

A SFC MODEL FOR ITALY

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2. THEORETICAL MODEL
3. METHODOLOGICAL ASPECTS
4. PRELIMINARY FINDINGS
5. A RECAP
6. REFERENCES

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1.1 RESEARCH QUESTION AND OTHER FEATURES

AIM AND THEORETICAL REFERENCES

Developing a medium-scale SFC dynamic model for Italy. A theory-constrained but *data-driven* method is used. The model is inspired by [Godley & Lavoie \(2006\)](#).

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EMPIRICAL REFERENCES

Sectoral stocks & flows are explicitly modelled and their evolution over time (under alternative scenarios) is “predicted” - based on the applied work by [Burgess et al. \(2016\)](#).

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EPISTEMOLOGICAL STATUS

The model is built upon available ([Eurostat](#)) data rather than microeconomic first principles. No dynamic optimisation / no representative agent.

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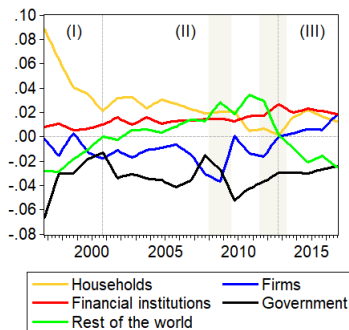
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1.2 ITALY'S SECTORAL FINANCIAL BALANCES

Italy's SFBs have gone through 3 different phases since the mid-1990s. Aim: to develop a macro model accounting for the dynamics below, while comparing different scenarios

FIGURE 1: Sectoral net lending (% GDP, 1996Q4-2016Q4)



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2.1 DISAGGREGATION LEVEL

The model is built upon Eurostat data. Five macro-sectors are considered:

- ▶ (1) Households (marked by the subscript H).

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- ▶ (4) Financial corporations (including banks and other financial institutions, B).

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- ▶ (5) Rest of the world (or foreign sector, RoW).

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- ▶ (6) Central bank (ECB) is (implicitly) considered as well.

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2.2 MAIN FEATURES

The main features (assumptions, limitations) of the model are:

- ▶ (a) The model aims at fitting *Eurostat classifications*, while assuring full stock-flow consistency.

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The main features (assumptions, limitations) of the model are:

- ▶ (a) The model aims at fitting *Eurostat classifications*, while assuring full stock-flow consistency.
- ▶ (b) The economy is *demand-led* both in the short- and long-run. Demand constrains production and determines employment.

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- ▶ (c) Monetary variables are expressed at *current prices* (euro). Price setting and inventories (?) to be included later on.

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- ▶ (d) Total gross output is produced by non-financial firms, on behalf of other sectors. Only *one production function* (Marxian flavour?).

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- ▶ (e) Sectoral GDPs are determined by institutional, political, social and historical factors, embodied in *coefficients* named β_j (Sraffian flavour?).

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2.2 MAIN FEATURES (CONT'D)

- ▶ (f) Each sector has either a *portfolio investment function* or a simple financial investment rule.

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- ▶ (h) No information about *who pays whom*. Some simplifying hypotheses about sectoral portfolio compositions are used, based on observation of available data.

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- ▶ (i) All dividends are paid by NFCs and received by Hs, while almost all securities are issued by G. Interests are paid by G and NFCs to Bs, Hs and RoW.

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- ▶ (l) Banks and other financial institutions are regarded as an *integrated and consolidated sector*.
- ▶ (m) Some model “parameters” include *trend components* to fit of past data.

2.3 SELECTED EQUATIONS

HOUSEHOLD CONSUMPTION

Household consumption is defined by the Haig-Simons function:

$$C_H = c_1 \cdot E(YD) + c_2 \cdot NW_{H,-1} \quad (1)$$

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HOUSEHOLD PORTFOLIO

Portfolio allocation by households is modelled based on Brainard and Tobin (1968) and Godley and Lavoie (2006). All shares are marked by the same average return rate. Total net equity (stock) is:

$$V_H = \lambda_{1,0}^H \cdot E(NFW_H) + \lambda_{1,1}^H \cdot E(NFW_H) \cdot r_V + \lambda_{1,2}^H \cdot E(YD_H) + \lambda_{1,3}^H \cdot E(NFW_H) \cdot r_{BA} \quad (2)$$

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2.3 SELECTED EQUATIONS (CONT'D)

HOUSING INVESTMENT

Housing investment is modelled as a function of past investment, mortgages, housing stock, household disposable income and expected growth rate in property income:

$$\begin{aligned} INV_H = & \vartheta_1 \cdot INV_{H,-1} + \vartheta_2 \cdot MORT_{H,-1} + \\ & + \vartheta_3 \cdot HOUSE_{H,-1} + \vartheta_4 \cdot YD_{H,-1} + \vartheta_5 \cdot E(r_H) \end{aligned} \quad (3)$$

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HOUSEHOLD NET LENDING

Household net lending is the part of disposable income exceeding consumption, investment and other payments:

$$NL_H = YD + FUNDS - CONS_H - INV_H \quad (4)$$

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2.3 SELECTED EQUATIONS (CONT'D)

GROWTH RATE OF CAPITAL

Growth rate is a function of expected utilisation rate, risk premium on loans, and expected profit rate:

$$g_K = \gamma_Y + \gamma_U \cdot E\left(\frac{GDP}{K}\right) - \gamma_R \cdot (r_{L,F} - r_Z) + \gamma_\Pi \cdot E\left(\frac{\Pi_F}{K}\right) \quad (5)$$

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ADJUSTMENT IN HOUSEHOLD FUNDS

“Funds” is a heterogeneous entry including adjustment in pension funds, capital transfers and N-P N-F products. It is modelled as a linear function of disposable income:

$$FUNDS_H = \alpha_{H,FU} \cdot YD_{H,-1} \quad (6)$$

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2.4 EXOGENOUS VARIABLES

KEY DISCOUNT INTEREST RATE

Rate on main refinancing operations (MRO) set by the ECB:

$$r_{ECB} = \bar{r}_{ECB} \quad (7)$$

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RISK-FREE INTEREST RATE

Return rate on 10-year German bonds:

$$r_z = \bar{r}_z \quad (8)$$

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NOMINAL EXCHANGE RATE

Defined as the effective nominal exchange rate with 42 trading partners:

$$NER = \bar{NER} \quad (9)$$

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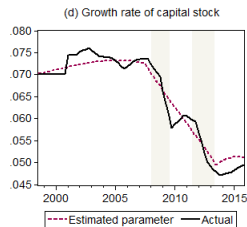
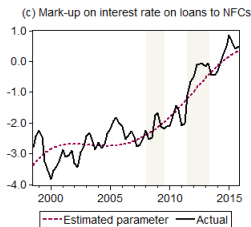
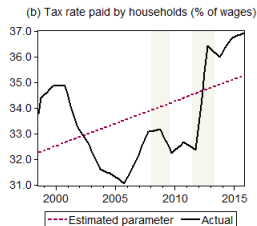
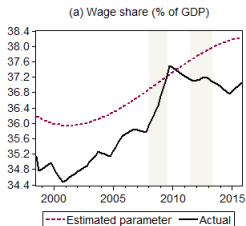
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2.5 MOVING PARAMETERS

FIGURE 2: Calibration: selected “moving parameters”



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3.1 THE FULL T-F MATRIX

A SFC MODEL
FOR ITALY

MARCO
VERONESE
PASSARELLA

Italy 2015		Non-Financial Corporation	Financial Corporations	Government	Households	Rest of World	Total economy (row total)
		S11	S12	S13	S14 S15	S2	S1
Gross Output	P1	2095694	130440	306245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-54429	-90092	-129658	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24469	0	-167	-24636
Memo: GDP		735524	76011	381038	450782	2084	1645439
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-93949		-284895
Total Production		585966	71582	32440	-644181	-45808	-1
Wages	D1	-411085	-32356	-161998	609723	-4284	0
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620	-189354	-1
Subsidies on Production	D3	4347	4	-28481	3929	20201	0
Dividends	D42	-109941	-1633	4271	114625	-7322	0
Interests payments	D41	-5209	18574	-65237	30759	21113	0
Other property income	D4G*	-11995	-17221	3924	23481	1812	1
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485	-1206	0
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607	-2609	0
Other Current Transfers	D7	-5081	-1075	-6476	-6232	18844	0
Adjustments in Pension Funds	D8	-1272	-2461	0	3733	0	0
Capital Transfers	D9	18031	8294	-25421	2889	-3792	1
Total Transfers		-575309	-37170	88668	670409	-146597	1
Sum Production and Transfers		10657	34412	121108	26228	-192405	0
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789	1184	0
Tax - subsidies on product	-D21+D31	0	0	-164885	0	164885	0
Computed Net Lending Position		9122	34394	-44197	27017	-26336	0
Net Lending Position	B9	9120	34396	-44197	27017	-26336	0
Total by sector (column total)		2	-2	0	0	0	0

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3.1 THE FULL T-F MATRIX

- ▶ Two issues:

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Gross Output	P1	209594	130440	305245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-64429	-90092	-129558	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24489	0	-187	-24636
Memo: GDP		735524	76011	381038	450782	2084	1645436
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-83049		-284895
Total Production		585969	71562	32440	-644181	-45808	-1
Wages	D1	-411065	-32356	-161968	609723	-4294	0
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620	-189354	-1
Subsidies on Production	D3	4347	4	-28481	3929	20201	0
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Other Current Transfers	D7	-5061	-1075	-6478	-6232	18844	0
Adjustments in Pension Funds	D8	-1272	-2461	0	3733	0	0
Capital Transfers	D9	18031	8294	-25421	2869	-3792	1
Total Transfers		-575339	-37170	88968	870409	-146597	1
Sum Production and Transfers		16867	34412	121108	26228	-192405	0
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789	1194	0
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3.1 THE FULL T-F MATRIX

- ▶ Two issues:
 - ▶ Lines 6-9 do not sum up to zero (who pays whom?)

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Wages	D1	-411065	-32356	-161968	609723	-4294	0
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620	-189354	-1
Subsidies on Production	D3	4347	4	-28481	3929	20201	0
Dividends	D42	-109941	-1633	4271	114625	-7322	0
Interests payments	D41	-5239	18574	-65237	30759	21115	0
Other property income	D40*	-11095	-17221	3924	23481	1812	1
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485	-1208	0
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607	-2609	0
Other Current Transfers	D7	-5061	-1075	-6478	-6232	18844	0
Adjustments in Pension Funds	D8	-1272	-2461	0	3733	0	0
Capital Transfers	D9	18031	8294	-25421	2889	-3792	1
Total Transfers		-575339	-37170	88968	870409	-146597	1
Sum Production and Transfers		16867	34412	121108	26228	-192405	0
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789	1194	0
Tax - subsidies on product	-D21+D31	0	0	-164885	0	164885	0
Computed Net Lending Position		9122	34394	-44197	27017	-26336	0
Net Lending Position	B9	9120	34396	-44197	27017	-26336	0
Total by sector (column total)		2	-2	0	0	0	0

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3.1 THE FULL T-F MATRIX

- ▶ Two issues:
 - ▶ Lines 6-9 do not sum up to zero (who pays whom?)
 - ▶ Too many entries (rows).

Italy 2015	Non-Financial Corporation \$11	Financial Corporations \$12	Government \$13	Households \$14, \$15	Rest of World \$2	Total economy (row total) \$1	
Gross Output	P1	2095694	130440	305245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-64429	-90092	-129558	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24489	0	-187	-24636
Memo: GDP		735524	76011	381038	450782	2084	1645436
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-83049		-284895
Total Production		585966	71562	32440	-644181	-45808	-1
Wages	D1	-411065	-32356	-161968	609723	-4294	0
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620	-189354	-1
Subsidies on Production	D3	4347	4	-28481	3929	20201	0
Dividends	D42	-109941	-1633	4271	114625	-7322	0
Interests payments	D41	-5209	18574	-65237	30759	21115	0
Other property income	D40*	-11095	-17221	3924	23481	1812	1
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485	-1208	0
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607	-2609	0
Other Current Transfers	D7	-5061	-1075	-6478	-6232	18844	0
Adjustments in Pension Funds	D8	-1272	-2461	0	3733	0	0
Capital Transfers	D9	18031	8294	-25421	2869	-3792	1
Total Transfers		-575309	-37170	88968	870409	-146597	1
Sum Production and Transfers		10667	34412	121108	26228	-192405	0
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789	1194	0
Tax - subsidies on product	-D21+D31	0	0	-164885	0	164885	0
Computed Net Lending Position		9122	34304	-44197	27017	-26336	0
Net Lending Position	B9	9120	34396	-44197	27017	-26336	0
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Italy 2015	Non-Financial Corporation	Financial Corporations	Government	Households	Rest of World	Total economy (row total)	
	\$11	\$12	\$13	\$14, \$15	\$2	\$1	
Gross Output	P1	2095694	130440	305245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-64429	-90092	-129658	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24489	0	-187	-24636
Memo: GDP		735524	76011	381038	450782	2084	1645436
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-83049		-284895
Total Production		585969	71567	32440	-644181	-45808	-1
Wages	D1	-411065	-32356	-161998	609723		-4294
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620		-189354
Subsidies on Production	D3	4347	4	-28481	3929		20201
Dividends	D42	-109941	-1633	4271	114625		-7322
Interests payments	D41	-5209	18574	-65237	30759		21115
Other property income	D40*	-11095	-17221	3924	23481		1812
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485		-1208
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607		-2609
Other Current Transfers	D7	-5061	-1075	-6478	-6232		18844
Adjustments in Pension Funds	D8	-1272	-2461	0	3733		0
Capital Transfers	D9	18031	8294	-25421	2889		-3792
Total Transfers		-575309	-37170	88668	870409		-146597
Sum Production and Transfers		10667	34412	121108	26228		-192405
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789		1194
Tax - subsidies on product	-D21+D31	0	0	-164885	0		164885
Computed Net Lending Position		9122	34394	-44197	27017		-26336
Net Lending Position	B9	9120	34396	-44197	27017		-26336
Total by sector (column total)		2	-2	0	0	0	0

- ▶ So, the full T-F matrix is simplified by two steps:

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3.1 THE FULL T-F MATRIX

- ▶ Two issues:
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 - ▶ Too many entries (rows).

Italy 2015	Non-Financial Corporation \$11	Financial Corporations \$12	Government \$13	Households \$14, \$15	Rest of World \$2	Total economy (row total) \$1	
Gross Output	P1	2095694	130440	305245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-64429	-90092	-129558	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24489	0	-187	-24636
Memo: GDP							
		735524	76011	381038	450782	2084	1645436
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-83049		-284895
Total Production							
		585969	71567	32440	-644181	-45808	-1
Wages	D1	-411065	-32356	-161998	609723	-4294	0
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620	-189354	-1
Subsidies on Production	D3	4347	4	-28481	3929	20201	0
Dividends	D42	-109941	-1633	4271	114625	-7322	0
Interests payments	D41	-5209	18574	-65237	30759	21115	0
Other property income	D4G*	-11095	-17221	3924	23481	1812	1
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485	-1208	0
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607	-2609	0
Other Current Transfers	D7	-5061	-1075	-6478	-8232	18844	0
Adjustments in Pension Funds	D8	-1272	-2461	0	3733	0	0
Capital Transfers	D9	18031	8294	-25421	2869	-3792	1
Total Transfers							
		-575309	-37170	88968	870409	-146597	1
Sum Production and Transfers							
		10667	34412	121108	26228	-192405	0
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789	1194	0
Tax - subsidies on product	-D21+D31	0	0	-164885	0	164885	0
Computed Net Lending Position							
		9122	34304	-44197	27017	-26336	0
Net Lending Position	B9	9120	34396	-44197	27017	-26336	0
Total by sector (column total)							
		2	-2	0	0	0	0

- ▶ So, the full T-F matrix is simplified by two steps:
 - ▶ Everything is produced by NFCs.

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3.1 THE FULL T-F MATRIX

- ▶ Two issues:
 - ▶ Lines 6-9 do not sum up to zero (who pays whom?)
 - ▶ Too many entries (rows).

Italy 2015	Non-Financial Corporation \$11	Financial Corporations \$12	Government \$13	Households \$14, \$15	Rest of World \$2	Total economy (row total) \$1	
Gross Output	P1	2095694	130440	305245	580440	0	3112819
Intermediate Consumption	P2	-1360170	-64429	-90092	-129558	0	-1634349
Taxes on Product	D21	0	0	189354	0	2251	191605
Subsidies on Products	D31	0	0	-24489	0	-187	-24636
Memo: GDP		735524	76011	381038	450782	2084	1645436
Consumption	P3	0	0	-311639	-1001014		-1312653
Exports	P6	0	0	0	0	-493934	-493934
Imports	P7	0	0	0	0	446042	446042
Investment	P5 (G)	-149558	-4429	-36959	-83049		-284895
Total Production		585969	71562	32440	-644181	-45808	-1
Wages	D1	-411065	-32356	-161968	609723		-4294
Taxes on Production and Imports	D2***	-26528	-5735	240236	-18620		-189354
Subsidies on Production	D3	4347	4	-28481	3929		20201
Dividends	D42	-109941	-1633	4271	114625		-7322
Interests payments	D41	-5209	18574	-65237	30759		21115
Other property income	D40*	-11095	-17221	3924	23481		1812
Taxes on Income and Wealth	D5	-27869	-6022	241582	-206485		-1208
Social Benefits (net of social contributions)	D6**	1273	2461	-113732	112607		-2609
Other Current Transfers	D7	-5061	-1075	-6478	-6232		18844
Adjustments in Pension Funds	D8	-1272	-2461	0	3733		0
Capital Transfers	D9	18031	8294	-25421	2889		-3792
Total Transfers		-575309	-37170	88868	870409		-146597
Sum Production and Transfers		10667	34412	121108	26228		-192405
Acquisition less consumption of non produced, non fina	NP	-1535	-18	-420	789		1194
Tax - subsidies on product	-D21+D31	0	0	-164885	0		164885
Computed Net Lending Position		9122	34304	-44197	27017		-26336
Net Lending Position	B9	9120	34396	-44197	27017		-26336
Total by sector (column total)		2	-2	0	0	0	0

- ▶ So, the full T-F matrix is simplified by two steps:
 - ▶ Everything is produced by NFCs.
 - ▶ Some entries (rows) are merged.

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3.3 THE SIMPLIFIED T-F MATRIX

Italy 2015		Non-Financial Corporation S11	(capital)	Financial Corporations S12	Government S13	Households S14 S15	Rest of World S2	Total economy (row total) S1
Gross Output	P1	2095264		130440	306245	580440	0	3112819
Intermediate Consumption	P2	-1380170		-54429	-90092	-129658	0	-1634349
Taxes on Product	D21	0		0	189354	0	2251	191605
Subsidies on Products	D31	0		0	-24469	0	-167	-24636
Memo: GDP per sector		735524		76011	381038	450782	2084	1645440
Memo: total GDP		1645440						
GDP Redistribution		-909915	= -E	76011	381038	450782	2084	0
Consumption	P3	1312853		0	-311639	-1001014	0	0
Exports	P6	493934		0	0	0	-493934	0
Imports	P7	-446042		0	0	0	446042	0
Investment	P5 (G)	284895	-149558	-4429	-36959	-93949	0	0
Wages	D1	-411085		-32356	-161998	609723	-4284	0
Taxes on Production and Imports	D2	-26528		-5735	240236	-18620	-189354	0
Subsidies on Production	D3	4347		4	-28481	3929	20201	0
Dividends	D42	-109941		-1633	4271	114625	-7322	0
Interests payments	D41	-5209		18574	-65237	30759	21113	0
Other property income	D4G	-11995		-17221	3924	23481	1812	0
Taxes on Income and Wealth	D5	-27869		-6022	241582	-206485	-1206	0
Social Benefits (net of social contributions)	D6	1273		2461	-113732	112607	-2809	0
Other Current Transfers	D7	-5061		-1075	-6476	-6232	18844	0
Adjustments in Pension Funds	D8	-1272		-2461	0	3733	0	0
Capital Transfers	D9	18031		8294	-25421	2889	-3792	0
Acquisition less consumption of non produced, non fina	NP	-1535		-18	-420	789	1184	0
Tax - subsidies on product	-D21+D31	0		0	-164885	0	164885	0
Computed Net Lending Position		9123		34394	-44197	27017	-26336	0
Net Lending Position	B9	9120		34396	-44197	27017	-26336	0
Total by sector (column total)		0		0	0	0	0	0

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3.4 THE SUPER-SIMPLIFIED T-F MATRIX

A SFC MODEL
FOR ITALY

MARCO
VERONESE
PASSARELLA

Italy 2015		Non-Financial Corporation S11	(capital)	Financial Corporations S12	Government S13	Households S14 S15	Rest of World S2	Total economy (row total) S1
Gross Output	P1	2095994		130440	306245	580440	0	3112819
Intermediate Consumption	P2	-1380170		-54429	-90092	-129658	0	-1634349
Taxes on Product	D21	0		0	189354	0	2251	191605
Subsidies on Products	D31	0		0	-24489	0	-167	-24638
Memo: GDP		735524		78011	381038	450782	2084	1739563
Memo: GDP		1645440						
GDP Redistribution		-909915	= -Σ	78011	381038	450782	2084	0
Consumption	P3	1312653		0	-311639	-1001014	0	0
Exports	P6	493934		0	0	0	-493934	0
Imports	P7	-446042		0	0	0	446042	0
Investment	P5 (G)	284895	-149558	-4429	-36959	-93949	0	0
Wages	D1	-411085		-32356	-161998	609723	-4284	0
Total Taxes	D2+D5-D21	-54397		-11757	292464	-225105	-1206	0
Dividends	D42	-109941		-1633	4271	114625	-7322	0
Interests payments	D41	-5209		18574	-65237	30759	21113	0
Other property income	D4G	-11995		-17221	3924	23481	1812	0
Transfers (subsidies, benefits, etc.)	D3+D6+D7-D31	559		1390	-124220	110304	11967	0
(Change in) funds	D8+D9+NP	15224		5815	-25841	7411	-2608	0
Computed Net Lending Position		9123		34394	-44197	27017	-26336	0
Net Lending Position	B9	9120		34396	-44197	27017	-26336	0
Total by sector (row total)		0		0	0	0	0	0

Note: reclassification used to develop ItalySFC model

Key:

	Constructed time series by merging existing ones
	Constructed time series by forcing a counterpart (hypothesis: NFCs produce everything)
	Constructed time series by taking existing data from production account
-100	Payment
100	Revenue

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3.5 CALIBRATION

- ▶ Eurostat annual data (from 1996 to 2016) are used to estimate most of model parameters (e.g. consumption function parameters, housing investment parameters, loan and deposit interest rates, etc.)

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3.5 CALIBRATION

- ▶ Eurostat annual data (from 1996 to 2016) are used to estimate most of model parameters (e.g. consumption function parameters, housing investment parameters, loan and deposit interest rates, etc.)
- ▶ Annual data are turned into quarterly series using a simple “linear-match last” method. This means that variables (including flows) are all calculated as annual series and then displayed quarterly.

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- ▶ Eurostat annual data (from 1996 to 2016) are used to estimate most of model parameters (e.g. consumption function parameters, housing investment parameters, loan and deposit interest rates, etc.)
- ▶ Annual data are turned into quarterly series using a simple “linear-match last” method. This means that variables (including flows) are all calculated as annual series and then displayed quarterly.
- ▶ Other parameters are either borrowed from the available literature or chosen from a range of realistic values (e.g. weights on past errors in agents' expectations).

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3.5 CALIBRATION

- ▶ Eurostat annual data (from 1996 to 2016) are used to estimate most of model parameters (e.g. consumption function parameters, housing investment parameters, loan and deposit interest rates, etc.)
- ▶ Annual data are turned into quarterly series using a simple “linear-match last” method. This means that variables (including flows) are all calculated as annual series and then displayed quarterly.
- ▶ Other parameters are either borrowed from the available literature or chosen from a range of realistic values (e.g. weights on past errors in agents’ expectations).
- ▶ Equations were first estimated one at a time and then using a “seemingly unrelated regression” (SUR) method.

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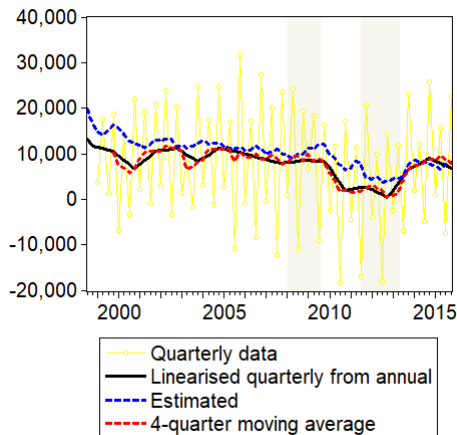
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3.5 CALIBRATION (CONT'D)

FIGURE 3: Household net lending: data check (c.p., million euro)



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3.5 CALIBRATION (CONT'D)

TABLE 1: Fine-tuned parameters

Equation number	Description	Parameter values
8	Weight on past errors in expectations	$v = 0.000$ [0.100]
37	Capital depreciation rate (initial value)	$\delta_k = 0.013$
68	% of NPBL turning into NFC loans write-offs	$\xi_F = 0.15$
61	Share of accounting dividends received by the government	$e_G = 0$ $e_G = 0$
62	Share of accounting dividends received by financial institutions	$e_B = 0$
139	Share of accounting dividends received by the rest of the world	$e_{RoW} = 0$
65	% of investment funded by new shares	$\psi = 0.010$
8	Interest rate on bank deposits	$r_D = 0.000$

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3.5 CALIBRATION (CONT'D)

TABLE 2: Selected estimated parameters (SUR)

Equation number	Dependent variable	Parameter values
12	Household consumption	$c_1 = 0.600, c_2 = 0.059$
15	Dwellings stock	$\delta_H^1 = 0.013, \delta_H^2 = 0.423$
17	Household equity portfolio	$\lambda_{1,0}^H = 0.774, \lambda_{1,1}^H = 0.0004$ $\lambda_{1,2}^H = -2.146, \lambda_{1,3}^H = 0.040$
28	Change in mortgages	$\phi_1 = 0.009, \phi_2 = -0.014,$ $\phi_3 = 0.235$
29	Housing investment	$\vartheta_1 = 0.792, \vartheta_2 = 0.026$ $\vartheta_3 = -0.021, \vartheta_4 = 0.049$ $\vartheta_5 = 7, 963.884$

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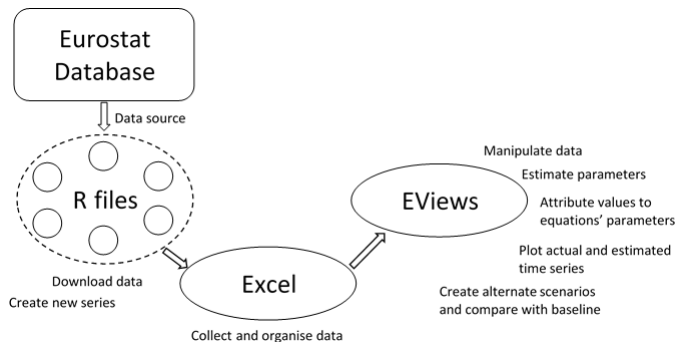
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FIGURE 4: Programs structure



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4.1 PRELIMINARY FINDINGS

The model can be used to:

- ▶ (a) Check the adherence or fit of forecast series to past data.

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4.1 PRELIMINARY FINDINGS

The model can be used to:

- ▶ (a) Check the adherence or fit of forecast series to past data.
- ▶ (b) Predict future developments in main endogenous variables, particularly sectoral financial balances.

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4.1 PRELIMINARY FINDINGS

The model can be used to:

- ▶ (a) Check the adherence or fit of forecast series to past data.
- ▶ (b) Predict future developments in main endogenous variables, particularly sectoral financial balances.
- ▶ (c) Create alternate scenarios to be compared with the *status quo*.

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4.1 PRELIMINARY FINDINGS

The model can be used to:

- ▶ (a) Check the adherence or fit of forecast series to past data.
- ▶ (b) Predict future developments in main endogenous variables, particularly sectoral financial balances.
- ▶ (c) Create alternate scenarios to be compared with the *status quo*.
- ▶ *Notice*: no residuals.

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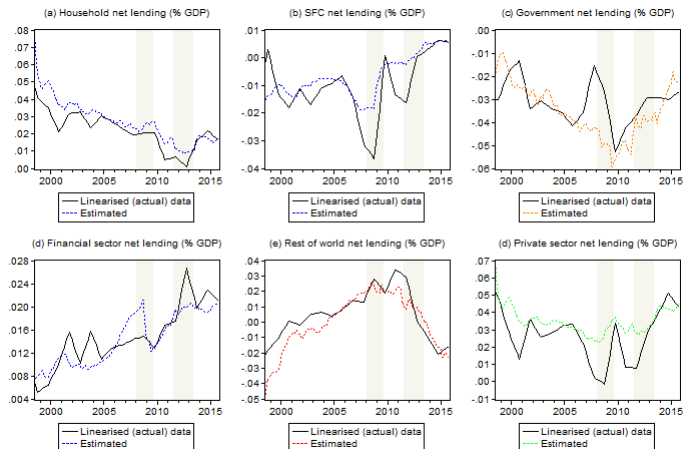
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4.2 FORECASTING PAST DATA (a)

FIGURE 5: Sectoral financial balances in Italy over 1998q1-2015q4



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4.2 PREDICTING FUTURE TRENDS (*b*)

A SFC MODEL
FOR ITALY

MARCO
VERONESE
PASSARELLA

Four methods:

- ▶ (*i*) Parameters are re-estimated using last period average values & variables are allowed to revert to their own model-implied paths in first period of forecast.

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4.2 PREDICTING FUTURE TRENDS (b)

Four methods:

- ▶ (i) Parameters are re-estimated using last period average values & variables are allowed to revert to their own model-implied paths in first period of forecast.
- ▶ (ii) Parameters are re-estimated using last period average values & forecast is “normalised” to fit last available data.

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4.2 PREDICTING FUTURE TRENDS (b)

Four methods:

- ▶ (i) Parameters are re-estimated using last period average values & variables are allowed to revert to their own model-implied paths in first period of forecast.
- ▶ (ii) Parameters are re-estimated using last period average values & forecast is “normalised” to fit last available data.
- ▶ (iii) Original parameter estimates are kept & variables are allowed to revert to their own model-implied paths in first period of forecast.

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4.2 PREDICTING FUTURE TRENDS (b)

Four methods:

- ▶ (i) Parameters are re-estimated using last period average values & variables are allowed to revert to their own model-implied paths in first period of forecast.
- ▶ (ii) Parameters are re-estimated using last period average values & forecast is “normalised” to fit last available data.
- ▶ (iii) Original parameter estimates are kept & variables are allowed to revert to their own model-implied paths in first period of forecast.
- ▶ (iv) Original parameter estimates are kept & forecast is “normalised” to fit last available data.

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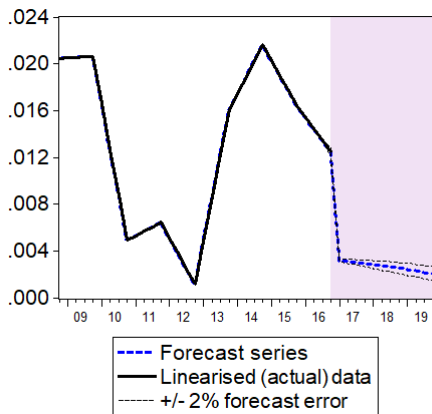
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4.2 PREDICTING FUTURE TRENDS (b) (CONT'D)

FIGURE 6: Household net lending (% GDP) - method (iv)



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Reaction of endogenous variables (household net lending) to shocks (Δ government consumption). Three scenarios: **baseline**; **austerity** (-10% of GDP); **profligacy** ($+10\%$ of GDP). Note: *no need for steady state.*

Household net lending: reaction to shocks to government spending - method (iv)

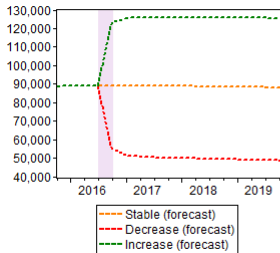
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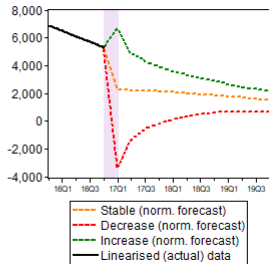
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(a) Three scenarios for gov. cons. (c.p., million euro)

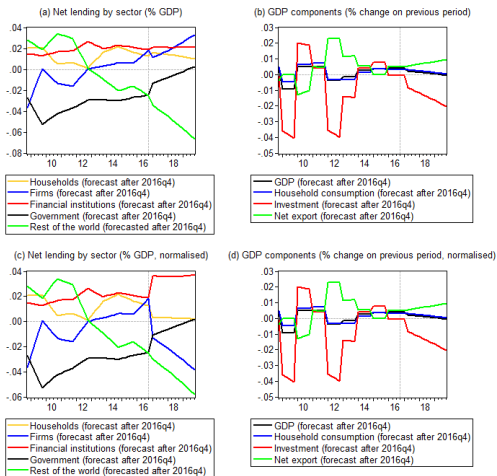


(b) Household net lending: different scenarios (c.p., million euro)



4.4 OTHER VARIABLES/SECTORS

FIGURE 7: Net lending and GDP components



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- ▶ Aim: Develop a (empirical) SFC model based on available data. The model can be used to explain recent developments in key macro-monetary variables (i.e. monitor stock-flow norms) and create alternative future scenarios for policy purposes.

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- ▶ To do list:
 - ▶ Replace transf. annual data with quarterly data (?).

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- ▶ To do list:
 - ▶ Replace transf. annual data with quarterly data (?).
 - ▶ Test other (better) estimation techniques.

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- ▶ To do list:
 - ▶ Replace transf. annual data with quarterly data (?).
 - ▶ Test other (better) estimation techniques.
 - ▶ Replace gross stocks & flows with net stocks & flows.

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- ▶ To do list:
 - ▶ Replace transf. annual data with quarterly data (?).
 - ▶ Test other (better) estimation techniques.
 - ▶ Replace gross stocks & flows with net stocks & flows.
 - ▶ Use disaggregated financial assets and add balance sheet.

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 - ▶ Model inventories (?) and price setting (or constant prices?).

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 - ▶ Replace transf. annual data with quarterly data (?).
 - ▶ Test other (better) estimation techniques.
 - ▶ Replace gross stocks & flows with net stocks & flows.
 - ▶ Use disaggregated financial assets and add balance sheet.
 - ▶ Model inventories (?) and price setting (or constant prices?).
 - ▶ If no detailed info available, go for ABM (simple rule of thumb) or stochastic components.

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