Building a macroeconometric model for the Italian economy: MeMo-It (*)

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This version: October 16, 2012 - 5:36 PM~~5:21 PM~~

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1. - Introduction

Since January 2011, Istat has been involved in the forecasting activity previously carried out at Isae. This is not a novelty for a National Statistical Institute since other institutions in European countries conduct forecasting activity together with the usual production of statistics. Insee (France) and Eurostat are a good example in this respect..

The forecasting activity at Isae was focused on four different tasks: the Euro-zone economic outlook (together with Insee and Ifo) providing a three quarterly ahead forecast for the mail aggregates; the EU Harmonized Index of Consumer Prices (HICP) considered without energetic imported goods with an annual forecast 4 years ahead; the monthly forecast for Italian production index up to three month ahead; the traditional forecast reports on Italian economy.

The implementation of these tasks at Istat implied a debate about the reorganization of the unit, on the metadata standards and on the release calendar.

In 2011 the Econometric Studies and Economic Forecasting Division (SEP) has been created and included in the Integration, Quality, Research and Production Networks Development Department. The activity of SEP is carried out independently from the current production of national statistics.

Our main idea has been to build a transparent and reproducible framework where the structural macroeconometric model, based on the specification of the relationship among the aggregate variables, was the primary actor.

The idea behind the macromodel approach is twofold. Firstly, it must be simple, so it should be easier to communicate to the users, secondly many features of the economy are likely to be robust to the details of microeconomic environment.

Since summer 2011, Istat has developed a new Macro Econometric Model for Italy (MeMo-It) and its first release was used as the base for the Istat forecast scenario released on May 22, 2012 together with the traditional annual report.

MEMO-It is estimated on annual data. This decision has been quite irrelevant in May, when only few information where available for the current year. The picture is quite different for the release of the updated forecasts scheduled at the beginning of November when a revised vintage of the national accounts is released.

The development of MEMO-It has been realized with a small short-term model based on Bridge and VAR models where a number of relevant (selected a priori) monthly indicators are exploited to forecast the relevant quarterly National Accounts (NA) variables over an horizon of four quarters ahead.

The short-term scenario drives MEMo-It over the first simulation year – by the use of add factors in MeMo-It equations – and, at the same time, gives the corresponding quarterly pattern of the first simulation year; in this way, different-periodicity (annual and quarterly) forecasts are fully consistent.

At the moment MEMO-It is composed by 53 stochastic equation and 78 identities and represents an economic system composed by households, enterprises, public administration and foreign sector. Annual data spans from 1970 to 2011.

The model refers to the New-Keynesian Theoretical framework, where the demand side drives the economy in the short-run whilein the long run the system converges to the equilibrium at its potential output level.

The differences between the demand and the supply side drive the price changes that react to the deviation of actual output from potential output (output gap). MEMO-It is built up along different blocks each one fully defined from behavioral equations and account structure.

The specification and estimation follow three different steps. Each equation and block are individually estimated to test for integration and cointegration and to evaluate the casual relationships. To account for weakly endogeneity and measurement errors we adopt a two stage estimation strategy.Further a three-stage estimation manages the covariance between the different equations.

The dynamic features of the model have been evaluated both by means of ad hoc exercises that shock exogenous variables compared to the solution pattern and by forecast accuracy in the sample. Standard errors estimated at three-stage level produce the stochastic solution to the model with a measure of the uncertainty.

This preliminary version of the paper provides a review of the theoretical background on model construction and economic theory (chapter 2) together with a presentation of the main characteristics of the model (chapter 3) and a multiplier analysis (chapter 4).

2. - MeMo-it and the macroeconometric modeling literature

In introducing their paper about model-building strategies, Kapetanios et al. (2007) note - among the others - that "A persistent question in the development of models for macroeconomic policy analysis has been the relative role of economic theory and evidence in their construction." (p. 565). Since the 1960s, following the strand of research at the Cowles Commission (see e.g. Klein, 1950), when first macroeconometric models (MM henceforth) were introduced three methods of quantitative research have emerged over time(see Pagan, 1994).

At the beginning, theory - or perhaps better "theoretical reasoning" - suggested model's specification one equation at a time, and the random error was then attached. The so called "failure" of MM in explaining the stagflation occurred in mid-1970s (see Lucas, 1976, and Sims, 1980), produced a change in the paradigm emphasizing the role of the statistical relationships. Data were regarded as realizations of a multivariate data generation process (DGP) from which the empirical model had to be reduced with the help of theoretical ideas. In this second strand of research (often referred to as LSE approach), economic theory lost its "dominance" over model specification.

Last development (Kydland and Prescott, 1982) refers to the micro-founded model based on *a priori* theory (e.g. Real Business Cycle, RBC, or neo Keynesian, DSGE) which gives exact micro-foundations to the macro structure by assuming representative agents who solve intertemporal optimization problems under rational expectations. In this context, theory not only is more important than data, but also reached the highest dominance ever, as the relationships between model and empirical evidence suggest *ad hoc* errors, with the only aim to reconcile the theory with available data.

Overall, the three modeling approaches listed above entail a sort of dichotomy between two opposed methodological approaches: "theory comes first" versus "facts come first", which represent the trade-off along the frontier (curve) plotted in Figure 1, as brilliantly summarized by Adrian Pagan (Pagan, 2003a and 2003b, and Fukac and Pagan, 2009)..

figure 1 about here

In the words of Pagan (2003a, p. 2), the curve in Figure 1 is the frontier that reflects different 'optimal' composition between economic theory and data.

Crudely speaking, we might say that economics has primacy for those modelling strategies located at the top left hand corner while statistics is dominant at the bottom right hand end. Another way of expressing this is to say that at the top we have models (such as RBCs and DSGEs) that aim to interpret the data, while at the bottom we have models (such as VARs) that aim to summarize the data. It is a matter of fact that data coherence pays more than theory coherence in terms of models' forecasting ability.

The position on the curve might be related to the institutional framework. Constraints represent the relative price (value) to "optimally" allocate the total effort which can be spent in the modeling activity and, in this way, the slope of the "budget constraint" line is defined. Figure 1 reports two alternative lines (cases): the thin one might represent the academic situation: it has a flat slope on the hypothesis that academic MM target publishers (and referees) pay more attention to the theoretical aspects of the empirical work, rather than data coherence. As a result, the flat line put the "academic model" in the top-left point A of Figure 1.

The second line in Figure 1, the thick one, shows the Istat modeling choice for its new MM. In order to understand why Istat found its optimal point in B - along the thick line - instead of A, we remark that Istat "relative price" is higher, i.e. a steeper slope, because the two institutional tasks which are supposed to be accomplished by Istat are (as discussed in the introductory section of this paper): (1) to provide macroeconomic forecasts two- and five-years ahead (respectively for the macroeconomic scenario and for inflation); (2) to model and to interpret *actual* data for the Italian economy (e.g. published NA variables and Europe 2020 indicators). Istat relative price emphasizes the systematic use of the latest available (and continuously updated) statistical information to feed MeMo-It, integrating the best available data with both theoretical and institutional (e.g. chain accounting identities) knowledge.

The relative prominence of data coherency depicted in point B of Figure 1 is admissible on the theoretical ground, as it reflects the epistemological pragmatism advocated e.g. in Colander et al (2008), Hoover et al (2008), and Morley (2010). Following this approach, the idea of optimizing agents in microfounded models stands for a metaphor, because of the insurmountable problems in aggregating behaviors across actual individuals (see e.g. Hoover, 2006).[1] , Along this line MeMo-It makes explicit reference to empirical information to assess the data-admissibility of the theoretical constructs and does not include an explicity microfoundations of *weak*-form[2]. In doing so, MeMo-It deals with the "fallacy of composition" problem to which representative agents' models can be prone (Howitt, 2006), as the aggregation of heterogeneous microdecisions invariably leads to macrorelations with very different dynamic properties. In general, no simple transition from micro- to macro-behavior seems possible; see Pesaran and Smith (2011).

[1] Besides the representative agent critique, Driffil (2011, p. 3) quotes a full paragraph of papers arguing against DSGE by pointing at they are burdened with far too much economic theory (much of it of dubious value); illuminated by far too little examination of data, facts and history.

[2] A model has *weak*-form microfoundations if decisions by agents are governed by explicit dynamic optimization problems. Interestingly, *strong*-form microfoundations require, in addition to weak-form microfoundations, that the formulation of the optimization problem is consistent with relevant microeconomic evidence; see Faust (2009, p. 53). In other terms, *strong*-form microfoundations require that the theoretical model is supported by data.

In order to understand how the modeling practice corresponding to point A uses data information, we list some "drawbacks" and "misuses" when the coherence with the available empirical information is more valued than in A (i.e. from the point of view of the modeler in B).

All models which descend from DSGE philosophy are guided by the idea that there is a steady state to the economy (i.e. that ratios of certain variables are constants; see e.g. Fukac and Pagan (2006), and Morley (2010)). This idea seems far away from the suggestion related to a quick look at time series plots. It is quite awkward to use parameters' estimators in models which potentially suffer of this sort of misspecification: in the DSGE context, model parameters' calibration is better motivated than estimation.[3] On the other hand, the pragmatism evoked above (and its adoption by MeMo-It philosophy), needs formal statistic inferences on the ability of the theory to explain actual data, and this requirement makes parameters' calibration techniques less attractive than their statistical estimation.

Another practice in modeling microfounded MM (both RBC and DSGE) is that of filtering out the permanent components from original data. Besides the risk of using wrong filters to extract the cyclical components (see e.g. Harvey and Jaeger, 1993, and Catão and Pagan, 2011), the use of filtered data implies more attention to dynamics, and lead to the problem on how to link the (modeled) filtered series with the actual ones. Bank of England has proposed an "hybrid" route (see Harrison et al, 2005) to account for this issue, which however does not seem particularly attractive for MeMo-It. The combination of core variables (i.e. those filtered and modeled under pure theoretical guidance) and non-core variables (i.e. those not filtered and not included in the core relationships) by additional short-term equations (explaining the non-core variables as a function of the dynamic path of the core variables) is not viable in our context, as MeMo-It has been explicitly addressed to pass near the original data.[4]

Finally, section 6 of Fair (2012) lists a number of additional examples in which the microfounded approach makes a problematic use of the official statistics.

On the opposite when the drop in coherence with theory is too large, we have to remember the Sims's (1980) powerful attack to traditional macromodelling, which is often quoted to argue against models where the process of model identification is not fully based on the theoretical

[3] However, recently Bayesian estimation methods have been introduced to estimate DSGE parameters, but still with quite unclear statistical properties. More importantly, for the advocates of "point B" models, very little specification testing is carried out.

[4] From the point of view of the modeller who is oriented towards "point B models", it is particularly worrying that - as it is often the case - the dynamics between core and non-core variables delivers estimates of the speed of adjustment which are very slow.

ground (i.e. models with too low degree of coherence with theory). Despite Sims (1980, p. 11) acknowledged "much good work in progress on specifying and estimating systems of demand relations", he proposed the VAR approach as a better alternative strategy for empirical macromodeling because "the challenging research program to improve traditional macromodeling would impossible in the short run.".

After more than 30 years (i.e. well beyond Sims's paper "short run"), when also some limitations of VAR and Computable General Equilibrium (CGE) paradigms have been discovered, a range of new formal econometric tools are available to test for wrong specification of the MM.. Starting from Sims's critique, there has been an increasing use of statistical integration-cointegration techniques (see the milestone works of Dickey and Fuller, 1979; Engle and Granger, 1987; and Johansen, 1995) to formally test for the empirical congruence of long run relationships suggested by the economic theory. In other terms, the cointegration property checks whether the theoretical model is a valid approximation of a steady state situation which, in turn, can be used as an attractor in the specification of dynamic empirical models in equilibrium correction (EqC) form see the seminal "LSE approach" paper of Hendry et al., 1984). As cointegration property is invariant to widening the dataset, cointegration analysis is usually accomplished within blocks (subsystems) of strongly interrelated variables in order to make as much use as possible of theory in the blocks' specification see Jansen (2002)).

In this way, the modeler is enabled to test whether the theory is relevant in the specification of an empirical model which *also* accommodates institutional features, attempts to accommodate heterogeneity among agents, and addresses the temporal aspects for the dataset (see e.g. Hall (1995), Granger (1999), Bardsen et al. (2006), and Bardsen and Nymonen (2009)). Therefore, model's ability to characterize data is an essential quality of empirical models as, given the absence of theoretical truisms, the implications of economic theory have to be confronted with the data in a systematic way. The work of Juselius and Johansen (2005) summarizes this methodological synthesis (derived from the LSE approach) that is accomplished within the modeling frame of stochastic difference equation in EqC form.[5] Despite the use of cointegration techniques requires a lot of realism about the difficulties in the measurement of the long run and in the assessment of economic theories, we rather prefer to face these problems instead of assuming a priori the knowledge of the answers, as theorists and calibrators are prone to do (see Pesaran (1997), and

[5] See also Juselius (2009); Juselius and Franchi (2007) use this LSE approach and reject the basic hypotheses underlying the theoretical DSGE/RBC models. However, Favero (2009), with reference to models of monetary policy, is slightly less optimistic: even though he acknowledges the usefulness of the advances due to the LSE approach, he still see potential improvements of the use of DSGE models approximated by restricted VARs; for forecasting purposes see also Del Negro and Schorfheide (2003).

Smith (2006)). Garratt et al. (2003) is a good example of an emerging class of medium-small scale models to which MeMo-It aims to belong. In these models, theoretical steady state properties are estimated as cointegrating (long-run) level-relationships, while theory-based short-run cross-equation restrictions are either ignored, or at best tested in their data congruency before entering the system.[6]

Overall, the statistical assessment of the cointegration property and, more generally, of the dynamic relationships inside blocks of variables is one possible way to account for the economic theory in "point B" models, i.e. where the data adequacy of the model is more valued. Pesaran and Smith (2011) title their conclusions as “avoiding the straitjacket”, and give explicit support to the methodology that we can broadly label as the LSE approach in the following way: “[this approach] uses the long-run cointegrating information in the data, but allows more flexible short-run dynamics; recognizes the interconnectedness of large systems and develops methods to estimate high-dimensional systems that help identify certain types of shocks.” (p. 15).

Another pragmatic way to react to Sims-Lucas arguments against the early empirical MM is the direct improvement of MM by introducing other (both new and revised) techniques (but not explicitly cointegration) to better estimate, test, and analyze them. This wide line of research has been conducted (almost alone, over the last 40 years) by Ray Fair, who can be seen as the most prominent advocate of the "improved" Cowles Commission modeling approach. Since early 1970s, every ten years, Fair (1974 and 1976; 1984; 1994; and 2004) has published a book which can be seen as the update of the best-practice to implement the Cowles Commission simultaneous macro-modeling framework. In each book, Fair updates his *US model* (for modeling the US economy[7]) to incorporate most recent data, and uses it to analyze several important empirical questions, such as "testing for a New Economy in the 1990s" (Fair, 2004, chapter 6).

Fair (1993) lists six different improvements[8] to the old-fashioned MM which have been introduced to answer the mid/end-1970s critiques and to keep "point B" modeling activity on the frontier[9]: (1) parameters of large scale and possibly non-linear MM can be estimated with instrumental-variables methods in order to account for possible endogenous regressors (i.e. two-stage and three-stage least squares, 2SLS and 3SLS, and generalized method of moments, GMM);

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[6] The recent versions of OECD and Oxford Economics global models are based on this modelling approach too; see Hervé et al. (2010), and Oxford Economics (2011).

[7] Since 1984 book, the *MC model*, i.e. his multi-country model, is also described and used in empirical analyses.

[8] Improvements made possible also thanks to the advances in computer techniques and in hardware power.

[9] Of course, the advocates of the "point A" DSGE models do not fully agree with Fair's claim that models obtained thanks to the listed improvements are the better way to macro modelling; see e.g. Fernandez-Villaverde (2008).

(2) stochastic simulations of MM can be accomplished in order to know model's solution uncertainty at system level; (3) model-consistent expectations can be introduced (if needed by theory and if data relevant) in order to handle the issue of rational expectations: in MM adopting this technique, the expected values are the predicted values from the model (i.e. the model is iteratively solved over solution paths of the endogenous variables); (4) a number of diagnostic tests are available to analyze the residual of single and systems of equations (with both asymptotic and simulated test distributions). The aim of these tests is to prevent models from misspecified dynamics, and to assess the persistence over time (inertia) of variables' fluctuations;[10] (5) forecasting encompassing tests of MM predictions against those of purely statistical uni- and multi-variate models (such as AR and VAR); (6) MM "multipliers" are the way to better understand the consistency of the full empirical system with the underlying economic theories. In this context, one or more exogenous variables of the MM are changed, and the effects on endogenous variables due to these changes are computed from either deterministic or stochastic solutions of the MM.

As noted in Hendry and Chong (1986), since system characteristics are the prime concern of macroeconometric models, it might be the case that the validity of every individual component is not essential to adequate overall performance. Therefore it is understandable why the six Fair techniques listed above produce outcomes which usually refer to the performance and behavior of the whole model rather than to single elements of it.

MeMo-It modeling is a mixture of both LSE and Fair-updated Cowles Commission approaches and techniques: in order to merge theory and data at point B, MeMo-It uses cointegration methods on dynamic sub-systems to estimate theory-interpretable and identified steady state relationships, imposed in the form of equilibrium-correction models. However, in absence of weak exogeneity property (i.e. of forcing explanatory variables; see Pesaran et al., 2001), single equations are preliminarily inspected by estimating parameters with 2SLS. When the whole model is assembled, all MeMo-It parameters are simultaneously estimated with 3SLS. Note that the use of conventional formulae for computing the asymptotic covariance of the 2SLS/3SLS estimators and the Wald-type test statistics remain good approximations despite the fact that model variables may be integrated; see Hsiao (1997a and 1997b).

MeMo-It periodicity is annual. This choice has two main advantages. First, from the data coherence point of view it must be noted that, despite very different theoretical views, Fernandez-

[10] Pesaran and Chudik (2011) show that the aggregation across heterogeneous agents with simple micro dynamics can lead to considerably more complicated macro dynamics if micro units are each other related (i.e. random micro shocks do not cancel out). Therefore, modelling macro dynamics may require more flexible dynamics for adequately represent aggregated data across heterogeneous individuals.

Villaverde (2008) strongly agrees with the Fair ideas of keep model's database as most updated as possible: "Statistical agencies are constantly revising data, both to incorporate further information and to update their definitions to reflect advances in economic theory and measurement. The issue faced by all macro modelers is how to incorporate those changes in a consistent way. One possibility, followed by Fair (the most reasonable one from our point of view), is to always use the most recent vintage of data. This amounts to asking the model to account for what we currently think actually happened." (p. 699). Annual data entail two NA data releases per year (in March and October), just in the eve of each the two releases of the MeMo.It forecast scenarios in May and November. Therefore, as soon as new data are released, MeMo.It databank is fully updated and the whole model is re-estimated with the new (revised) statistical evidence, in order to look for the occurrence of relevant location shifts in the most recent part of the sample to be accounted for with intercept corrections (see Clements and Hendry, 1998 and 1999); occasionally, some equations may also be revised.

Second, the annual periodicity makes easier the modeling of medium-long term features of the economy which helps longer range forecasts (five years ahead and beyond) because, from annual data, medium-term business cycles may better emerge(see Comin and Gertler (2006)).

In this section we tried to answer questions such as: "Why Istat decided to build its model by following a mixture of LSE-type data-driven modeling and of Fair-updated Cowles Commission approach instead of adhere to the current strong *vogue* of the DSGE models?". As bottom line, we can quote Faust (2009, p. 47) to answer the previous question:

> "In bringing new technologies we often see the following pattern: a new idea is adopted and experiences some initial success; inflated optimism arises among experts regarding what has been achieved; traditional cautions are neglected; catastrophe follows; after a period of recovery, the new idea settles into its more modest but rightful productive place." [11]

We hope that the traditional critiques to the macro-modeling strategy can be emended in order to make avoidable past errors: nowadays, it could be that a more modest (because a bit wrong) MeMo-It model is able to give useful empirical outcomes.

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[11] Of course, in the context of the present paper, Faust's sentence, "bringing new technologies" means "introducing operational MM in the 1960s". Interestingly and ironically, here we refer to the story of early empirical MM, while Faust originally refers to DSGE models. In other terms, main criticisms moved in the 1970s to the early empirical MM can be nowadays addressed to DSGE models; see Favero (2007).

3. - Overview of Memo-It structure and blocks

The model is substantially based on the New-Keynesian approach where the supply side of the economy plays a central role. Accordingly, the underlying key assumption is that short-run economic growth is mainly driven by the demand side, while in the long run the economic system converges to potential output path. Wages and prices react to unemployment (NAIRU) as well as to the output gaps thus guaranteeing the interaction between aggregate supply and demand (xxxx).

3.1 - The supply side

Potential output is modeled as a constant returns to scale Cobb-Douglas production function with two productive inputs, labor and capital stock, assuming a Harrod-neutral technical progress (Beffy et al, 2006; D'Auria et al, 2010):

(1) $$Y_{POT}=f_{POT}(K, LP, HTFP)$$

where potential labor input (LP), expressed in terms of total hours worked, is given by trend labor force participation, working age population, trend hours worked and the NAIRU rate of unemployment. Potential capital stock (K)[12] is given by the full utilization of the existing capital stock which is by definition an index of the overall capacity. HTFP is the trend component of the Solow residual (Total factor productivity).

Short-run fluctuations are represented by the output gap measured as the ratio of actual (Y_{ACT}) and potential (Y_{POT}) GDP:

(2) $$GAP=(Y_{ACT}/Y_{POT}-1)$$

The GAP can also be expressed in terms of the differential between actual (UR) and underlying structural rates of unemployment (NAIRU) (Okun, 1962), as:

(3) $$GAP=-b(UR - NAIRU)$$

[12] Capital stock is calculated using a perpetual inventory method approach; see Goldsmith (1951).

The unemployment and the output gaps affect the demand side through their effect on prices and wages.

3.2 Prices and Wages

Following Gordon (1981,1988), prices and wages (per capita) are related to three main effects: i) persistence measured by their dynamics in the previous years; ii) demand shocks derived from output and unemployment gaps; iii) shocks from import prices, productivity or special condition in the labour market. Changes in price are represented as:

(4) dlogPV = fPV (dlogPV-1 , GAP, WB/YU)

where dlogPV-1 is the l'inerzia, GAP is the output GAP and WB/YU is the GDP share of wage bill.

The equation might be interpreted as a New-Keynesian Phillips curve (NKPC, Galì e Gertler, 1999) where expectation are backward-looking.13

The rate of change of nominal wages is driven by lagged household consumption price, unemployment rate, labour productivity and a proxy for the tension on the labour market14

3.3 - The labour market

The labour market is represented by means of three sets of equations that define labour demand and supply and wages.

Labour demand is consistent with a standard Cobb Douglas production function (Hamermesh 1996, 1999) assuming constant returns to scale and Harrod neutral technical progress. Under perfect competition, labor is paid its marginal product: labor demand depends on output, and negatively on the real wage.

Labor demand is specified according to two behavioral equations and one identity. Labor input is measured in terms of full time equivalent units. The labour demand (LDP) of the private sector refers to both employees and self-employed:

(5) $$LDP = f_{LD}(Y, PY, \frac{WB}{LDD}, PV)$$

where Y is the value added at current prices, PY is the GDP deflator, WB represents total compensation of employees at current prices (including payroll taxes), PV is the deflator of value

[13] See Gordon (2011).

[14] See Phillips (1958), and Golinelli (1998).

added at “factor cost” (i.e.net of *indirect* taxation). LDD is the amount of employees in the private sector.

The labour supply accounts for the diverging patterns of the long run development of participation rates for both males and females and of business cycle (Lucas and Rapping, 1969):

(6) $$PART_i = f_{LS}(\overline{POP_i}, \frac{WI}{LDD}, EMPR_i, HWDW, PCH),$$

where PART is the participation rate by gender, POP is the population aged 15 to 64 years, WI/LDD are real per capita earnings, PCH is the private consumption deflator, EMPR is the employment rate (Bodo and Visco 1987), HWDW is an indicator of the real wealth of households (Fair, 2004). This specification implies that labor supply responds to real wage movements as well as to observed variation of the real wealth.

3.4 - The demand side

The demand side is focused on the behavior of economic agents’ (households, firms), of the public sector and of the rest of the world. Households purchase consumption goods and services, perform residential investments, and accumulate real and financial wealth. Firms invest in other (non residential) assets, such as machineries and equipment. The public sector affects directly the final demand through its consumption and investment plans, and the rest of the world determines the foreign component of the final demand..

Private consumption and the household sector

Private consumption is modeled according to the permanent income hypothesis (Friedman, 1957), and consistently with Rossi and Visco (1995) and Bassanetti and Zollino (2008), who adopted a similar approach to model the behavior of the Italian consumers.

Real private consumption (CHO) is represented by means of a long-run relationship between disposable income, financial wealth and the real interest rate:

(7) $$CHO = f_{CHO}(YDH, HWFA, PCH, IRN)$$

where YDH is the disposable income (net of interests) at current prices, $HWFA$ and $HWDW$ are respectively the financial and real wealth at current prices, PCH is the consumption deflator and IRN is the long term nominal interest rate.

The share of disposable income, which is not consumed by the households, increases their real and financial wealth stocks. These two stocks[15] are modeled following the perpetual inventory method . The equations for residential investments, and for real and financial wealth are the following:

(8) $IRO = f_{IRO}(YDH, PIR, IRN)$

(9) $HWDW = f_{HWDW}(YDH, IRO, PIR, IRN)$

(10) $HWFA = f_{HWFA}(YDH, CHO, IRO, IRN, COMIT)$

where PIR is the residential investments deflator, and $COMIT$ is the Italian stock index.

Investments and the firm sector

Firms purchase machineries, equipment and other goods. These investments are driven by the share of potential output,, a persistence factor (investments' dynamics), the user cost of capital, the gross operating surplus (a proxy for retained earnings) and the uncertainty, measured as the conditional volatility of business cycleshocks. The user cost of capital measures the price of capital services and it is expressed as a function of borrowing cost, depreciation and capital gains on the asset price.

Imports, exports and the foreign sector

The transactions between the home economy and the rest of the world are represented trough the sector balance identity of the foreign sector $(ROWSALDO)$, as follows:

$$\begin{aligned} ROWSALDO = {} & (XO \times PX - MO \times PM) + (WB - WBH) + (APETIND \\ & - APUCP - TINDN) + ROWDT + ROWID + ROWSB \\ & + ROWOTH \end{aligned}$$

(11)

where $(XO \times PX - MO \times PM)$ is the trade balance in value (XO and MO are exports and imports in volume and PX and PM are the export and import deflators); $(WB - WBH)$ are the net foreign incomes; $(APETIND - APUCP - TINDN)$ are the net indirect taxes; $ROWID$ are net capital

[15] The stocks of wealth are at market prices.

incomes; $ROWDT$ are current taxes on income and wealth; $ROWSB$ are social benefits; $ROWOTH$ are other unilateral transfers.

The theoretical approach followed to model the foreign sector behaviour refers to the most recent literature, such as Lane and Milesi-Ferretti, (2011), and Obstfeld and Rogoff, (2010).The foreign sector is represented by means of four equations: one for the real exports of goods and services, and the others for the real imports of goods and services (i.e. imports of non fuel goods, imports of fuel goods, and imports of services).

Real exports are expressed as follows:

(12) $$XO = f_{XO}(WDXXTR, ITXRXER)$$

where $WDXXTR$ represents the world exports in value and $ITXRXER$ the effective Italian real exchange rate.

Real imports of non fuel goods are specified as follows:

(13) $$MNFGO = f_{MNFGO}(DDO, PMNFG, GAP)$$

where DDO is the domestic demand in real terms, $PMNFG$ is the deflator of nonfuel goods imports and GAP measures the cyclical fluctuations.

Real imports of fuel goods are modeled as:

(14) $$MFGO = f_{MFGO}(DDO, PETROL)$$

where $PETROL$ is the total consumption of oil. Real imports of services are specified as:

(15) $$MSO = f_{MSO}(DDO, PMS, GAP)$$

where PMS is the deflator of imported services.

The net capital income (mainly including profits and dividends) are derived by the following equation:

(16) $$ROWID = f_{ROWID}(APSALDO)$$

where $APSALDO$ is the public sector balance. The inclusion of this variable allows to control for the impact of an improvement of the public sector balance that is expected to reduce the risk premium (Lane and Milesi-Ferretti, 2011; Caporale and Williams, 2002). The reduction of the risk premium should improve the capital income mainly through the reduction of interest's component. Finally the equation of other unilateral transfers (including current, capital, public and private unilateral transfers) is as follows

(17) $$ROWOTH = f_{ROWOTH}(WDXXTR)$$

where a negative correlation between world exports and inflows of transfers is assumed.

3.4 – The Public sector

The Public sector is represented according to an institutional approach. The endogenous variables are defined by accounting identities and algebraic relations. The exogenous variables are distinguished between policy and other exogenous variables.

The behavior of the sector is modeled to enable the evaluation of both direct and indirect effects of fiscal policies and to assess the impact of macroeconomic changes on government accounts.

Public sector influences total demand, affecting prices, unit labour cost and households' disposable income. Public consumption, compensation of public employees and public investments have a direct impact on GDP while taxes, social security contributions, compensation of employees and subsidies affect either prices or households disposable income.

On the expenditure side, main items modeled are: final consumption, in turn decomposed in primary spending and compensation of employees; investments; private production subsidies; contribution to private investments; interest payments, and social benefits.

. Compensation of employees depends on the average per-capita wage rate for civil servant, related to the private wages and the exogenous number of public employees. Subsidies to private production and investment depends linearly on the level of their target.

Interest payments are obtained by multiplying the average cost of the public debt, estimated as a function of lags of the short and the long term interest rates, times the stock of debt. Social benefits in nominal terms are linked to population age structure and inflation.

Total revenues are decomposed in social security contributions, indirect taxes and direct taxes. Social security contributions are obtained as the sum of those paid by employers, by employees, and by self-employed. Direct taxes are decomposed in taxes on household's income (IRPEF), on firm profits (IRES), and on capital yields.

Indirect taxes are decomposed in Value added tax (VAT), local tax on productive activity (IRAP), and excise duties on mineral oils. The tax base of the excise duties on mineral oils is a function of petroleum products consumption.

General government net lending is calculated by subtracting expenditures from receipts. Public debt is cumulative net lending corrected for a exogenous variable to consider stock flow adjustments (due to net acquisition of financial assets, changes in volume due to reclassifications, statistical discrepancy, ecc.)

4. - Memo-It's fiscal multipliers

This section is devoted to the presentation of selected MeMo-It fiscal multiplier exercises. They consist of looking at the effects on a number of endogenous variables such as GDP and inflation of permanent changes in some exogenous variables, such as the fiscal instruments. To do so, for each endogenous variable of interest we will compute and report the deviations (in percentage points for the variables in flows , in absolute differences for variables representing ratios or rates) between the shocked solution and a baseline scenario of MeMo-It model over the period 2012 to 2018 (over an horizon of 7 years).

In particular, we will report the results of four alternative fiscal *stimula*: an increase (1) in Government spending (GS) and (2) in Government transfers to households (TRH); and a reduction in (3) households income tax (ITH), and (4) in consumption tax (CT). In order to make comparable the effects on GDP of different fiscal instruments, we will normalize the four fiscal impulses in order to have always a permanent impulse (i.e. a reduction in fiscal revenues, or an increase of Government spending) which ex ante is equal to 1% of baseline GDP in the initial year (i.e. 2012).

The outcomes of these exercises are of interest for two reasons. First, multipliers' analysis is a sort of impulse-response summary of the reduced form of model's parameters which is, in our view, much more informative about MeMo-It genuine economic features than a mere (long) list of single-equation parameters' estimates (see the appendix). Therefore, multiplier exercises are the from-equations-to-system way to analyze models: we assess for the relevance at whole-model level of various cross-equation links (transmission mechanisms). In other terms, multipliers are the way to assess how the full model embodies the theoretical views on which its block-specification is based (see Section 3), and after that those theoretical assumptions have been faced (in the parameter estimation phase) with actual data. Second, given the unprecedented depth of the 2008-2009 economic slowdown, it is of great interest nowadays to evaluate to what extent policymakers can rely on fiscal stimula to help economies to recover; see e.g. Cogan et al (2010), Coenen et al. (2012), Fair (2012), and Reichling and Whalen (2012).

Regarding model's assumptions about the conduct of the monetary policy in the shocked scenarios, we will always (and nowadays quite realistically) assume, as in the other recent papers quoted above, that the monetary policy remains accommodative. To complement the four fiscal multiplier results, we will also report the results of an exercise of a monetary policy restriction: a sustained increase in the short term interest rate of 100 basis points; this rate is the monetary policy instrument.

The direct effects of the four simulated fiscal stimula pass through different channels in MeMo-It. The increase in public spending (Hp 1) directly affects the domestic demand in real terms, while the increase in transfers to households (Hp 2) and the reduction in households income tax (Hp 3) both affect the households disposable income in nominal terms and, in this way, affect consumption, which is another component - as direct public spending - of the total domestic demand. Finally, the reduction in consumption tax (Hp 4) is implemented through a decrease in the VAT tax rate which leads to the reduction in consumption prices and, for this way, an increase in households income in real terms that, in turn, affect consumption spending. Therefore, since Haavelmo (1945), expected short-run multipliers effects will be different: an increase in public transfers and a cut in either income or consumption tax rates are, in a way or in the other, partly saved and, as such, give a smaller push to the final demand.

Expectations are fulfilled by the vision of table 1, where the GDP multipliers are reported. The comparison of the effectiveness of the four alternative tax instruments in expanding GDP, clearly shows that the best way is to increase public spending.

Table 2 reports the outcome of the HP 1 with respect to other variables of interest: real GDP, unemployment rate, consumer prices, and trade balance on GDP. In the year of the shock, the real effects on GDP (upwards) and unemployment (downwards) go in the expected direction, apart of the case of CT that couples the smaller impulse of GDP with a slight increase in the unemployment due to an increase in real wages which expands labor supply and curbs labor demand.

The upward pressures on demand over supply, generally increases the output gap and, through the short run trade-off, the level of prices before indirect taxes whose levels are about 1% above levels in the baseline after 6-7 years. However, VAT tax rates decrease pushes downward the consumer prices (despite higher prices at factor costs) and raises the real households income.

Thanks to the effects of automatic stabilizers, the increase of ex post Government deficit is always smaller (in absolute value) than 1% (which was the ex ante impulse). Trade balance slightly deteriorates because of the joint effect of the larger domestic demand and of the worsening competitiveness. Given the present difficult situation in the Italian public finances, the results in Table 1 suggest that the best policy mix to expand the output in the short run without a relevant worsening of the public net lending would be to decrease the Government consumption together with an ex ante balanced increase in the VAT rate.

Overall, the fiscal multipliers in Table 1 are overall in line with the new-Keynesian models and much smaller than those in Keynesian models (similar results are in Cogan et al., 2010), because the effect on GDP diminishes as non government components are crowded out by higher inflation due to demand pressures on the supply. Additionally, if we compare our multiplier outcomes with those obtained by Coenen et al. (2012) using various DSGE models, we note that the time profile is quite similar. Qualitatively similar results (but with reference to the whole Euro Area) are also reported in Oxford Economics (2011), and Hervé et al. (2010). This fact suggests that, despite very different methodological approaches and unequal degree of coherence with data, MiMo-It neo-Keynesian theoretical roots clearly emerge: while in the short run it is possible to manage domestic demand, in the long run all these fiscal stimula will lead to higher prices, as being the output determined by supply-side factors.

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Figures and tables

Fig. 1 - Two alternative models (points) along the "best practice" frontier

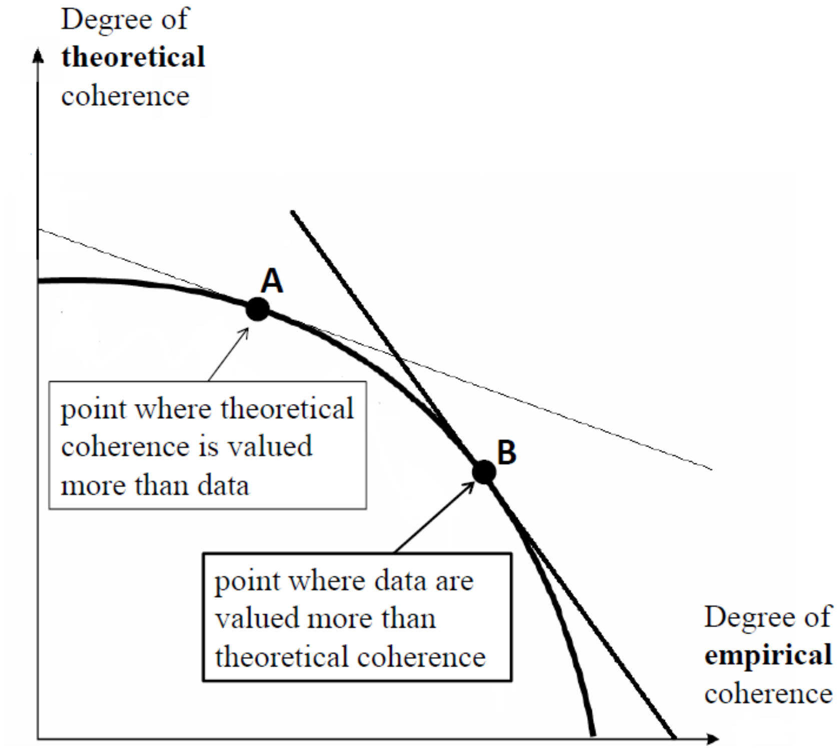

Table 1: the effect of multipliers on GDP for 4 different tax instruments

	2012	2013	2014	2015	2016	2017	2018
Hp 1:	0.7	0.5	0.4	0.3	0.2	0.1	0
Hp 2:	0.2	0.4	0.3	0.3	0.2	0.1	0.1
Hp 3:	0.2	0.4	0.4	0.3	0.3	0.2	0.1
Hp 4:	0.1	0.4	0.4	0.4	0.4	0.4	0.3

Table 2: the effect of multipliers on HP 1 for relevant variables

	2012	2013	2014	2015	2016	2017	2018
GDP	0.7	0.5	0.4	0.3	0.2	0.1	0
Unemployment	-0.2	-0.2	-0.3	-0.3	-0.3	-0.2	-0.1
Consumer price	0.3	0.7	1	1.4	1.6	1.7	1.7
Trade balance (% GDP)	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4	-0.4

Appendix A1 – MeMo-It details: labels, definitions, equations and estimates

Price

Equation (4)

Dependent Variable: DLOG(PV)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1973 2011
Included observations: 39 after adjustments
DLOG(PV) = C(21*10+0) + C(21*10+1)*Y_GAP/100 + C(21*10+2)
*DLOG(PV(-1)) + C(21*10+3)*DLOG(PM(-1)) + C(21*10+4)
*LOG(Y_POT(-1)/LF_POT(-1))
Instrument specification: C LOG(WB(-1)/YU(-1)) Y_GAP(-1)/100 DLOG(PV(
-1)) DLOG(PM(-1)) DLOG(PV(-2)) DLOG(PM(-2)) LOG(Y_POT(-1)
/LF_POT(-1))

	Coefficient	Std. Error	t-Statistic	Prob.
C(210)	-0.267168	0.053023	-5.038732	0.0000
C(211)	0.536428	0.148173	3.620291	0.0009
C(212)	0.536756	0.070710	7.590915	0.0000
C(213)	0.105395	0.024205	4.354211	0.0001
C(214)	-0.079874	0.015478	-5.160647	0.0000

R-squared	0.964142	Mean dependent var	0.068159
Adjusted R-squared	0.959923	S.D. dependent var	0.055935
S.E. of regression	0.011198	Sum squared resid	0.004263
Durbin-Watson stat	1.835481	J-statistic	2.307254
Instrument rank	8	Prob(J-statistic)	0.511133

Labour market

Equation (5)

Dependent Variable: DLOG(ULAPD)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1972 2011
Included observations: 40 after adjustments
DLOG(ULAPD) = DLOG(ULAP) +C(38*10+0) +C(38*10+1)*(QR(-1)-75)/100
+C(38*10+2)*LOG(CONFLICTH(-1)) +C(38*10+3)*D2005
Instrument specification: C DLOG(ULAPD(-1)) DLOG(ULAP(-1)) QR(-1)/100
LOG(CONFLICTH(-1)) D2005

	Coefficient	Std. Error	t-Statistic	Prob.
C(380)	0.019957	0.006843	2.916352	0.0061
C(381)	0.104532	0.032962	3.171318	0.0031
C(382)	-0.002072	0.000686	-3.021911	0.0046
C(383)	0.015775	0.005876	2.684450	0.0109

R-squared	0.858594	Mean dependent var	0.003635
Adjusted R-squared	0.846810	S.D. dependent var	0.014608
S.E. of regression	0.005717	Sum squared resid	0.001177
Durbin-Watson stat	1.599632	J-statistic	2.586566
Instrument rank	6	Prob(J-statistic)	0.274369

Equation (6)

Dependent Variable: DLOG(PART_F)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1973 2011
Included observations: 39 after adjustments
DLOG(PART_F) = C(41*10+1) * (DLOG(WIPC(-1))-DLOG(PCH(-1))) + C(41*10+2) * DLOG(100*OCCSHARE_F*OCC_T/POP_F) + C(41*10+3) * DLOG(HWDW(-1)/PCH(-1)) + C(41*10+4) * DLOG(PART_M(-1)) + C(41*10+5) *DLOG(PART_F(-1)) + C(41*10+6) *(D1980(-3)+D2008) + C(41*10+7)*D2011
Instrument specification: C DLOG(POP_F(-1)) DLOG(WIPC(-2)/PCH(-2)) DLOG(100*OCCSHARE_F(-1)*OCC_T(-1)/POP_F(-1)) DLOG(HWDW(-1)/PCH(-1)) DLOG(PART_F(-1)) DLOG(PART_M(-1)) DLOG(PART_M(-2)) DLOG(PART_F(-2)) (D1980(-3)+D2008) D2011

	Coefficient	Std. Error	t-Statistic	Prob.
C(411)	0.119245	0.063283	1.884309	0.0686
C(412)	0.552018	0.136180	4.053590	0.0003
C(413)	-0.031023	0.014058	-2.206762	0.0346
C(414)	-0.368940	0.165044	-2.235410	0.0325
C(415)	0.267054	0.113945	2.343710	0.0255
C(416)	0.015653	0.004344	3.603399	0.0011
C(417)	-0.009685	0.005713	-1.695289	0.0997

R-squared	0.720665	Mean dependent var	0.008621
Adjusted R-squared	0.668290	S.D. dependent var	0.009554
S.E. of regression	0.005502	Sum squared resid	0.000969
Durbin-Watson stat	1.501786	J-statistic	5.717250
Instrument rank	11	Prob(J-statistic)	0.221283

Demand side

Equation (7)

Dependent Variable: DLOG(CHO)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1972 2011
Included observations: 40 after adjustments
DLOG(CHO) = C(8*10+0) +C(8*10+1)*DLOG(YDHN/PCH) +C(8*10+2) *DLOG(YDHN(-1)/PCH(-1)) +C(8*10+3)*LOG(CHO(-1)*PCH(-1)/YDHN(-1)) +C(8*10+4)*DLOG(1+INTR(-1)/100) +C(8*10+5)*DLOG(HWFA(-1)/YDHN(-1)) +C(8*10+6)*D1993 +C(8*10+7)*D2009
Instrument specification: C DLOG(YDHN/PCH) DLOG(YDHN(-1)/PCH(-1)) LOG(CHO(-1)*PCH(-1)/YDHN(-1)) DLOG(1+INTR(-1)/100) D1993 D2009 DLOG(HWFA(-1)/YDHN(-1)) DLOG(CHO(-1))

	Coefficient	Std. Error	t-Statistic	Prob.
C(80)	0.007655	0.002471	3.097496	0.0040
C(81)	0.205948	0.070118	2.937145	0.0061
C(82)	0.343587	0.075109	4.574521	0.0001
C(83)	-0.112189	0.030525	-3.675291	0.0009
C(84)	-0.148915	0.105667	-1.409284	0.1684
C(85)	0.143342	0.031441	4.559041	0.0001
C(86)	-0.037759	0.010558	-3.576355	0.0011
C(87)	-0.017871	0.010234	-1.746153	0.0904

R-squared	0.814620	Mean dependent var	0.022234
Adjusted R-squared	0.774068	S.D. dependent var	0.020508
S.E. of regression	0.009748	Sum squared resid	0.003041
Durbin-Watson stat	1.417731	J-statistic	2.541135
Instrument rank	9	Prob(J-statistic)	0.110915

Equation investment

Dependent Variable: INRNGO/Y_POT(-1)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1981 2011
Included observations: 31 after adjustments
INRNGO/Y_POT(-1) = C(14*10+1)*INRNGO(-1)/Y_POT(-2) + C(14*10+2)
*INRNGO(-2)/Y_POT(-3) + C(14*10+3)*(USERCOST+2*USERCOST(
-1))/(PINRNG(-2)*3) + C(14*10+4)*(UNCERT(-2)+UNCERT(-1)) + C(14
10+5)(GOS+GOS(-1)+GOS(-2)+GOS(-3))/(PY(-1)*Y_POT(-1)) + C(14
*10+6)*D1993 + C(14*10+7)*D2009
Instrument specification: C INRNGO(-1)/Y_POT(-2) INRNGO(-2)/Y_POT(-3)
USERCOST/PINRNG(-1) USERCOST(-1)/PINRNG(-2) UNCERT(-2)
UNCERT(-1) (GOS(-1)+GOS(-2)+GOS(-3))/(PY(-1)*Y_POT(-1)) D1993
D2009

	Coefficient	Std. Error	t-Statistic	Prob.
C(141)	0.624412	0.092023	6.785389	0.0000
C(142)	-0.142867	0.087498	-1.632806	0.1156
C(143)	-0.071267	0.029025	-2.455349	0.0217
C(144)	-0.001493	0.000347	-4.299025	0.0002
C(145)	0.043998	0.008199	5.366534	0.0000
C(146)	-0.018103	0.003653	-4.955188	0.0000
C(147)	-0.016068	0.003294	-4.878819	0.0001

R-squared	0.932482	Mean dependent var	0.124169
Adjusted R-squared	0.915603	S.D. dependent var	0.010619
S.E. of regression	0.003085	Sum squared resid	0.000228
Durbin-Watson stat	2.370847	J-statistic	0.810763
Instrument rank	10	Prob(J-statistic)	0.846891

Equation (12)

Dependent Variable: DLOG(XO)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments
DLOG(XO) = C(17*10+0) + C(17*10+1)*DLOG(WDXXTR) + C(17*10+2)
*DLOG(WDXXTR(-1)) + C(17*10+3)* DLOG(ITXRXER) + C(17*10+4)*
LOG(XO(-1)) + C(17*10+5)*LOG(WDXXTR(-1)) + C(17*10+6)*
LOG(ITXRXER(-1))
Instrument specification: C DLOG(XO(-1)) DLOG(WDXXTR)
DLOG(WDXXTR(-1)) LOG(PX(-1)/PM(-1)) DLOG(ITXRXER(-1)) LOG(XO(
-1)) LOG(WDXXTR(-1)) LOG(ITXRXER(-1)) D2001

	Coefficient	Std. Error	t-Statistic	Prob.
C(170)	1.670205	0.507984	3.287911	0.0032
C(171)	1.156406	0.110969	10.42094	0.0000
C(172)	0.285404	0.122505	2.329725	0.0290
C(173)	-0.543297	0.261316	-2.079079	0.0489
C(174)	-0.253688	0.073250	-3.463317	0.0021
C(175)	0.155426	0.056349	2.758291	0.0112
C(176)	-0.221858	0.108788	-2.039357	0.0531

R-squared	0.867159	Mean dependent var	0.037313
Adjusted R-squared	0.832505	S.D. dependent var	0.060390
S.E. of regression	0.024715	Sum squared resid	0.014049
Durbin-Watson stat	2.716554	J-statistic	6.244678
Instrument rank	10	Prob(J-statistic)	0.100294

Equation (13)

Dependent Variable: DLOG(MGNFO/DDO)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments
DLOG(MGNFO/DDO) =C(19*10+0) +C(19*10+2)*LOG(MGNFO(-1)/DDO(-1))
+C(19*10+3)*LOG(PMGNF(-1)/PDD(-1))+ C(19*10+4)*(D1986+D1993)
+ C(19*10+5)*(D1992+D2009)
Instrument specification: C DLOG(MGNFO(-1)/DDO(-1)) LOG(MGNFO(-1)
/DDO(-1)) LOG(PMGNF(-1)/PDD(-1)) (D1986+D1993) (D1992+D2009)

	Coefficient	Std. Error	t-Statistic	Prob.
C(190)	1.739942	0.357795	4.862956	0.0001
C(192)	-0.364774	0.067324	-5.418211	0.0000
C(193)	-0.508453	0.099957	-5.086694	0.0000
C(194)	-0.243301	0.032549	-7.474813	0.0000
C(195)	-0.128004	0.032876	-3.893586	0.0007

R-squared	0.771345	Mean dependent var	0.028009
Adjusted R-squared	0.734761	S.D. dependent var	0.084581
S.E. of regression	0.043560	Sum squared resid	0.047437
Durbin-Watson stat	2.577007	J-statistic	2.724696
Instrument rank	6	Prob(J-statistic)	0.098807

Equation (14)

Dependent Variable: DLOG(MGFO/DDO)
Method: Two-Stage Least Squares
Date: 10/16/12 Time: 10:41
Sample (adjusted): 1982 2011
Included observations: 30 after adjustments
DLOG(MGFO/DDO) =C(20*10+0) +C(20*10+1)*@TREND +C(20*10+2)
*DLOG(PETROL(-1)) +C(20*10+3)*D1986 + C(20*10+4)*LOG(MGFO(
-1)/DDO(-1)) + C(20*10+5)*LOG(PMGF(-1)/PDD(-1)) + C(20*10+6)
*(D1989+D1990+D1984)
Instrument specification: C DLOG(PETROL(-1)) D1986 DLOG(MGFO(-1)
/DDO(-1)) (D1989+D1990+D1984) LOG(PMGF(-1)/PDD(-1))
LOG(MGFO(-1)/DDO(-1)) @TREND

	Coefficient	Std. Error	t-Statistic	Prob.
C(200)	-0.160947	0.212520	-0.757328	0.4565
C(201)	0.002335	0.001267	1.842833	0.0783
C(202)	0.658279	0.369260	1.782695	0.0878
C(203)	0.968383	0.047575	20.35501	0.0000
C(204)	-0.083271	0.062097	-1.340996	0.1930
C(205)	-0.053135	0.024106	-2.204232	0.0378
C(206)	-0.141165	0.024923	-5.664045	0.0000

R-squared	0.969053	Mean dependent var	0.012276
Adjusted R-squared	0.960980	S.D. dependent var	0.188663
S.E. of regression	0.037268	Sum squared resid	0.031944
Durbin-Watson stat	2.695691	J-statistic	0.362383
Instrument rank	8	Prob(J-statistic)	0.547186