

# Economic impact of monetary policy: Focus on real estate sector in Italy

Irfan Ahmed<sup>1</sup>  | Claudio Socci<sup>2</sup>  | Ali Medabesh<sup>1</sup>  | Francesca Severini<sup>3</sup>  | Jacopo Zotti<sup>3</sup> 

<sup>1</sup>Department of Finance and Banking, College of Business Administration, Jazan University, Jizan, Saudi Arabia

<sup>2</sup>Department of Economics and Law, University of Macerata, Macerata, Italy

<sup>3</sup>Department of Political and Social Sciences, University of Trieste, Trieste, Italy

## Correspondence

Irfan Ahmed, Department of Finance and Banking, College of Business Administration, Jazan University, Jizan, Kingdom of Saudi Arabia.  
Email: irfana@jazanu.edu.sa, irfislam@gmail.com

## Abstract

This study investigates the nexus between financial market and real estate (RE) sector against the backdrop of ECB's unconventional monetary policy. A financial dynamic computable general equilibrium (DCGE) model is calibrated on the financial social accounting matrix (FSAM) of Italian economy. The findings confirm that the inclusion of financial intermediation into real economy affects the real estate sector's output, value added, and pricing.

## KEYWORDS

CGE analysis, financial accounts, monetary policy, real estate sector, social accounting matrix

## JEL CLASSIFICATION

E51; E52; G21

## 1 | INTRODUCTION

There are widespread interactions between financial institutions and economic sectors of countries (Dakila, Bayangos, & Ignacio, 2013). Real estate (RE) sector is one of the economic sectors which present a nexus with the financial market (Nobili & Zollino, 2017). These interactions are characterized by the income circular flow wherein final demand determines total output which leads to the generation and distribution of domestic income and finally the disposable income leaves the institutional sectors on a vein to consume or to invest in the financial market (Ciaschini, Pretaroli, Severini, & Socci, 2012). On the other hand, the easy access of money also changes the choices of the economic agents and effects their behaviour of investment and consumption (Ahmed, Socci, Severini, Yasser et al., 2018; Baker, Hollified, & Osambela, 2016; Cesarini, Lindqvist, Ostling, & Wallace, 2016; Mian, Rao, & Sufi, 2013). The trends in investment/consumption decisions in turn activate the productivity of both manufacturing and service sectors thereby affecting the level of employment, prices and output, etc.

The recent years evidenced a noteworthy growth in Italian RE sector with a rise of 5.6% in total RE investments by the year 2017 (CBRE, 2017). The residential properties surged up respectively by 4.3 and 6.7% in metropolitan cities and small municipalities while the business properties grew by 4.7 and 7.8% in metropolitan and small municipalities respectively.<sup>1</sup> This growth is vital to the aggregate Italian economy since the RE is a key sector for Italy and hence it can stimulate the production of other sectors (*backward linkage*), and can promptly respond to the demand of other sectors (*forward linkage*) (Ciaschini & Socci, 2007). Keeping in view the aforementioned RE growth and its strong connections with other sectors of economy, this study quantifies the impact of money flow on the performance of RE sector in the implementation of the monetary policy by European Central Bank (ECB). The analysis is carried out using a dynamic computable general equilibrium (DCGE) model based on the Financial Social Accounting Matrix (FSAM). This set of instruments is recognized by the current literature as a valid tool to quantify the impact of both fiscal and monetary policies because it allows tracking the policy transmission mechanisms through the phases of the income

**TABLE 1** Basic framework of financial social accounting matrix (FSAM)

		Factors of productions							Trade and transport margins			Institutional sectors current account			Institutional sectors capital account											
		Production activities			P1	P2	P3	P4	Taxes	P1	P2	P3	P4	Firms	Govt	HH	ROW	Firms	Govt	HH	ROW	Ch.	In.	Stocks	Financial instruments	Total
Revenues	n.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19						
Commodities	1	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19						
			Intermediate consumption	Net value added							Final demand by Govt	Final demand by HH	Exports	Gross fixed capital formation/Investment demand by institutional sectors				Inventories		Total demand						
Production activities	2																									
Factors of productions	P1	3																								
				Net value added																						
Revenues	P2	4																								
	P3	5																								
	P4	6																								
Taxes	7																									
Trade and transport margins	8																									
Institutional sectors current account	Firms	9																								
	Govt	10																								
	HH	11																								
	ROW	12																								
Institutional sectors capital account	Firms	13																								
	Govt	14																								
	HH	15																								
	ROW	16																								
Ch. In stocks	17																									
Financial instruments	18																									
Total	19																									

Source: Ahmed, Socc, Severini, Yasser, et al. (2018).

Note: P1-compensation of employees; P2-mixed income; P3-gross operating surplus; P4-other taxes less subsidies; Govt-Government; HH-households; ROW-rest of the world.

circular flows (Ahmed, Socci, Severini, & Pretaroli, 2018; Ciaschini et al. 2015). In particular, when focusing on monetary policy, its effect originates from the financial markets and reverberates to the commodity markets. This connection can be studied using exogenous flows (as in Christiano, Eichenbaum, & Evans, 2005, Smets & Wouters, 2003, 2007) or alternatively, integrating the financial flows with the economic flows of the SAM to derive the FSAM (Ahmed, Socci, Severini, Yasser et al., 2018). Compared to the existing literature, the present study contributes to disclosure the connections between the financial market and the RE market that operate in two different but related levels, within the Italian economic system. The results of the policy simulation are indeed evaluated in terms of RE's total output, value added generation, demand of labour and price fluctuation.

The next section describes the construction of FSAM. Section three presents the dynamic general equilibrium model. Section four illustrates the policy simulation and presents the findings and section five presents the conclusion.

## **2 | THE FINANCIAL SOCIAL ACCOUNTING MATRIX**

The SAM replicates the income circular flow within the economic system since it presents the economic transactions occurring among the production processes, the value added components and the institutional sectors for a particular year (Ciaschini & Socci, 2006). The inclusion of financial accounts to derive the FSAM implies the collection of the flows related to the capital accounts and the financial assets (or liabilities) accounts (Emini & Fofack, 2002). Indeed, the financial accounts depict the changes in the lending/borrowing of each agent in response to the changes in the holdings of financial assets and liabilities (Hubic, 2012). Notwithstanding, the SAM already contains a capital account that presents the information of gross fixed capital formation of the institutional sectors. However, this unitary account does not reflect the individual contribution of each institutional sector. In addition, the de facto capital account incorporates the information of physical capital of the institutional sectors. The integration of an individual capital account for each institutional sector keeps the detail of different resources of each agent as well as the detail of various assets (both physical and financial); the latter holds as counterparts of those resources (Ahmed, Socci, Severini, Yasser et al., 2018). The basic framework of the FSAM is reported in Table 1 and the aggregated FSAM is presented in Table 2.

The construction of the FSAM follows several steps: once the blocks of rows and columns referred to the specific economic functions are identified, it is possible to compile

the quadrants of the flows following the income circular flow (Socci, Severini, Pretaroli, Ahmed, & Ciaschini, 2018). This dataset in itself represents an important tool for policy making which, thanks to its construction, can be utilized by researchers for a vast array of policy applications. For the Italian economy we can mention the study by Ciaschini et al. (2012) in which the authors develop a SAM for 2008 which integrates economic and environmental accounts. A more recent contribution in this field is given by Ahmed, Socci, Severini, & Pretaroli (2018) where the authors developed a SAM for Italian economy for 2009 with a disaggregation of Households by income classes to test the distributional effects of a fiscal policy. In Severini, Felici, Ferracuti, Pretaroli, and Socci (2019) there is a SAM for 2009 with a disaggregation of the value added components by gender to test the impact of policies aimed to reduce the gender employment gap.

In current study we deal with the monetary policies but we can also study the impact of fiscal policies, or policies for selected industries, and observe how they reverberate within the financial market. The FSAM distinguishes the several blocks as follows:

### **2.1 | Block of intermediate consumption: The USE table**

The first quadrant of the SAM contains intermediate consumptions by commodities (Table 1, R1-C2). It is represented by a sub-matrix and posits the conversion of products into more complex products for further processing. We distinguish 64 commodities and 64 activities. The flows derive from the Use-Supply matrix for 2009 (ISTAT) and are expressed in purchasers' prices. Table A1 of appendix A lists the commodities and activities.

### **2.2 | Block of total output by activities: The Make table**

The second quadrant of the SAM represents the make matrix (Table 1, R2-C1). It represents how the commodities are made by the production activities. The Make matrix flows are at basic prices. Therefore, we include a separate trade and transport margin account.

### **2.3 | Block of generation of income: The value added generation**

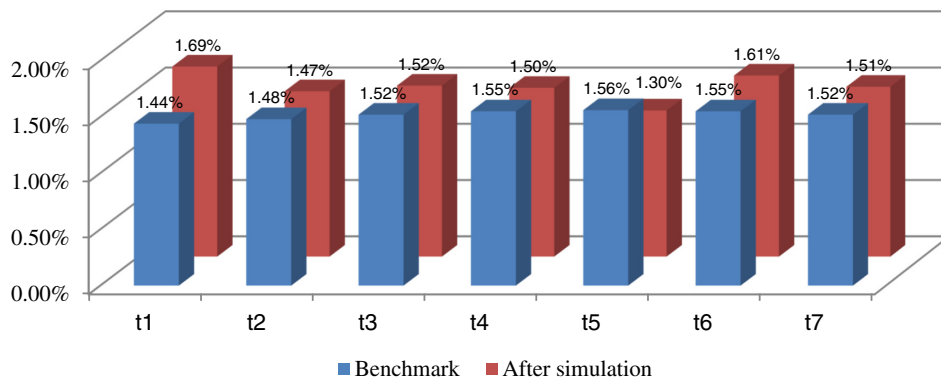
The block of income generation, also referred to as value added generation, depicts the activities in which the primary income originates (Table 1, R(3-6)-C2). The value

**TABLE 2** Aggregated FSAM for Italy (2009) (in millions of Euros)

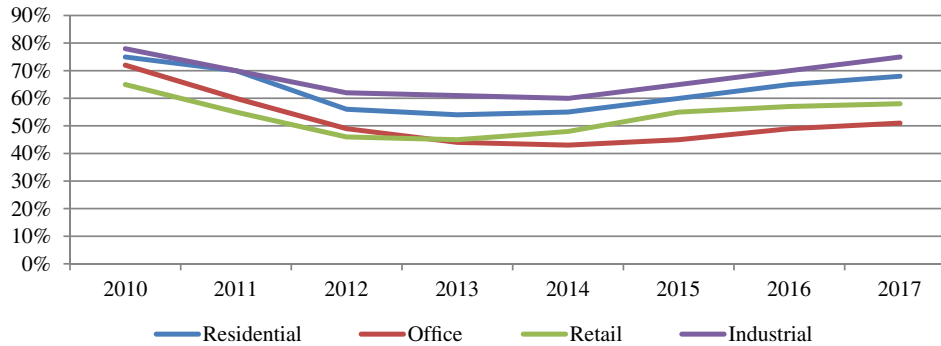
Revenues	Factors of productions										Institutional sectors current account				Institutional sectors capital account				Ch. In stock	Financial Inst.	Total rows
	Production					Trade and transport margins					Firms		Govt		Firms		Govt				
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18			
n.	Outlays	Commodities	activities	P1	P2	P3	P4	Taxes	Firms	Govt	H.H	ROW	Firms	Govt	H.H	ROW	Ch. In stock	Inst.	Total		
Commodities	1	1,551,044	-						324,684	929,482	333,714	149,070	38,404	107,206			-8,196				
Production activities	2	2,919,618																		2,919,618	
Factors of productions	P1		650,489					3,316												653,805	
	P2		217,583																	217,583	
	P3		464,905																	464,905	
	P4		35,597					6,019												41,616	
Taxes	7	151,121																		151,121	
Trade and transport margins	8																			0	
Institutional sectors current account	Firms	9				318,806		94,680	27,115	58,605	46,211									545,417	
	Govt	10				28,735	41,616	148,044	51,397	694	407,553	4,607								682,646	
	H.H	11				651,354	217,583	117,364	225,254	317,395	188,364	31,542								1,748,856	
	ROW	12				2,451		3,077	39,323	43,705	12,360									455,585	
Institutional sectors capital account	Firms	13						134,763					24,366	1	324					324,989	
	Govt	14						-30,947				8,181			6,143	1,310				165,535	
	H.H	15						152,492					2,953		895	1				88,276	
	ROW	16									30,176		-62,248		-4,204	414				20,805	
Ch. In stock	17												-8,230		-66	100				61,002	
Financial Inst.	18											238,216			11,510	62,387				23,505	
Total column	19	3,425,408	2,919,618	653,805	217,583	464,905	41,616	151,121	545,417	682,646	1,748,856	455,585	324,989	72,963	177,146	25,140	-8,196			335,618	

Source: ISTAT, Eurostat, Bank of Italy and authors' calculation.

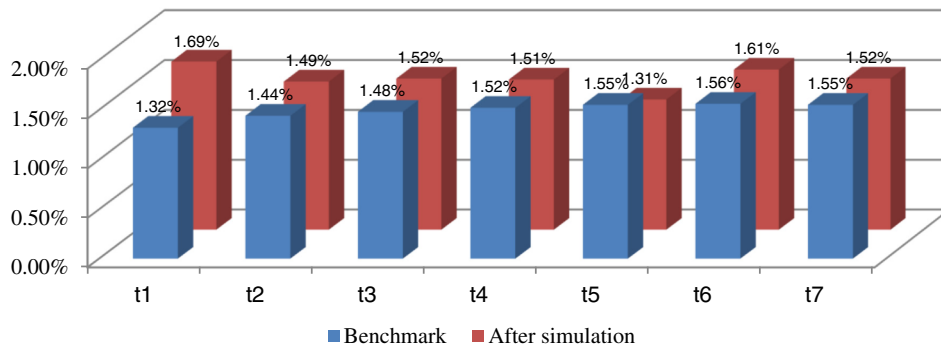
Note: P1-compensation of employees; P2-mixed income; P3-gross operating surplus; P4-other taxes less subsidies; Govt-Government; HH-households; ROW-rest of the world.



**FIGURE 1** Change in output of RE sector - in percent [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]



**FIGURE 2** Transaction trend in real estate sector (2010–2017) [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]



**FIGURE 3** Change in employment - in percent [Colour figure can be viewed at [wileyonlinelibrary.com](http://wileyonlinelibrary.com)]

added generated in production is considered as the incomes meant to the primary factors for their involvement in the production process. The current FSAM identifies four primary factors: employee's compensation, mixed income, gross operating surplus and other taxes less subsidies on domestic production.

## 2.4 | Block of primary income allocation

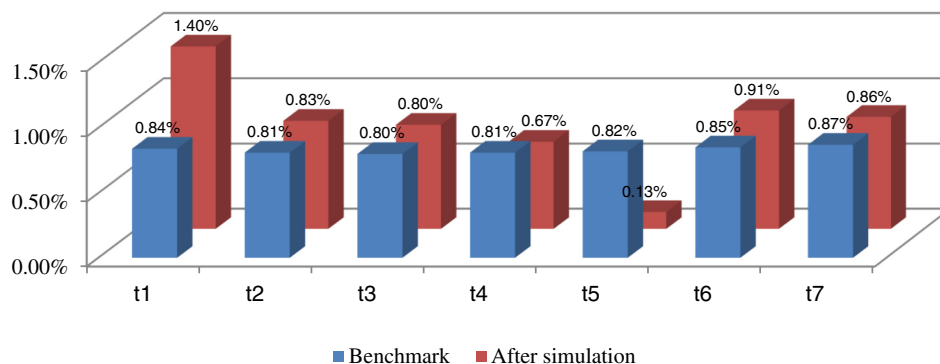
The block of primary income allocation focuses on resident institutional sectors in their capacity as recipients of primary incomes (Table 1, R(9–12)-C(3–6)). It describes where the items payable in generation of income account are receivable and includes the amounts of property incomes receivable and payable

by institutional sectors (United Nations, 2008). This study identifies four institutional sectors namely “Firms,” “Households,” “Government,” and “Rest of the World.”

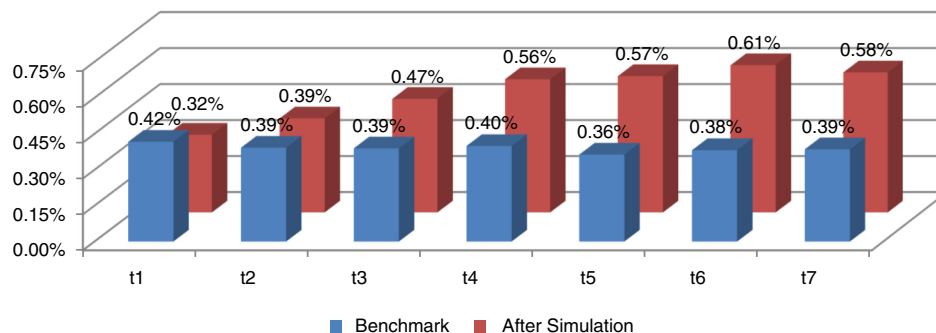
## 2.5 | Block of secondary income allocation

This block of secondary income distribution depicts the transformation of the primary income balance of an institutional sector into its disposable income in terms of current transfers (Table 1, R(9–12)-C(9–12)). It describes, in particular, the way the income is redistributed among institutional sectors via payments and receipts of current transfers.

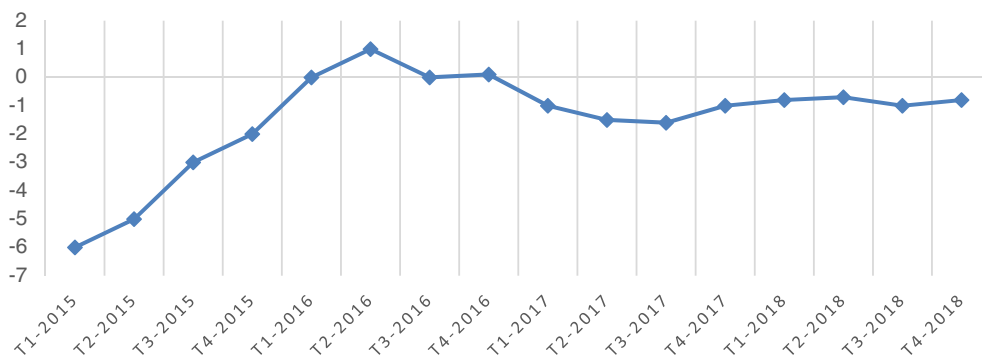
**FIGURE 4** Change in aggregated value added by real estate (RE) sector - in percent [Colour figure can be viewed at wileyonlinelibrary.com]



**FIGURE 5** Change in RE prices - in percent [Colour figure can be viewed at wileyonlinelibrary.com]



**FIGURE 6** Price index of real estate - quarterly percentage change [Colour figure can be viewed at wileyonlinelibrary.com]



## 2.6 | Block of final demand and savings

The income circular flow closes with the determination of disposable income by the institutional sectors. This block describes how institutional sectors allocate their disposable income between final consumption (Table 1, R1-C(9–12) and saving (Table 1, R(13–16)-C(9–12)). The disposable income is the balancing item carried forward from the secondary distribution of income account. The saving account is the first account that links the economic flows with the financial flows.

## 2.7 | Block of capital formation and inventory

The capital formation account presents the gross fixed capital formation and changes in inventories (Table 1, R1-C[13–17]). The current SAM has disaggregated this

account among institutional sectors in order to provide the capital account of each institutional sector. Hence, the gross fixed capital is disaggregated according to the structure of the national accounting matrix (NAM) accordingly. This block also includes the capital account of the rest of the world.

## 2.8 | Block of capital transfers

The block of capital transfers describes net receivable capital transfers and net payable capital transfers among the Institutional Sectors including the rest of the world (Table 1, R(13–16)-C(13–16)). Note that this account exhibits the flows of physical capital. Together with the block of savings, capital formation, financial assets and financial liabilities, this block gives rise to the net worth of institutional sectors. These accounts represent the stepping-stones for including the financial accounts in SAM.

## 2.9 | Block of financial assets

This block represents the acquisition of financial assets by the institutional sectors (Table 1, R18-C(13–16)). It contains the flows of financial instruments among economic agents during the year. An asset represents a benefit or series of benefits accruing to the economic agent by holding the entity over a period of time (United Nations, 2008). It is a means of carrying forward value from one accounting period to another. Benefits are exchanged by means of payments. Financial assets are the financial claims, shares or other equity in corporations plus gold bullion retained by monetary authorities as a reserve asset.

Including this block in FSAM, the columns in capital account show the use of the available resources by economic agents in investment goods and on financial assets (Waheed & Ezaki, 2008). The financial assets comprise of 12 financial instruments which are further disaggregated for detailed description. Table A2 of appendix A lists the financial instruments.

## 2.10 | Block of financial liabilities

This block completes the financial mechanism in the FSAM showing the incurring of financial liabilities by the economic agents in terms of flow of the financial instruments (Table 1, R(13–16)-C18). A financial liability refers to the situation when one agent, the debtor, is obliged under specific conditions, to provide a payment or series of payments to another agent, the creditor. A legally binding contract establishes the liability and specifies the terms and conditions of the payments to be made while the payments according to the contract are unconditional. Hence the rows of capital account in FSAM show the resources available to the agents in terms of savings and financial liabilities. Like financial assets, the financial liabilities also present 12 main financial instruments which are further disintegrated into several sub categories.

## 3 | DYNAMIC COMPUTABLE GENERAL EQUILIBRIUM MODEL (DCGE)

The DCGE is used to assess the dynamic effects of monetary shocks and observe the behaviour of inflation and persistence in aggregate quantities (Christiano et al., 2005; Smets & Wouters, 2003, 2007). Its ability to integrate the financial frictions is receiving consent in the economic literature. For instance, Ahmed, Socci, Severini, Yasser

et al., 2018 investigate the behaviour of investment and consumption of economic agents in response to the quantitative easing (QE) using financial SAM and DCGE model. Similarly, the DCGE is also used to investigate the nexus between capital inflow and growth rate of developing economies (Prasad, Rogoff, Wei, & Ayhan Kose, 2004).

Gerali, Neri, Sessa, and Signoretti (2010) have developed a model explaining the role of credit-supply factors in business cycle fluctuations. Using Bayesian techniques and data for the euro area over the period 1999–2008 into a DSGE model, the study shows that the largest part of the economic activities' slowdown during 2008 is mainly caused by shocks occurred within the banking sector. Similarly, Palić (2018) demonstrates the compliance of financial policy shocks by calibrating financial friction into DSGE model in the case of Croatia. The study posits the positive impact of monetary policy shocks on interest rate and negative initial impact on house prices and output gap.

While trying to reduce the negative impact of credit supply shock on economy, Kiyotaki and Moore (1997) construct a model of a dynamic economy in which debts cannot be paid unless they are secured. In this model the interaction of asset markets and credit markets has been highlighted as an important transmission mechanism by which the cumulative impact of a persistent shock on asset prices and on net worth is considered as an intertemporal multiplier process. Based on a real US data and a DSGE model with a heterogeneous banking sector, De Walque, Pierrard, and Rouabah (2010) have showed that the resilience of economy to shocks is well improved by Basel which unfortunately reduces the steady state and that liquidity injection is important to relieve financial instability but it has unclear impact on output fluctuation. For Brunnermeier, Eisenbach, and Sannikov (2012), these ambiguous effects can result in price instability and additional fragility. In fact, surveying the macroeconomic implications of financial frictions, authors suggest that the best policy in crisis times is the intervention of the central bank by substituting the lack of private credit by public funding.

The DCGE model calibrates not only the domestic financial flows but also the international financial flows in terms of exogenous foreign investments (Goodhart, Sunirand, & Tsomocos, 2004, 2005). The endogenous capital foreign capital flows are modelled by Maldonado, Tourinho, and Valli (2007) for Brazil. Several other studies are devoted to the inclusion of financial frictions in the calibration of DCGE model (e.g., Christensen & Dib, 2008; Christiano, Trabandt, & Walentin, 2011; De Graeve, 2008; Nolan & Thoenissen, 2009). On the other hand, the inclusion of agency problems due to financial

intermediation is augmented in DCGE by Christiano, Motto, and Rostagno (2014).

The current study incorporates the multi-sectoral aspect, which allows emphasizing the structural changes in intermediate consumption among the production activities of the economy and the changes in institutional sector's choice on investment and savings because of the fluctuations in financial instruments prices) according to the SAM structure.

### 3.1 | The dynamic financial CGE model

The dynamic FCGE model used in this study originates from Ahmed, Socci, Severini, Yasser, et al. (2018) and formalizes the main relationships among the agents over the time based on the data provided by the FSAM for the Italian economy. The model implies that the behaviour of agents depends on adaptive expectations and that the evolution path is a sequence of single period static equilibria and both are linked with each other by the capital accumulation condition (Lau, Pahlke, & Rutherford, 2002). The model allows computing the prices and quantities that solve the intertemporal optimization problem of the agents subject to income, technology and feasibility constraints.<sup>2</sup> In each period the economic flows related to the production processes, income generation and distribution among institutional sectors and final demand formation are linked to the financial flows describing the formation of the assets and liabilities through the capital accounts and savings. Therefore, the conjunction between the economic and the financial variables comes through the representation of the financial markets as complementary to the economic system. The changes in the demand of financial instruments, depending on disposable income by institutional sectors and financial instrument's price, affects the amount of savings and thus the total resources available for investments. Thus the change in investments reverberates in the production processes and income generation and distribution closing the loop.

The model is built to consider an open economy with a set of 64 commodities, 64 activities, 3 components of value added (compensation of employees, mixed income, gross operating surplus), taxes on production and imports less subsidies, 4 institutional sectors (firms, households, government, and rest of the world), 12 financial instruments. Compared to the financial DCGE in Ahmed, Socci, Severini, Yasser, et al. (2018) in this study there is a specification of the behaviour of a selected commodity represented by Real Estate that is considered a key sector for the Italian Economy.

In broader terms, the total output (supply) by commodity constitutes of CES aggregation of domestic production and imports following Armington hypothesis.<sup>3</sup> The domestic production by commodity derives from the combination of primary factors and intermediate consumption by each activity according to a nested production function. More specifically, domestic output is the combination (assuming Leontief technology) of intermediate goods, which depends on total output and prices, and value added that is affected by total production and primary factors compensations. Then assuming a CES technology, value added is generated by combining capital and labour aggregates that are perfectly mobile across activities. Technically, all the parameters of the equations identifying the shares of each input on the respective aggregate (depending on the nest of the production function) are calculated from the flows identified by the FSAM in the model calibration process.

The final demand for each product comes from activities (intermediate consumption), households (final consumption), Government (public expenditure), rest of the world (exports) and investment. Again, the parameter (the shares) identifying the final demand allocation are computed from the FSAM as the value of each final demand component on the total final demand. Linear expenditure system (LES) determines the consumption of households and Government with a fraction of agent's disposable income allocated to each commodity. This quota is determined in the first period by the FSAM flows as the value of the consumption expenditure by commodity on the total disposable income by institutional sector. Then the share of disposable income allocated to final consumption and savings becomes endogenous in the following periods. Indeed, the institutional sectors' decisions on final consumption and savings depend on their intertemporal well-being function. More precisely, all the institutional sectors maximize the present value of their intertemporal utility function (Parada-Daza, 2004) depending on final consumption expenditure and gross saving subject to the lifetime budget constraint (Ciaschini, Pretaroli, Severini, & Socci, 2015). The lifetime budget constraint is the lifetime disposable income that derives from the sum of compensation of primary factors plus net transfers/taxes from the other agents occurring in the secondary income distribution phase in each period.

The financial market is included in this model considering the balance between the total demand ( $A_t$ ) and the total supply of financial instruments ( $SL_t$ ). In other words, the financial instruments represent the goods that are exchanged in the financial market and thus for each of them we consider a production function and a function of demand. Therefore, the prices of financial



instruments are flexible and adjust in order to grant the perfect competitiveness of financial market where the flows originated by changes in demand for financial instruments generate a similar change in liabilities (supply) of those instruments. Hence, the change in the value, for each agent, lent to the financial fund and the changes in its liabilities with the financial fund are compatible with total savings (investment) in each period. Accordingly, the net asset equilibrium of each agent requires that net change in the balance of borrowings and loans of each agent, corresponds to the difference between savings and investment.

The model is completed by the market clearing conditions for all markets (commodities, primary factors and financial instruments), zero profit conditions, budget constraints of institutional sectors and macroeconomic closures.

The market clearing conditions impose that in each period total supply is equal to total demand thanks to the fluctuation of prices. Then, the zero profit conditions ensure that in each period, the equilibrium price from the market clearing condition equals the average cost to produce (supply) each commodity (or financial instrument).

The market clearing condition for each primary factor assumes the balance between the total demand by activity (endogenously determined) and the total supply (exogenously determined). The primary factors prices, as well as all prices are set equal to one in the benchmark, then they fluctuate to restore in each period the balance between the demand and the supply in all markets.

The Government balance follows the condition by which gross saving is endogenously determined as the difference between lifetime Government disposable incomes and total expenditure.<sup>4</sup> The condition for the balance of rest of world imposes that the real exchange rate can be flexible, while gross saving is fixed in nominal terms.<sup>5</sup> The condition for Savings-Investment balance imposes that investments are saving driven, so that in each period the gross fixed investment derives from the sum of institutional sector's savings. However, the model closes with the capital accumulation condition stating that the capital stock in period  $t+1$  is equal to the capital stock in period  $t$ , less depreciation, plus gross fixed capital formation in period  $t$ .

## **4 | POLICY SIMULATION FOR ITALIAN ECONOMY**

In September 2012, the ECB decided to support the debt ridden countries against the backdrop of spillover effects of global financial crisis (De Grauwe, 2013). Notwithstanding the criticism on the said policy from several member countries, the ECB took up the policy.<sup>6</sup>

### **4.1 | Policy setup**

The current study supposes that the system has an inflow of funds in response to the increased demand of bonds in the Central Bank's assets. The resulting effects are estimated as the change in RE sector's output, value added and prices in seven periods onward. The study does not include the rents of owner-occupied lodgings. To assess these effects, we injected 10 Billion Euro. The study uses this amount for the purpose of simulation and it does not correspond to the actual amount of QE. Firstly, the bonds in the block of central bank's assets are increased and this increase is compensated by decreasing the counter cell in the block of government assets. Secondly, the currency in government assets is raised which is compensated by the decrease the same amount of currency in central bank's assets.

### **4.2 | Results and discussion**

#### **4.2.1 | Impact on RE sector's output**

The money injection and its circulation from trading of bonds activates the whole income circular flow and the effects are recorded. The model is able to track the monetary policy transmission mechanism and, thanks to the disaggregation of production processes provided by the FSAM, the sectoral outcome can be plotted. Figure 1 depicts the percentage change in the RE output compared to the counterfactual scenario, that is the baseline trend without any shock. After policy simulation, the output of RE sector in  $t_1$  increases more than the benchmark, then in the succeeding periods the change is more or less similar to the benchmark. In other words, the injection of currency in the Italian economic system stimulates the RE output in the very short run, then the effect withdraws in the next periods. This finding is interestingly consistent with the actual statistics of Italian real estate sector for the years from 2014 to 2017. The transaction trend in real estate sector is depicted in Figure 2. The figure shows a decline in the transactions until the beginning of 2014 and it started to increase in the following years<sup>7</sup> after the introduction of QE. This resemblance proves the consistency of the model to forecast the response of the RE sector in Italy to a monetary policy shock.

#### **4.2.2 | Impact on employment by RE sector**

The impact on RE total output reverberates in the demand of primary factors, and in particular in the

labour employment. Figure 3 demonstrates the post simulation increase in employment by RE sector in the t1, t2, t3 and t6 periods. The change in employment is more persistent in the time compared to the effect on RE because of the indirect effects that the increase in RE sectors generates in the economy as a whole. Indeed, we already said that RE represents a key industry in Italian economy and thus, an expansion of its production directly and indirectly stimulates other production processes.

### 4.2.3 | Impact on aggregated value added by RE sector

Figure 4 presents the change in aggregated value added by RE sector. The changes in this variable are mainly due to the changes in its most important components that are capital and labour. The findings demonstrate a significant increase in the value added immediately after the policy and normalization in the subsequent periods till t5. Notwithstanding the employment also undergoes similar variation in the aforementioned periods however the variation is not as significant as it is observed in the aggregated value added. This is due to the price effect that is included in the value added performance.

### 4.2.4 | Impact on pricing of real estate services

Variation in prices of RE services from benchmark is depicted in Figure 5 which shows the decline after the policy simulation in period t1 and stabilizing prices in t2. The following periods observe a positive effect and there is a rise in the pricing of RE services.

The change in RE's prices can be compared with the actual RE price index as shown in Figure 6. The implementation of ECB's QE has a negative impact on the RE's prices in the first year. However, the prices are stabilized in the subsequent year and present a slight negative change in the next years. This actual trend is consistent with our findings in the first three periods and therefore can be partially interpreted as a result of ECB's monetary policy.

## 5 | CONCLUSION

Knowledge of inter-industry connections is vital in policy implication since it gives insightful information of the behaviour of different sectors in response to fiscal and monetary policies. After the great recession 2008, the

nexus between financial market and real estate market has been the key subject of discussion since these two sectors were involved in the outbreak of financial crisis. Several studies have been devoted, hereafter, to study the interactions between financial sectors and real economic sectors.

This study contributes to the existing literature in a way that it investigates relationship between financial market and real estate sector for Italian economy. The study uses financial SAM and financial dynamic CGE model with a specification of the behaviour of real estate industry to investigate the impact of ECB's monetary policy in terms of this sector's output growth, labour employment, value added change and pricing trends.

The findings of our study confirm that the effects of the expansion in money supply stimulates the real estate sector but only in the short run and do not affect much prices. These results are consistent with the evidence showed in the performance of the RE sector in the latest years, confirming the forecasting potential of this model. A wide strand of literature has been devoted to the discussion of ECB's stance on Government bond buying policy and the financial SAM and Financial DCGE can be included in the range of tools able to detect the economic and financial impact of policy measures, whether they are monetary of fiscal or a combination of both.

### DATA AVAILABILITY STATEMENT


Data sharing is not applicable to this article as no new data were created or analyzed in this study.

### ORCID

*Irfan Ahmed*  <https://orcid.org/0000-0002-9015-0277>

*Claudio Soggi*  <https://orcid.org/0000-0002-8367-0776>

*Ali Medabesh*  <https://orcid.org/0000-0002-9758-2574>

*Francesca Severini*  <https://orcid.org/0000-0003-4969-0834>

*Jacopo Zotti*  <https://orcid.org/0000-0002-6906-6142>

### ENDNOTES

<sup>1</sup> See for detail at <https://www.istat.it/en/archivio/216278>.

<sup>2</sup> For the detailed description of the model see the appendix B of Ahmed, Soggi, Severini, Yasser, et al. (2018).

<sup>3</sup> Following this assumption, domestic commodities and imports are imperfect substitutable since they have some elements of differentiation that can be observed by final consumers.

<sup>4</sup> The Government disposable income is calculated as the sum of total tax revenues (tax rates are assumed as fixed) primary factors remuneration and transfers from other institutional sectors. Total expenditure is the sum of transfers paid to other institutional sectors (exogenous in nominal terms) and Government consumption expenditure (exogenous in real terms).

<sup>5</sup> The balance in each period derives from the difference between Rest of world's revenues and expenditures. Revenues are imports

and transfers from domestic institutional sectors that are endogenously determined and depend on domestic income. Rest of world expenditures are exports and other transfers to domestic institutional sectors that are exogenous.

<sup>6</sup> See Ferry (2013), De Grauwe (2012, 2013), and Lane (2012).

<sup>7</sup> See the following reports for details:

1. [https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/realstate/reflexions/lu\\_italian-real-estate-market.pdf](https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/realstate/reflexions/lu_italian-real-estate-market.pdf)
2. <https://www.pwc.com/it/it/publications/assets/docs/pwc-real-estate-2018.pdf>
3. <http://www.italy24.ilssole24ore.com/art/real-estate/2017-03-22/a-positive-outlook-for-the-italian-real-estate-emerges-from-cannes-mipim-fair-135444.php?uuid=AEihCMr>
4. <http://www.propertywire.com/news/europe/italy-commercial-property-markets/>.

## REFERENCES

- Ahmed, I., Socci, C., Severini, F., & Pretaroli, R. (2018). Fiscal policy for households and public budget constraint in Italy. *Economia Politica*, 36(1), 19–35.
- Ahmed, I., Socci, C., Severini, F., Yasser, Q. R., & Pretaroli, R. (2018). Forecasting investment and consumption behavior of economic agents through dynamic computable general equilibrium model. *Financial Innovation*, 4, 7. <https://doi.org/10.1186/s40854-018-0091-3>
- Armington, P. S. (1969). A theory of demand for products distinguished by place of production. *International Monetary Fund*, 16, 159–178.
- Baker, S. D., Hollified, B., & Osambela, E. (2016). Disagreement, speculation, and aggregate investment. *Journal of Financial Economics*, 119(1), 210–225.
- Brunnermeier, M. K., Eisenbach, T. M., & Sannikov, Y.. (2012, December). *Macroeconomics with financial frictions: A survey* (NBER Working Paper Series, No. 1810). National Bureau of Economic Research. Retrieved from <http://www.nber.org/papers/w18102>
- CBRE. (2017). *Real estate market outlook*. CBRE Research Report. Retrieved from <http://www.ice-tokyo.or.jp/wpcontent/uploads/2017/05/2017RealEstateCBRE.pdf>
- Cesarini, D., Lindqvist, E., Ostling, R., & Wallace, B. (2016). Wealth, health, and child development: Evidence from administrative data on Swedish lottery players. *The Quarterly Journal of Economics*, 131(2), 687–738.
- Christensen, I., & Dib, A. (2008). The financial accelerator in an estimated new Keynesian model. *Review of Economic Dynamics*, 11, 155–178.
- Christiano, L. J., Eichenbaum, M., & Evans, C. (2005). Nominal rigidities and the dynamic effects of a shock to monetary policy. *Journal of Political Economy*, 113, 1–45.
- Christiano, L. J., Motto, R., & Rostagno, M. (2014). Risk shocks. *American Economic Review*, 104, 27–65.
- Christiano, L. J., Trabandt, M., & Walentin, K. (2011). Introducing financial frictions and unemployment into a small open economy model. *Journal of Economic Dynamics and Control*, 35, 1999–2041.
- Ciaschini, M., Pretaroli, R., Severini, F., & Socci, C. (2012). Regional double dividend from environmental tax reform: An application for Italian economy. *Research in Economics*, 66(3), 273–283.
- Ciaschini, M., Pretaroli, R., Severini, F., & Socci, C. (2015). Assessing US policies for health care through the dynamic CGE approach. *Bulletin of Political Economy*, 9, 93–126.
- Ciaschini, M., & Socci, C. (2006). Income distribution and output change: Macro multiplier approach. In N. Salvadori (Ed.), *Economic growth and distribution: On the nature and cause of the wealth of nations*. Cheltenham: Edward Elgar Publishing, 247–270.
- Ciaschini, M., & Socci, C. (2007). Bi-regional SAM linkages: A modified backward and forward dispersion approach. *Reviews of Urban and Regional Development Studies*, 19, 233–254.
- Dakila, F. J., Bayangos, G. V. B., & Ignacio, L. L. (2013, July). *Identifying sectoral vulnerabilities and strengths for the Philippines: A financial social accounting matrix approach* (BSP Working Paper Series No. 01). Center for Monetary and Financial Policy in the Bangko Sentral ng Pilipinas (BSP).
- De Graeve, F. (2008). The external finance premium and the macro economy: US post-WWII evidence. *Journal of Economic Dynamics and Control*, 32, 3415–3440.
- De Grauwe, P. (2012). The governance of fragile eurozone. *The Australian Economic Review*, 45, 255–268.
- De Grauwe, P. (2013). The European central bank as lender of last resort in the government bond markets. *CESifo Economic Studies*, 59, 520–535.
- De Walque, G., Pierrard, O., & Rouabah A. (2010). Financial (in)stability, supervision and liquidity injections: A dynamic general equilibrium approach. *The Economic Journal*, 120(549), 1234–1261.
- Emini, C. A. & H. Fofack (2002) A financial social accounting matrix for the integrated macroeconomic model of poverty analysis: Application to Cameroon with a fixed-price multiplier analysis (Policy Research Working Paper Series No. 3219, World Bank).
- Ferry, J. P. (2013). The known unknowns and unknown unknowns of European Monetary Union. *Journal of International Money and Finance*, 34, 6–14.
- Gerali, A., Neri, S., Sessa, L., & Signoretti, F. M. (2010). Credit and banking in a DSGE model of the euro area. *Journal of Money, Credit and Banking*, 42(1), 107–141.
- Goodhart, C. A. E., Sunirand, P., & Tsomocos, D. (2004). A model to analyze financial fragility: Applications. *Journal of Financial Stability*, 1, 1–35.
- Goodhart, C. A. E., Sunirand, P., & Tsomocos, D. (2005). A model to analyze financial fragility. *Economic Theory*, 27, 107–142.
- Hubic, A. (2012). *A financial social accounting matrix (SAM) for Luxembourg* (Working Paper). The Bank of Luxembourg.
- Kiyotaki, N., & Moore, J. (1997). Credit cycles. *Journal of Political Economy*, 105(2), 211–248.
- Lane, P. R. (2012). The European sovereign debt crisis. *Journal of Economic Perspectives*, 26, 49–68.
- Lau, M. I., Pahlke, A., & Rutherford, T. F. (2002). Approximating infinite-horizon models in a complementarity format: A primer in dynamic general equilibrium analysis. *Journal of Economic Dynamics and Control*, 26, 577–609.
- Maldonado, W. L., Tourinho, O. A. F., & Valli, M. (2007). Endogenous foreign capital flow in a CGE model for Brazil: The role of foreign reserves. *Journal of Policy Modeling*, 29, 259–276.
- Mian, A., Rao, K., & Sufi, A. (2013). Household balance sheets, consumption, and the economic slump. *The Quarterly Journal of Economics*, 128(4), 1687–17-26.

- Nobili, A., & Zollino, F. (2017). A structural model for the housing and credit market in Italy. *Journal of Housing Economics*, 36, 73–87.
- Nolan, C., & Thoenissen, C. (2009). Financial shocks and the US business cycle. *Journal of Monetary Economics*, 56, 596–604.
- Palić, I. (2018). The empirical evaluation of monetary policy shock in dynamic stochastic general equilibrium model with financial frictions: Case of Croatia. *International Journal of Engineering Business Management*, 10, 1–11. <https://doi.org/10.1177/1847979018758740>
- Parada-Daza, J. R. (2004). The utility function and the emotional well-being function. *Electronic Journal of Business Ethics and Organization Studies*, 9(2), 22–29.
- Prasad, E., Rogoff, K., Wei, S. J., & Ayhan Kose, M. (2004, December). *Financial globalization, growth and volatility in developing countries* (NBER Working Paper, No. 10942). University of Chicago Press.
- Severini, F., Felici, F., Ferracuti, N., Pretaroli, R., & Socci, C. (2019). Gender policy and female employment: A CGE model for Italy. *Economic Systems Research*, 31(1), 92–113.
- Smets, F., & Wouters, R. (2003). An estimated dynamic stochastic general equilibrium model of the Euro area. *Journal of the European Economic Association*, 1, 1123–1175.
- Smets, F., & Wouters, R. (2007). Shocks and frictions in US business cycles: A bayesian DSGE approach. *American Economic Review*, 97, 586–606.
- Socci, C., Severini, F., Pretaroli, R., Ahmed, I., & Ciaschini, C. (2018). Unconventional monetary policy expansion: The economic impact through a dynamic CGE model. *International Journal of Monetary Economics and Finance*, 11(2), 140. <https://doi.org/10.1504/IJMEF.2018.092354>
- United Nations. (2008). *System of national accounts*. New York, NY: UNSO.
- Waheed, A., & Ezaki, M. (2008). Aggregated and compact disaggregated financial social accounting matrices for Pakistan. *Journal of Economic Cooperation*, 29, 17–36.

## APPENDIX A

**TABLE A1** Classification of commodities and activities in the SAM

<b>Sr. Commodities and activities</b>
1 Agriculture and hunting etc.
2 Forestry and logging etc.
3 Fisheries
4 Mining and quarrying
5 Food beverages and tobacco
6 Textiles
7 Wood other than furniture
8 Paper
9 Printing and recording
10 Coke and refined petroleum
11 Chemicals
12 Pharmaceutical
13 Rubber and plastics
14 Other non-metallic minerals
15 Basic metals
16 Fabricated metals
17 Computer, electronic and optical
18 Electrical equipment
19 Machinery and equipment
20 Motor vehicles, trailers and semi-trailers
21 Other transport equipment
22 Furniture
23 Repair and installation
24 Electricity, gas, steam and air-conditioning
25 Natural water and water treatment
26 Sewerage and materials recovery
27 Constructions
28 Wholesale and retail trade and repair services of motor vehicles and motorcycles
29 Wholesale trade services, except of motor vehicles and motorcycles
30 Retail trade services, except of motor vehicles and motorcycles
31 Land transport services and transport services via pipelines
32 Water transport services
33 Air transport services
34 Warehousing and support services for transportation
35 Postal and courier services
36 Accommodation and food services
37 Publishing services
38 Motion picture, video and television programme production services, sound recording and music publishing; programming and broadcasting services
39 Telecommunications services
40 Computer programming, consultancy and related services; information services
41 Financial services, except insurance and pension funding

**TABLE A1** (Continued)

<b>Sr. Commodities and activities</b>	
42	Insurance, reinsurance and pension funding services, except compulsory social security
43	Services auxiliary to financial services and insurance services
44	Real estate services (excluding imputed rent)
45	Imputed rents of owner-occupied dwellings
46	Legal and accounting services; services of head offices; management consulting services
47	Architectural and engineering services; technical testing and analysis services
48	Scientific research and development services
49	Advertising and market research services
50	Other professional, scientific and technical services; veterinary services
51	Rental and leasing services
52	Employment services
53	Travel agency, tour operator and other reservation services and related services
54	Security and investigation services; services to buildings and landscape; office administrative, office support and other business support services
55	Public administration and defence services; compulsory social security services
56	Education services
57	Human health services
58	Social work services
59	Creative, arts and entertainment services; library, archive, museum and other cultural services; gambling and betting services
60	Sporting services and amusement and recreation services
61	Services furnished by membership organizations
62	Repair services of computers and personal and household goods
63	Other personal services
64	Services of households as employers; undifferentiated goods and services produced by households for own use

**TABLE A2** Flow accounts assigned to financial assets and liabilities (aggregated)

<b>Sr.</b>	<b>Financial instruments</b>
1	Monetary gold and SDRs
2	Currency and transferable deposits
3	Other deposits
4	Short-term securities
5	Bonds
6	Derivatives
7	Short-term loans
8	Medium and long-term loans
9	Shares and other equity
10	Mutual fund shares
11	Insurance technical reserves
12	Other accounts receivable/payable

*Note:* Many of these instruments are further disaggregated with households, firms, Government and rest of the world thereby make total 33 instruments for analysis.