of IS Curve for Italy and the USA

Derived model can has been used to see how economy reacts to changes in fiscal policy. Assume Italian government increases its government expenditure (G) by 4 billion dollars, as it happened in 2000. Increase in G shifts up PE curve up and leads to rightward shift of the IS curve at a given interest rate and causes increase in output. Based on the macroeconomic statistics of the Italy it can be seen that in the highest increase in G has occurred in 2000, which followed by the largest economic expansion since 1991 (Table 2). The existing statistical evidence supports the framework of ISLM model for developed countries such as Italy and the USA.

Table 2 - Annual growth in GDP and Government Expenditure in Italy

	1991	1992	1993	1994	1995	1996	1997	1998	1999	2000
G, growth (%)	1.9	0.95	-1.5	-1.7	-3.2	0.8	0.5	0.4	1.4	2.2
Y, growth (%)	1.5	0.8	-0.9	2.2	2.8	1.1	1.9	1.5	1.5	3.7

The framework of LM emerges directly from the theory of liquidity preference. According to the theory the level of real money balances supply is fixed:

$$M/P = M^*/P^* \quad (8)$$

The level of money supply is determined by the central bank of the USA. The level of P is fixed as we assume sticky prices in the short run (Guesnerei, 2001). On the other hand demand for the money is:

$$(M/P)^d = L(r) \quad (9)$$

Then the Italian equilibrium interest rate is given when (8) = (9) or demand for money balances matches supply (Figure 13).

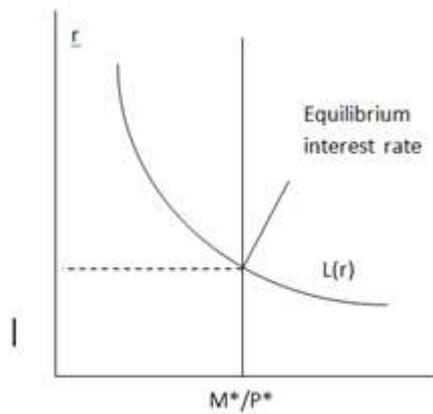


Figure 14 - The theory of liquidity preference

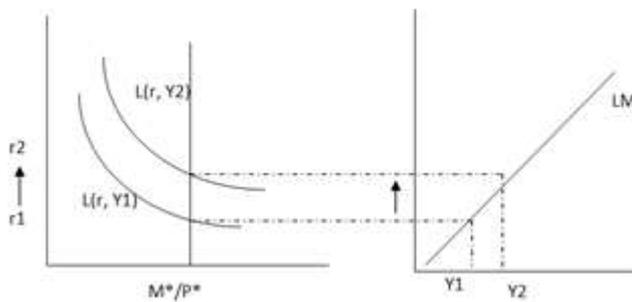


Figure 15 - Derivation of LM curve

Based on the derivation of the LM curve it can be concluded that reduction in the money supply for existing level of output shifts the LM curve and increases equilibrium interest rate of the money market. This is confirmed by King and Watson (1995).

To illustrate the impact of reduction in money supply in interest rate on Italy and USA I will use Money and quasi money growth (annual %) as a proxy for money supply and real interest rate as a proxy for interest rate. The scatterplot below illustrates the relationship between the money supply reduction and interest rate in the framework of ISLM model during 2000 – 2010 for Italy and the USA (Figure 15). As it can be seen the relationship doesn't hold for the specified period. Overall the money supply has been increasing along with the real interest rate.

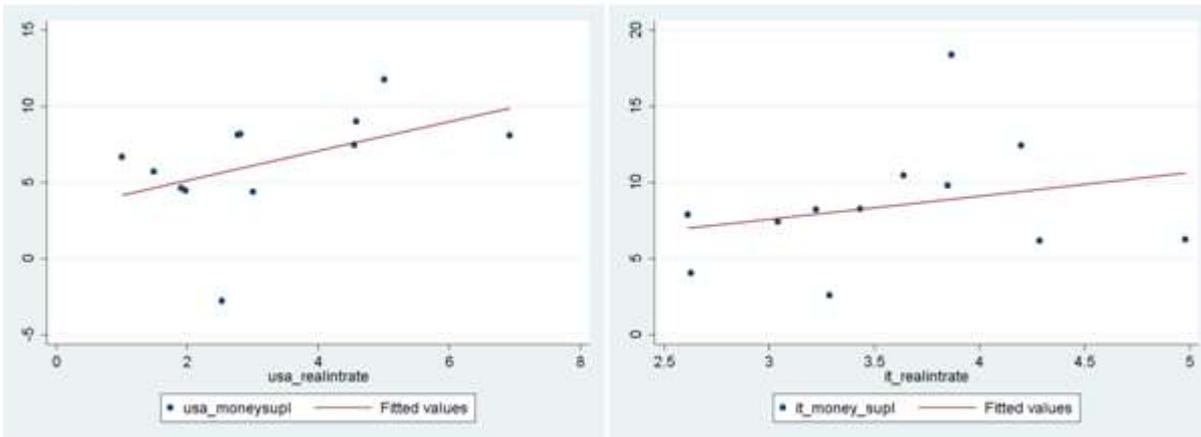


Figure 16 - LM relationship for USA and Italy during 2000 -2010

However if the data is extended to 1961 – 2009 the relationship exists in the long run (Figure 16). Reduction in the money supply Italy has increased interest rate (left panel in Figure 16). The results are in line with the assumptions of the IS LM model.

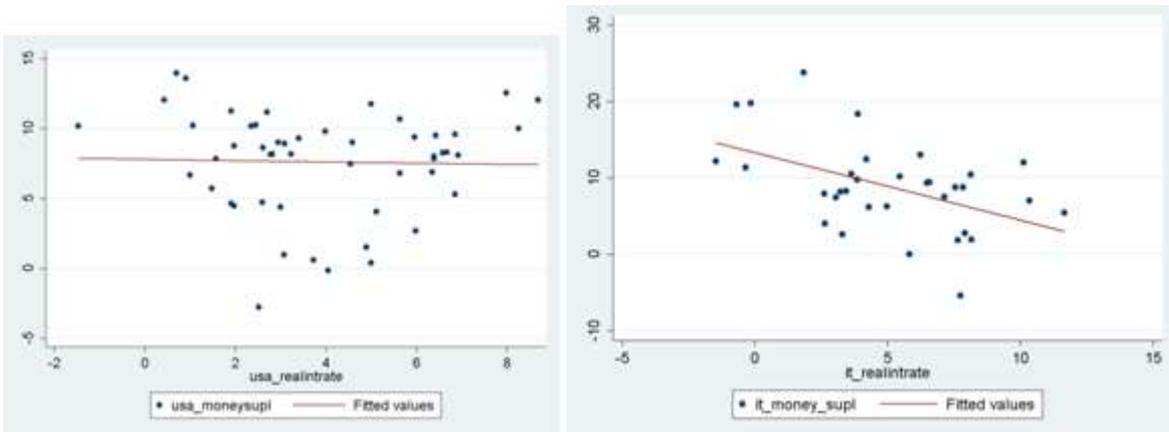


Figure 17 - LM relationship for USA and Italy during 1961-2010

Assume that in 2011 the European Central Bank started to sell its foreign currency reserves and buy Euros. How would this affect economies of Portugal and China? Use models above to illustrate you answer.

When Central Banks makes a decision to support European currency the ECB engages in purchasing Euros on the FX market. It reduces money supply. The reduction in money supply leads to increase in interest rate. Supply of Euros on the foreign market decreases and Euro becomes strong on the FX.

In case of Italy, LM shifts right and IS remains the same leading to increase in interest rate (figure 17). As the interest rate increases investment fall as $I=I(r)$. Decrease in money supply leads to upward pressure on the interest rate, capital inflows in the Italy as inverstors are seeking higher returns. Capital inflow controls increase in interest rate to the ceiling or r^* . Investing in Italy requires conversion of the foreign currency into Euro hence appreciating it further. As the Euro becomes stronger the Export decline due to inverse relationship between exchange rate and net exports: $NX = NX(e)$. Output in Italy declines and makes Italian goods more expensive on the global market.

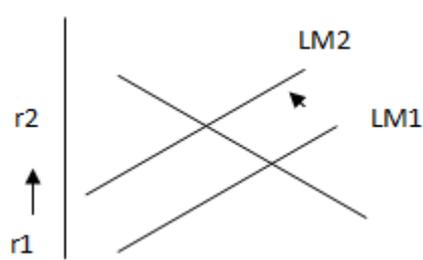


Figure 18 - Decrease in domestic money supply.

In case of China the exchange rate of the Chinese currency will depreciate (Figure 18) and become weaker compared to Euro. Thus increase in the money supply of foreign currency stimulates export of Chinese goods as they become cheaper compared to the Italian. Increase in net exports will stimulate increase in income in the Chinese economy.

Conclusion

In this I have estimated a long run and short run models for the economies of the USA and Italy. For the choice of long run models I have used small open economy and small closed economy. The statistical evidence from the macrodata for these countries is in line with the theory. Fiscal policy at home leads to increase in G and decrease in S and trade deficit during 2001- 2010 whereas fiscal policy abroad leads to increase in interest rate.

In case of short run model. First I have tested Okun's Law which can be expressed as inverse relationship between economic growth and unemployment change. The existing macroeconomic data for Italy and the USA once again support existence of this economic link in the countries. As a final step I derived ISLM model for both economies. Based on the macroeconomic statistics of the Italy it can be seen that in the highest increase in G has occurred in 2000, which followed by the largest economic expansion since 1991 (Table 2). The existing statistical evidence supports the framework of ISLM model for developed countries such as Italy and the USA.

References

1. Mankiw N. Gregory. 2009. *Macroeconomics*. Seventh Edition. Worth Publishers.
2. Hodrick, Robert J. "Dynamic effects of government policies in an open economy." *Journal of Monetary Economics* 6.2 (1980): 213-239.
3. Cooper, Richard N. *The United States as an open economy*. Harvard Institute of Economic Research, 1985.
4. Cheung, Yin-Wong, and Jude Yuen. "Effects of US inflation on Hong Kong and Singapore." *Journal of Comparative Economics* 30.3 (2002): 603-619.
5. Ball, Laurence M., Daniel Leigh, and Prakash Loungani. *Okun's Law: Fit at Fifty*. No. w18668. National Bureau of Economic Research, 2013.
6. Stock, Luisa, and Kurt Vogler-Ludwig. "NAIRU and Okun's Law—The Macro-Economy in a Nutshell? Final report." (2010).
7. McKinsey Global Institute (2011), "An Economy That Works: Job Creation and America's Future", June 2011 report
8. Owyang, Michael T., and Tatevik Sekhposyan. "Okun's law over the business cycle: was the great recession all that different?." *Federal Reserve Bank of St. Louis Review* 94.5 (2012): 399-418.
9. Dupor, Bill. "Investment and interest rate policy." *Journal of Economic Theory* 98.1 (2001): 85-113.
10. Guesnerie, Roger. "Short-run expectational coordination: Fixed versus flexible wages." *The Quarterly Journal of Economics* 116.3 (2001): 1115-1147.
11. King, Robert G., and Mark W. Watson. "Money, prices, interest rates and the business cycle." *The Review of Economics and statistics* (1996): 35-53.
12. Shamsadini, Solmaz, Reza Moghaddasi. "Relationship Between Trade Openness and GDP Growth a Panel Data Analysis." *World Applied Sciences Journal* 8.7 (2010): 906-911.

13. Barnett, Steven Alan, and Ray Brooks. China: does government health and education spending boost consumption. No. 2010-2016. International Monetary Fund, 2010.