BANCA D'ITALIA

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del Servizio Studi

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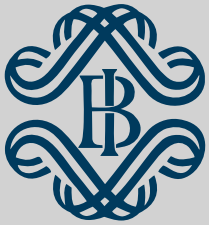
by Giuseppe Parigi and Giuseppe Schlitzer



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The purpose of the "Temi di discussione" series is to promote the circulation of working papers prepared within the Bank of Italy or presented in Bank seminars by outside economists with the aim of stimulating comments and suggestions.

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PREDICTING CONSUMPTION OF ITALIAN HOUSEHOLDS BY MEANS OF LEADING INDICATORS

by Giuseppe Parigi (*) and Giuseppe Schlitzer (*)

Summary

Providing real time estimates of private consumption is of paramount importance for policy-making. Structural macroeconometric models provide only a partial solution to the problem. They systematically neglect the up-to-date information contained in early indicators of economic activity. Moreover, they generally do not incorporate any measure of the uncertainty characterizing agents' behaviour. This paper presents a quarterly model based on early indicators of economic activity which allows to forecast the consumption expenditure of Italian households one semester ahead of the last release of the National Accounts. In the search for leading indicators we heavily rely on anticipations variables derived from the Isco survey on households. This allows to have some direct measures of consumers' expectations and subjective uncertainty. Although the emphasis of the paper is on prediction, we follow a theory based approach in modelling our consumption equations, as long as data permit. In the last part of the paper we tentatively pursue a counterfactual experiment, in order to evaluate the impact of the recent confidence crises on the expenditure pattern of Italian households.

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(*) Banca d'Italia, Research Department.

1. Introduction[1]

In 1993 the Italian economy has been experiencing one of the most severe recession of the post-war period. For the first time private consumption has registered a fall in real terms, with the unemployment rate rising above 10 percent. The sharp decrease of households' consumption is certainly due, among other things, to the increased uncertainty surrounding their economic prospects, which has contributed to undermine consumers' confidence. Indeed, the Isco confidence climate index fell during this period to its historical minimum.

Providing real time estimates of private consumption, especially in this context, is of paramount importance for policy-makers. These forecasts are however not easily obtained, mainly because of the delay with which the National Accounts (henceforth, NA) are released. The use of structural macroeconometric models may provide only a partial solution to this problem. The up-to-date information contained in early indicators of economic activity is in fact systematically neglected by these models; moreover, they usually do not incorporate any direct measure of consumers' attitude. However, as early suggested by Katona (1951, 1960), general feelings of optimism and pessimism on the part of consumers are likely to be important determinants of their decision process, especially in the presence of unforseen and extraordinary events. As a consequence, the forecasts of

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1. An earlier draft of this paper was presented at the Conference on "Modelli per l'analisi economica a breve termine", organized by the Italian Statistical Society jointly with Banca Toscana (Florence, June 15, 1994), where we received many stimulating suggestions. We are grateful to Luigi Guiso (Banca d'Italia) and Annette G. Köhler (Centre of International Research on Economic Tendency Surveys, Munich) for comments and to Liliana Pulcini and Luciana Santi for editorial assistance.

macroeconometric models may fail to fully capture consumers' behaviour during peculiar economic contingencies.

In this paper we present a quarterly consumption model based on early indicators of economic activity, most of which are released on a monthly basis. This is part of a larger macroeconometric model of the uses and sources account, originally presented in Parigi and Schlitzer (1993).

In the search for leading indicators, we heavily rely on the results of the Isco surveys on households, in order to obtain some direct measures of the consumers' confidence and expectations. We then use the model to forecast consumption of Italian households one semester ahead of the last release of the NA. The set of consumption equations that we present result from both theoretical and statistical information, as a combination of dynamics of both structural variables and leading indicators. The consumption equations are complemented with a series of updating equations which allow to exploit at best the information contained in early indicators of economic activity. Thus, the overall model results from the combination of various procedures, structural econometric relationships, autoregressive models with leading indicators, univariate models. As Zarnovitz (1992) argues, the various procedures tend to complement each other, and their combined use may greatly help the forecaster.

The rest of the paper is organized as follows. Sections 2 briefly reviews the main theory and empirical evidence about the consumption function and derives its implications for the regressions specification. Sections 3 describes the set of leading indicators that we employ for estimation and prediction. Section 4 presents the model and its logic. Results for estimation and prediction are presented in sections 5 and 6, respectively. In sections 7 we

shed some light on the role that the confidence crisis has played in affecting the consumption of Italian households during the last recession.

2. Theory, evidence and model specification

This section surveys the main theory and empirical evidence about the consumption function, with special reference to Italy, which can help to derive a model suitable for estimation purposes.

The majority of the studies of the consumption function can be found in the context of the Life Cycle-Permanent Income Hypothesis (LC-PIH), developed by Modigliani and Brumberg (1954) and Friedman (1957). In its simplest form, this theory assumes that individuals maximize their expected utility from consumption of non-durable goods and services, C, subject to the constraint given by their real wealth, current real disposable income and expected real future incomes.

Under a set of very restrictive assumptions (i.e. rational expectations, quadratic utility function, perfect capital markets and a costant interest rate), Hall (1978) has showed that the optimal rule for C_t is the random walk model with drift (1):

$$C_{t+1} = \alpha + C_t + \varepsilon_{t+1}, \qquad (1)$$

which implies that all the relevant information to predict future consumption is already embedded in current consumption.

The use of (1) as a forecasting tool poses some problems, essentially due to the empirical testings of the

"pure" LC-PIH.

First, starting with the work of Flavin (1981, 1985), most studies have found an "excess sensitivity" of consumption to changes in current (labour) income, which seems to contradict the implication of the theory.[2] The most plausible explanation for this failure of the theory is the presence of credit constraints on the part of consumers.[3] As shown by Jappelli and Pagano (1988, 1989) and Guiso et al. (1992a), in the case of Italy credit constraints play a prominent role in explaining household consumption-saving behaviour, due to imperfections in the capital markets. In this context, it is not unreasonable to find a relatively high elasticity of consumption to current disposable income.

Second, several studies have found that adding the information derived from surveys measuring consumers expectations helps to improve both the in-sample and out-of-sample performance of most econometric specifications. For instance Fuhrer (1988) for the US, Praet and Vuchelen (1984) for a number of EEC countries have shown that surveys expectations contain information beyond that already encompassed by lagged consumption as well as other relevant macroeconomic variables.[4] This is just the case for the

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2. See Bean (1986) and Campbell (1987), among others.

3. See Hayashi (1987) and Jappelli and Pagano (1989), among others. Runkle (1991), however, finds no evidence of liquidity constraints using US cross-section data.

4. A related evidence is that of Jaeger (1992), which considers the informative role of quartertly forecasting data issued by the Wharton Econometric Forecasting Associate on US consumption. Other studies have found that also inflation is significant when added to the consumption function. However Batchelor and Dua (1992), who estimate a survey-based consumption function for the US, have shown that the role of inflation as an

expected income and the degree of uncertainty about future earnings.

As concerns the effect of earnings uncertainty, the theory of precautionary savings, as recently formulated by several authors,[5] states that the amount of saving (consumption) increases (decreases) in response to an increase in the risk associated to the income generating process. Guiso et al. (1992b), using the 1989 "Survey of Household Income and Wealth" conducted by the Bank of Italy, have provided evidence of a positive and statistically significant, though small, effect of uncertainty on Italian households' saving.

Let W denote the stock of real wealth, r an ex-ante real interest rate, YR the flow of current disposable income and $\underline{YR}$ the discounted stream of future earnings. Thus, a specification more suitable for estimation purposes is given in (2):

$$C = C(W, r, YR, E(\underline{YR}), \sigma_{\underline{YR}}), \tag{2}$$

where E is the expectation operator and $\sigma_{\underline{YR}}$ is a variable measuring the degree of uncertainty about future earnings. The effect of increases in wealth, current and expected future earnings are all positive as implied by the theory, while the effects of r and $\sigma_{\underline{YR}}$ are expected to be negative.

US, have shown that the role of inflation as an independent variable is spurious, due to its correlation with expected inflation, which is an important determinant of expected real income.

5. See Zeldes (1989), Caballero (1990), Deaton (1991) and Carroll (1992, 1994).

Model (2) may be still too restrictive for estimation purposes. There are in fact possible failures of the assumptions required for aggregation which can induce differences between the micro and macro dimensions. The adoption of the representative agent framework in many empirical studies of the consumption function implies a complete neglect of heterogeneity, particularly heterogeneity in income.[6] It directly follows from Gorman (1959) that only under the very unrealistic assumption that the marginal propensity to consume out of (nominal) income is equal across households the representative agent construct holds. Using GI to denote an appropriate index of income inequality, a more appropriate model would thus be (3):

$$C = C(W, r, YR, E(\underline{YR}), \sigma_{\underline{YR}}, GI). \tag{3}$$

It should be clear that the theory does not provide any definite conclusion about the sign of the elasticity of consumption to GI. One generally expects to find a negative sign, since an increase in income inequality (i.e. a redistribution of income from the poors to the richs which is reflected in an increase in GI) should drive down the average propensity to consume out of income. As a counter example, just consider the Duesenberry effect.[7] In this case individual consumption also depends on the consumption of others, that is, poors adapt their consumption pattern so as to imitate the richs as much as possible. Under this condition, an equalization of incomes may well reduce the

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6. See Blinder (1975), Stoker (1986) and Deaton (1992) on this issue. Distributional effects have always had an important role in the econometric modelling of the aggregate consumption function in Italy, as discussed by Guiso (1993).

7. See Duesenberry (1949).

weight of the imitative effect, thus decreasing aggregate consumption.

A final issue concerns the application of the theory separately to durables and non-durables consumption. Most empirical studies of the consumption function only consider the latter, since the theory strictly applies to non-durables goods plus the service flows from durables, and the latter series is unavailable for most countries. There is more than one reason, however, to think that the model specification should be rather different in the two cases. Just as an example, consider Mankiw's (1982) model, which is an adaptation of the LC-PIH to consumption durables. Mankiw shows that under Hall's restrictive assumptions, the consumption rule for durables should follow an ARMA(1,1) model, in place of the random walk model (1). Also without imposing Hall's restrictive assumptions, durables can in principle be separated from non-durables only if the ratio of relative prices is constant or if the utility function is separable over the two types of consumption, two hypothesis which cannot be warranted in practice.[8] A furher reason to postulate two separate equations is related to consumers' expectations. In fact, given that the consumption of durables is more easily postponable, one would expect a stronger effect of a change in consumers' attitude on the expenditure of durables than on non-durables.

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8. See also Blinder and Deaton (1985) on the role of relative prices. The trade-off between the two types of goods can also be influenced by liquidity constraints. Brugiavini and Weber (1992), using a cross section of Italian households, have shown that liquidity constrained consumers tend to consume less durables, for a given level of non-durable consumption.

A simple and straightforward way of capturing the trade-off in consumption between durables and non-durables is to run separate regressions for the two categories of consumption, and possibly to include in each specification the relative price ratio. Our final baseline-consumption function is thus given by:

$$(4) \qquad C^i = C^i(W, r, YR, E(\underline{YR}), \sigma_{\underline{YR}}, GI, P_i/P),$$

where C^i denotes consumption on one of the two types of goods and P_i/P its relative price.

3. The data

This section describes the data employed to proxy the variables given in (4), as well as other explanatory variables employed in the model. Since the Italian National Accounts are released with two quarters of delay, our purpose is to employ the information contained in monthly and timely indicators to provide real time estimates of aggregate consumption. All data are considered adjusted for seasonal factors.[9]

As concerns the dependent variables, we employ the National Account series of consumption on durables and non-durables in 1985 lira. The latter series is defined as the sum of non-durables, semi-durables and services.[10]

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9. All estimations and simulations in this study have been performed on the data release available at June 1994, which included only data up to 1993.Q4.

10. See Attanasio and Onofri (1994) for a description of the stylized facts characterizing the consumption of Italian households in the last two decades. The series that we use comprehend the purchases of Italian households abroad and those of foreigners in Italy. We could not correct

In our search for leading indicators, we heavily rely on the Isco survey on households. The survey has been conducted since 1972 under the coordination of the EEC, but it is only since January 1982 that it is being conducted on a monthly basis, except for the month of August.[11] The survey, which provides detailed information about consumers' expectations, expenditure plans and incomes, is articulated into the following five sections:

1) general economic situation (expectations about prices, unemployment, and the country's economic performance);
2) household's economic condition (expectations about the evolution of the household's economic and financial situation, possibility to save);
3) convenience to purchase and expenditure plans (convenience to purchase durables, convenience to purchase a house, expenditure plans);
4) intentions of purchasing a car (a house) in the next two years;
5) quantitative information about the household's income.

The answers to items 1), 2) and 3) provide the basis to the construction of the families' climate index, which gives a direct measure of the psychological status of Italian households. As a matter of fact, the cyclical pattern of the

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for these components because of the lack of quarterly and short-term indicators.

11. To our knowledge, the only previous attempt to employ data from the Isco families' survey for the purpose of forecasting aggregate private consumption is that of Praet and Vuchelen (1984), who however only use data for the period 1972-1982, when the survey was conducted on a thrice-yearly basis.

climate index tracks reasonably well that of aggregate consumption, as Figure 1 shows. We use the index to proxy the expectations in future earnings, $E(\underline{YR})$ as well as the degree of subjective uncertainty ($\sigma_{\underline{YR}}$). Thus, a rise in the confidence index implies an improvement in the expectations of future income and/or a decrease in the degree of consumers' subjective uncertainty, which should induce an increase in consumption.

As shown by Brandolini and Parigi (1993), the answers to the questions belonging to item 5 can be employed to construct some measures of current disposable income and its distribution. The series of disposable income so obtained is plotted in Figure 2, together with the quarterly series of disposable income based on Istat data.[12] Figure 3 depicts the series of the Gini index of income concentration (GI) based on survey data, which can be used to proxy the effect of income distribution on aggregate consumption. The procyclical pattern of income distribution in Italy is evident from the picture.[13]

To capture intertemporal substitution effects, an important variable is represented by the real rate of interest. The main problem in this case is to obtain a proxy of expected inflation. To this purpose, we use the Visco (1984) procedure on the answers concerning prices out of item 1 of the Isco survey.

To capture the trade-off between the two components of consumption, we experimented two price indexes, respectively

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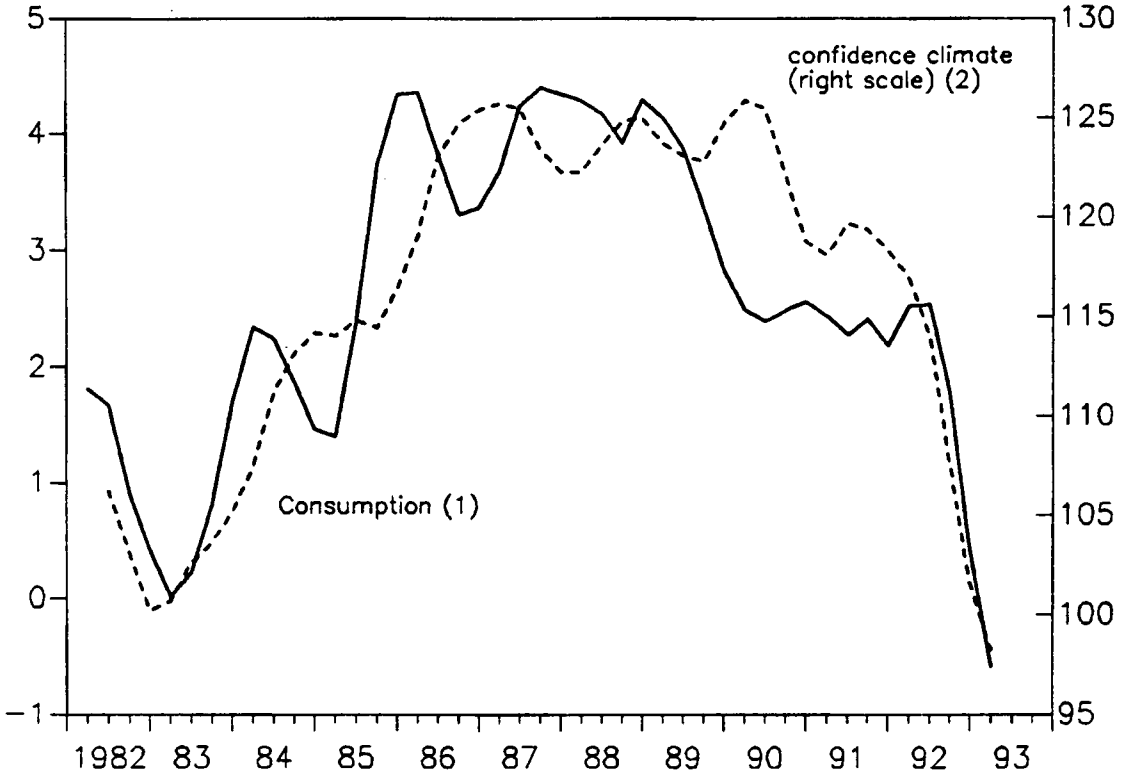
12. The series provided by the Istat is annual. Thus, the series in Figure 2 is its quarterly version as constructed by Brandolini and Muzzicato (1994).

13. See Brandolini and Sestito (1993) on this point.

Fig. 1

CONFIDENCE CLIMATE AND REAL CONSUMPTION OF HOUSEHOLDS

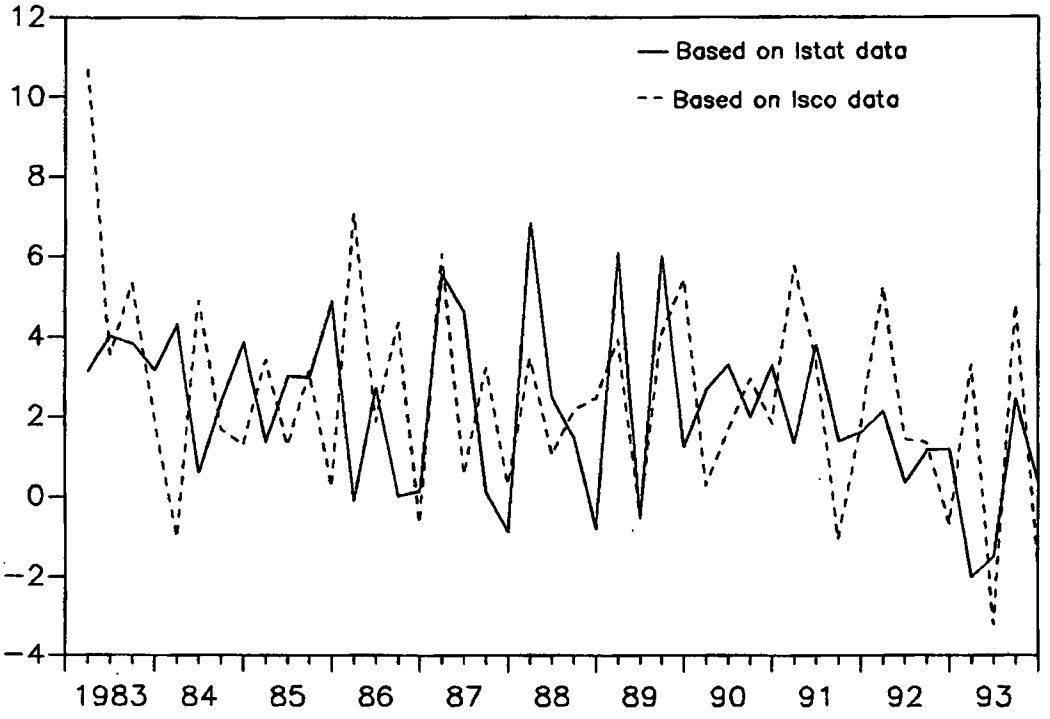


(1) Source: Istat; data at 1985 prices, quarterly percentage changes over the correspondent period.
(2) Source: Isco; index numbers, three terms centred moving average.

Fig. 2

NOMINAL DISPOSABLE INCOME

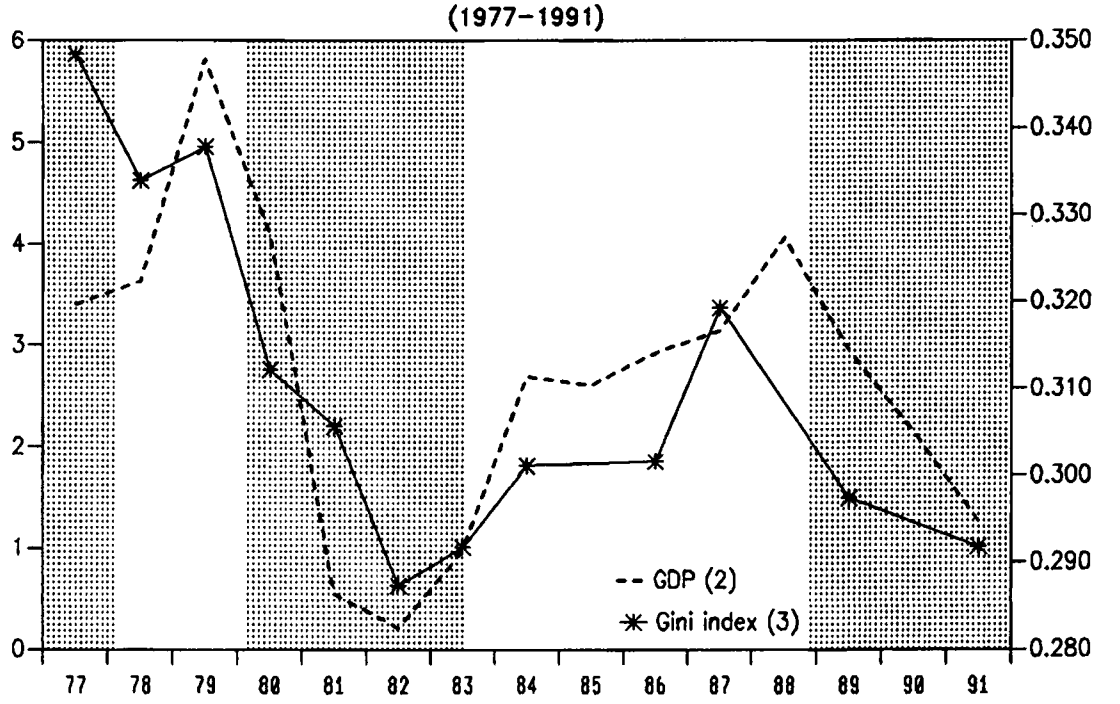
(% changes over the previous period)



Sources: Istat, Isco and Bank of Italy.

Fig. 3

INCOME INEQUALITY AND THE BUSINESS CYCLE (1)
(1977–1991)



Source: Brandolini and Sestito (1993).

(1) Shaded areas mark growth recessions in the industry as computed by Schlitzer (1993).
(2) Annual rate of growth; constant prices.
(3) Gini coefficient (right scale).

for durables and non-durables. Both price series are computed from the components of the CPI (Consumer Price Index) and are available with about two months of delay. As Figure 4 shows, however, there is not a clear correlation between the relative price ratio (non-durables to durables) and the share of consumption durables to total consumption. This pattern did not allow us to obtain sensible results for this variable in the estimation of both consumption components, as will be shown in Section 5.

In the case of consumption durables, there is a number of early indicators which can be employed to proxy consumption in transport means, which accounts for 1/3 of total consumption durables. One of these is the number of delivered cars, a record which is monthly released by the National Association of Automobile Industries (ANFIA). Some additional information can be drawn from item 4 of the Isco survey on households. Specifically, we use the percentage of units who declare of being positively inclined to buy a car in the next two years. Figure 5 compares these two indicators with the one-year rate of growth of consumption in transports, showing a good degree of conformity between the three series.

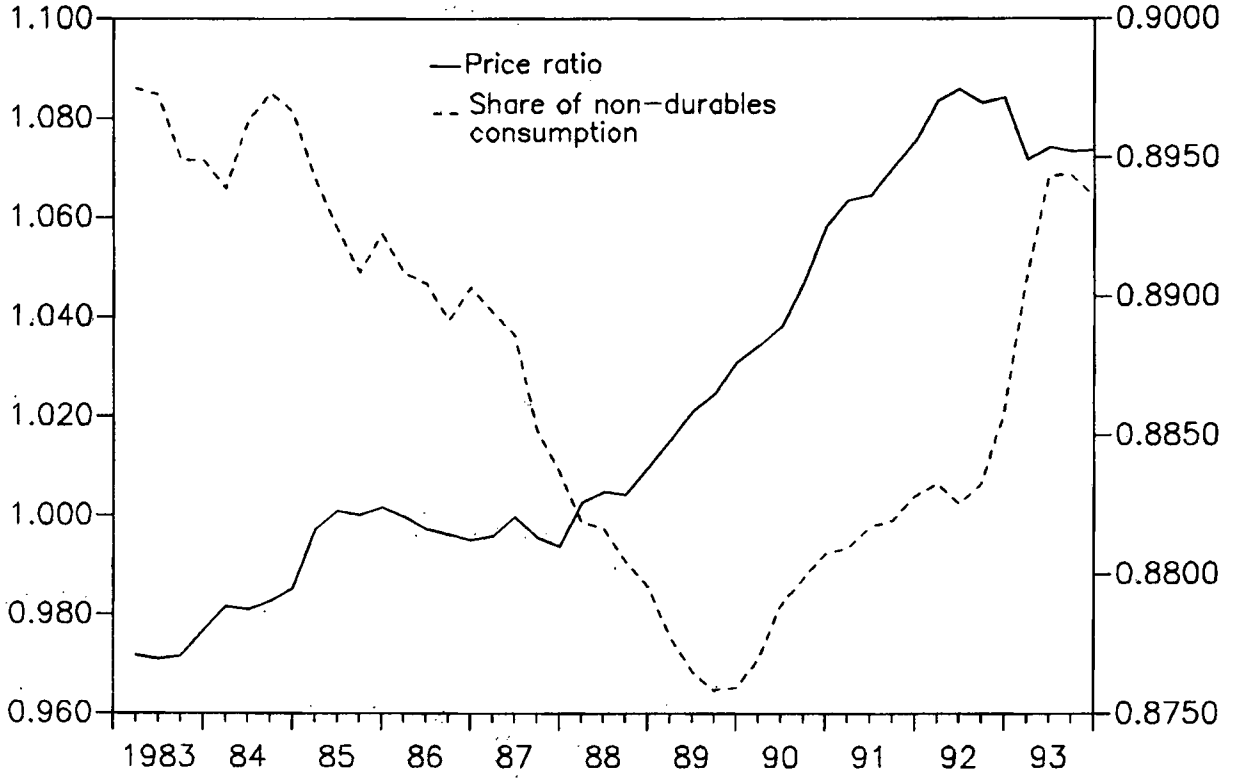
4. The Full Model

To predict consumption of Italian households we have built a small model consisting of three blocks of equations which can be identified as "bridge equations", "updating equations" and "ARIMA equations", respectively.

Bridge equations, whose definition was firstly proposed by Klein and Sojo (1989), form the key block of the

Fig. 4

RELATIVE PRICES AND NON-DURABLES CONSUMPTION

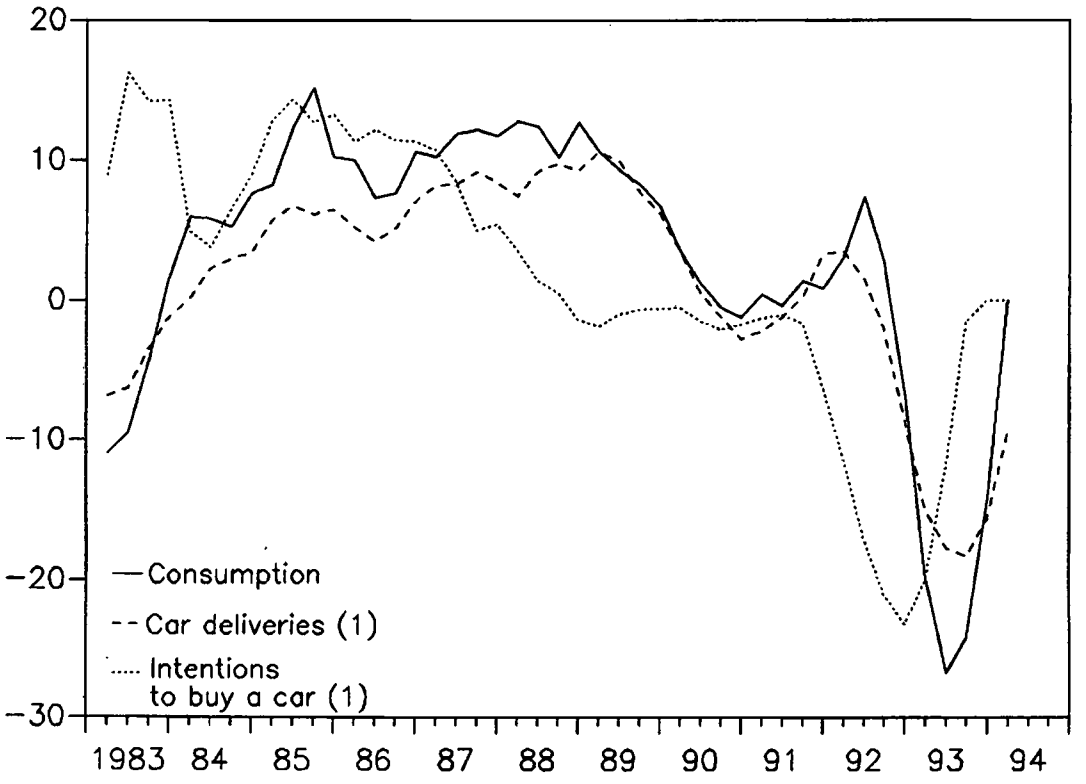


Source: Istat and Bank of Italy.

Fig. 5

REAL CONSUMPTION IN TRANSPORTS AND CAR DELIVERIES

(quarterly percentage changes over the correspondent period)



Source: Istat, Anfia and Isco.

(1) 5 terms centred moving averages.

model.[14] They represent the relationships which relate the consumption components to the main indicators. The block is composed of three bridge equations for non-durables consumption, consumption in transports and consumption durables net of transports, respectively. The equation for consumption in transport means is the typical bridge equation: it uses as indicators the number of car delivered (Anfia) and the intentions to buy a car in the next two years, as measured by Isco. Consumption of non-durables and durables net of transports are represented by some kind of structural bridge equations. Specifically, these two components of household purchases are modelled according to equation (4). Thus, they are linked to the real disposable income and its distribution as measured by the Gini index of inequality, to the stock of real wealth, and to some anticipation variables, such as the ex-ante real rate of interest and the confidence index.

The second block of equations allows to update some of the indicators used by the bridge equations by means of earlier indicators of economic activity. This is the case of the CPI and its components, which are updated via the Cost of Living index, and the series of disposable income, which is updated using the series of disposable income based on Isco data.[15]

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14. See Parigi and Schlitzer (1993) for an extensive application of bridge equations to the Italian case. Early applications to the US economy of this class of models can be found in Fair (1971), Adams and Klein (1972) and Juster and Wachtel (1972a, 1972b). See also Parigi and Schlitzer (1994) for a general discussion of the use of leading indicators in macro-econometric modelling.

15. The series for disposable income as released by the Istat is annual. Thus we use the quarterly series of Brandolini and Muzzicato (1994), which is consistent with the Istat definition of disposable income.

The third block of the model allows a furher updating of the set of indicators by means of time series techniques. In fact, all the leading indicators considered in the study are generally released with more or less a month of delay. Thus, if one denotes with Q_{t-2} the quarter to which the available official data on consumption refer, the monthly information will typically cover the entire previous quarter, Q_{t-1}, as well as most of the current quarter, Q_t. When using the model for the current forecasting exercise, it may be that the data on the indicators are not available for the entire Q_t. In this case one can rely on simple univariate forecasts to complete the current period and a set of ARIMA equations was explicitly designed to this purpose.

5. Estimation

In this section we describe the results of the estimation of the bridge-equations block of the model. Due to space constraints, we do not report the estimates of the updating and ARIMA equations; however, they are available from the authors on request.

All equations are estimated in a general dynamic framework, using as much data as possible up to 1992, and then simplified to obtain parsimonious specifications through a reduction process. Cointegration is assumed and not directly tested, given the shortness of the estimation period. In the estimation process, the main statistical properties of the specifications have been verified through a battery of misspecification tests. The 1993 is considered for a Chow-test, in order to evaluate the model accuracy out of sample.

Consumption of non-durables

Results for the estimated equation are reported in Table 1. All nominal variables (disposable income, financial wealth) have been deflated with the CPI index. Each monthly indicator has been appropriately aggregated to obtain a quarterly series. As can be seen, all variables have the expected sign and are strongly significant, except for relative prices, which seems to have no effect on non-durables consumption. The presence of the change in the Gini index with a positive sign suggests that the inequality may be characterized by a strong cyclical component (see Figure 3). This result is common to other empirical works, such as Brandolini and Sestito (1993), who consider a much larger sample period.

The equation pass easily the battery of specification tests. There is no evidence of autocorrelation in the residuals; the Reset test for the functional form is not significant and the Chow test reveals a good forecasting ability over the 1993.

Although we are not so much interested in the long run properties of our set of equations, we report the long-run elasticities in Table 4. As can be seen, in the long run a 1 per cent increase in the stock of real wealth should induce a 1/3 per cent increase in non-durable consumption. This is a little larger than the effect on consumption of a 1% increase in current real income.

Tab. 1

NON-DURABLES CONSUMPTION
Dependent variable: ΔlogCND
(Estimation period: 1982.Q1 - 1992.Q4)

Variables	Estimated Coefficients	Student t (1)
Intercept	0.981	3.677
$\log CND_{-1}$	-0.345	-3.343
$\Delta \log CND_{-1}$	0.768	7.436
$\Delta_2 \log CND_{-3}$	-0.380	-4.601
$\log REAL_{-1}$	-0.00225	-3.303
logMCLIMATE	0.0283	3.577
$\Delta \log GI_{-3}$	0.0270	3.665
$\log MYR_{-1}$	0.229	3.159
$\log M(WEALTH/YR)_{-1}$	0.143	3.649

$\bar{R}^2$	0.768	Heteroschedasticity (3)	
Standard error (%)	0.190	First order	0.042
Durbin-Watson	2.151	Second order	0.066
F(1,31) test C1+C7+C8=0	0.008	Third order	3.240
		Fourth order	0.762
Autocorrelation (2)			
First order	0.441	Functional Form (4)	1.961
Second order	0.076		
Third order	0.041	Forecasting Ability (5)	
Fourth order	0.144	(1993.Q1-1993.Q4)	0.767

(1) Computed according to White procedure. -(2) Breusch-Godfrey test, F(1,31). -(3) ARCH test, $\chi^2(1)$. -(4) RESET test, F(2,36).- (5) Chow test, F(4,38).

Legenda:
CND = Non-durables consumption at constant prices;
GI = GINI index;
MYR = Real disposable income (3 terms uncentered moving average);
MCLIMATE = Consumers' confidence index (2 terms uncentered moving average);
REAL = Ex-ante real rate of interest;
WEALTH = Real wealth;
M(WEALTH/YR)= 4 terms uncentered moving average.

Consumption of durables

Estimates of durables consumption are obtained in the model via two equations. The first equation produces separate estimates for consumption of transports, using as explanatory variables the number of car delivered provided monthly by the ANFIA and the percentage of households who declare, in the Isco survey, of being positively inclined to buy a car in the next two years. The results for this equation, which appear satisfactory, are reported in Table 2.

The second equation models consumption durables net of transports in a behavioural fashion, using the same explanatory variables of the non-durables equation. We use as price ratio the price of transport durables to the rest of non-durables. The effect of changes in relative prices seems in fact not to affect the two main categories of goods, rather a substitution effect within durables seems to be in effect. As shown in Table 3, all coefficients have the a priori expected sign and all specification tests are easily passed.

Both the long-run elasticity to income and that to wealth are larger than in the case of non-durables consumption (Table 4). The high value of the elasticity to the climate confidence index shows how an increase in the uncertainty about the future and in the perceived degree of risk in the economy mainly affect expenditure in durables. This comes at no surprise, given that, as argued in section 2, durables expenditure is more easily postponable. Finally, it should be noticed that again distributive effect show some sort of cyclical pattern.

Tab. 2

CONSUMPTION IN TRANSPORTS
Dependent variable: logCTR
(Estimation period: 1983.Q1 - 1992.Q4)

Variables	Estimated Coefficients	Student t (1)
$\Delta logCTR_{-3}$	-0.403	-4.536
$\Delta logANFIA$	0.433	7.234
$\Delta logANFIA_{-1}$	0.277	7.064
$\Delta logANFIA_{-2}$	0.120	2.941
$logCTR_{-1}$	0.757	18.298
$logANFIA_{-1}$	0.119	5.825
$MINT_{-1}$	0.180	5.305

$\bar{R}^2$	0.997	Heteroschedasticity(3)	
Standard error (%)	1.140	First order	1.544
Durbin-Watson	1.851	Second order	0.516
		Third order	2.001
Autocorrelation (2)		Fourth order	0.339
First order	0.048		
Second order	2.741	Functional Form (4)	0.232
Third order	1.199		
Fourth order	1.134	Forecasting Ability (5)	
		(1993.Q1-1993.Q4)	1.160

(1) Computed according to White procedure. -(2) Breusch-Godfrey test, F(1,33). -(3) ARCH test, $\chi^2(1)$. -(4) RESET test, F(2,32). -(5) Chow test, F(4,38).

Legenda:
CTR = Consumption in transports at constant prices;
ANFIA = Number of cars delivered;
MINT = Intentions to buy a car (4 terms uncentered moving average).

DURABLES CONSUMPTION NET OF TRANSPORTS
Dependent variable: ΔlogCD
(Estimation period: 1983.Q1 - 1992.Q4)

Variables	Estimated Coefficients	Student t (1)
Intercept	-3.376	-5.546
$\Delta_4 logCD_{-1}$	0.355	7.305
$\Delta logCD_{-3}$	-0.606	-6.382
$\Delta_2 logMGI$	0.302	6.596
$logCD_{-1}$	0.384	-9.218
$logMCLIMATE_{-1}$	0.305	7.035
$logMREAL_{-1}$	-0.0232	-5.262
$logMYR_{-1}$	0.166	1.906
$logMWEALTH_{-2}$	0.337	4.554
$logMPREL_{-4}$	1.234	2.479

$\bar{R}^2$	0.771	Heteroschedasticity(3)	
Standard error (%)	0.792	First order	1.093
Durbin-Watson	1.942	Second order	2.183
		Third order	0.026
		Fourth order	1.803
Autocorrelation (2)			
First order	0.026	Functional Form (4)	0.066
Second order	2.506		
Third order	0.542	Forecasting Ability (5)	
Fourth order	0.063	(1993.Q1-1993.Q4)	3.541*

(1) Computed according to White procedure. -(2) Breusch-Godfrey test, F(1,29). -(3) ARCH test, $\chi^2(1)$. -(4) RESET test, F(2,28). -(5) Chow test, F(4,34).

Legenda:
CD = Durables consumption net of transport at constant prices;
MGI = GINI index (2 terms uncentered moving average);
MYR = Real disposable income (3 terms uncentered moving average);
MCLIMATE = Consumers confidence index (4 terms uncentered moving average);
MREAL = Ex-ante real rate of interest (3 terms uncentered moving average);
MWEALTH = Real wealth (2 terms uncentered moving average);
MPREL = Relative price of transport durables to non-transport durables (4 terms uncentered moving average).

* Below 1% critical bound.

Table 4

LONG-RUN ELASTICITIES

Independent variables	Dependent variable	
	log CND	log CD
log YR	0.324	0.431
log WEALTH	0.340	0.877
log REAL	-0.0067	-0.0604
log CLIMATE	0.0802	0.793

Legenda:

CND = non durables consumption at costant price;
CD = durable consumption net of transport at costant prices;
YR = real disposable income;
WEALTH = real stock of wealth;
CLIMATE = Isco confidence climate index.

6. Prediction

To verify the model's performance in situations as much as possible close to the actual forecasting activity we compute one-quarter and two-quarters ahead forecasts using a rolling estimation technique over a fixed, though different for each equation, interval. The same experiment is conducted by selecting an univariate model for both durables and non-durables.[16] We compare the forecasting performance of our model with the benchmark univariate models in terms of both the RMPSE (Root Mean Percentage Squared Error) and the test of Fair and Shiller (1990).[17]

Table 5 shows the results of the forecasting exercise in terms of the RMPSE. As can be seen, our model outperforms the univariate scheme in both the one-step and the two-steps ahead forecasts. The superiority of our model is especially evident in the latter case. For durables consumption, there is a reduction in the RMPSE from 4.08 to 2.67. For total consumption, the RMPSE is reduced from 1.27 to 0.81.

Given the superior forecasting performance of our

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16. The IARIMA function of the statistical package SCA was employed to select the appropriate univariate models. An ARIMA(0,1,2) was selected for both series.

17. Denoting the log of the series to be forecasted with Yt, the test consists in estimating the model:

$$Y_t - Y_{t-j} = \alpha + \beta_1(\hat{Y}_{1t} - Y_{t-j}) + \beta_2(\hat{Y}_{2t} - Y_{t-j}) + \mu_t$$

where $\hat{Y}_{1t}$ and $\hat{Y}_{2t}$ denote the (logs of the) forecasts of Yt made at time t-j by model 1 and 2 respectively. One thus compares the Student ts of β_1 and β_2, computed using a GMM estimate of the covariance matrix of μ_t, to ascertain whether a model is encompassed by the other. When both coefficients are statistically significant, gains can be obtained using a combination of forecasts.

Table 5

ROOT MEAN PERCENTAGE SQUARED ERROR
(Forecasting period: 1991.Q1-1993.Q4)

ONE-STEP-AHEAD FORECASTS

	OUR MODEL	ARIMA MODEL
Non-durables	0.24	0.31
Durables	1.17	1.61
Total	0.33	0.43

TWO-STEPS-AHEAD FORECASTS

	OUR MODEL	ARIMA MODEL
Non-durables	0.61	0.97
Durables	2.67	4.08
Total	0.81	1.27

model, we employ the Fair-Shiller test to ascertain whether the latter model may still contain some residual information which could be usefully exploited. In this case a combination of forecasts would guarantee an even better performance. As can be seen from Table 6, this does not seem to be the case for the one-step ahead forecasts, where the predictions from the univariate model are not significant. For the two-steps ahead forecasts, however, the test signals that there is some residual information contained in the univariate model.

Figure 6 provides additional insight on the forecasting comparison using the series of total consumption. It can be noted that the univariate scheme completely fails to forecast the cyclical peak in consumption which occurred in 1992.Q1, while the predictions from our model seem to be more in phase with the target series. For the 1993, however, our model predicts a too strong fall in consumption for the second quarter of 1992, thus it predicts a slower subsequent recovery.

7. Measuring the effect of the confidence crisis

In this section we use our model to tentatively evaluate the role that consumers' confidence has played during the three years under examination. In fact, psychological factors should have a special influence on household demand in the case of particular events, such as oil-shocks, wars or elections. This was the case between 1991 and 1993, during which several episodes occurred - the Gulf war (first quarter of 1991), the devaluation of the lira (September 1992) and the subsequent abandonement of the EEC exchange rate agreement, the change of government after an acute political crisis (April 1993) - which may have affected Italian households' expenditure. This period was also characterized by a general uncertainty about the actions of

Table 6

FAIR-SHILLER TEST *
(Forecasting period: 1991.Q1-1993.Q4)

ONE-STEP-AHEAD FORECASTS

	OUR MODEL	ARIMA MODEL
Non-durables	2.09	-0.50
Durables	4.74	-1.64
Total	1.70	-0.91

TWO-STEPS-AHEAD FORECASTS

	OUR MODEL	ARIMA MODEL
Non-durables	9.47	-4.87
Durables	9.47	-3.94
Total	13.41	-7.15

* The table reports the Student t for the β coefficients of the estimated equation:

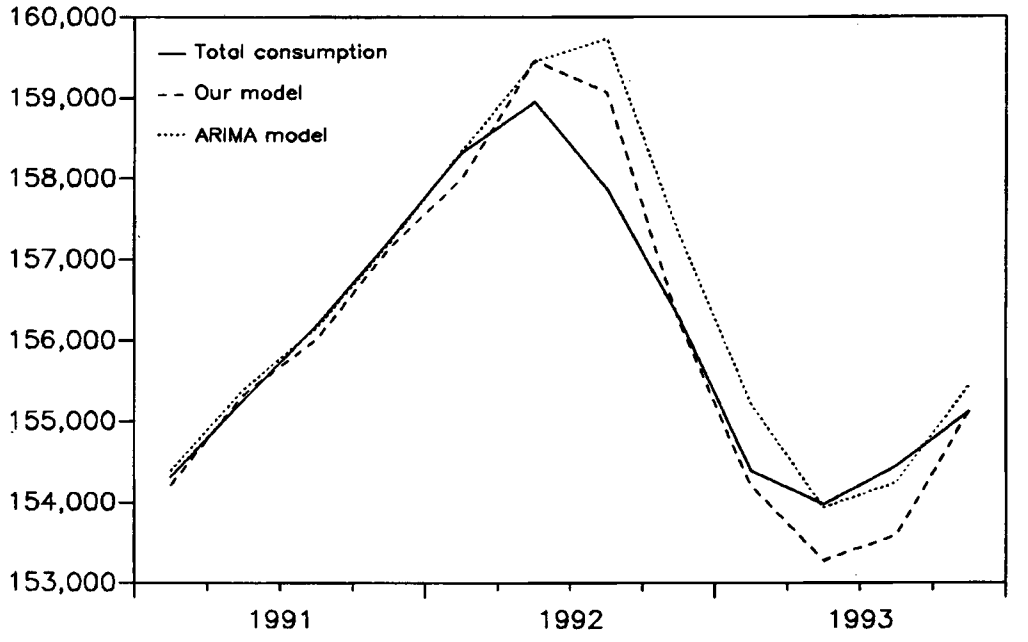
$$Y_t - Y_{t-j} = \alpha + \beta_1(\hat{Y}_{1t} - Y_{t-j}) + \beta_2(\hat{Y}_{2t} - Y_{t-j}) + \mu_t$$

where $\hat{Y}_{1t}$ and $\hat{Y}_{2t}$ are the forecasts of Y_t made at time $t-j$ by our model and the ARIMA model respectively. The Student t are computed using a GMM estimator.

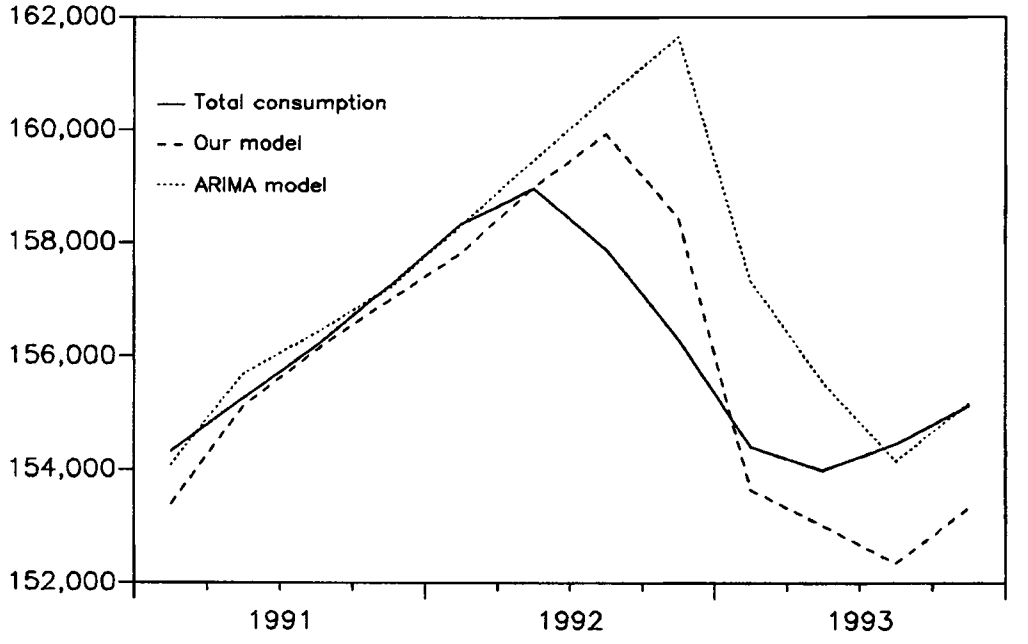
Fig. 6

COMPARISON OF FORECASTS FOR TOTAL CONSUMPTION

one-step-ahead forecasts



two-steps-ahead forecasts



the fiscal authority, engaged in a restrictive budget policy, and an increased instability of the financial markets.

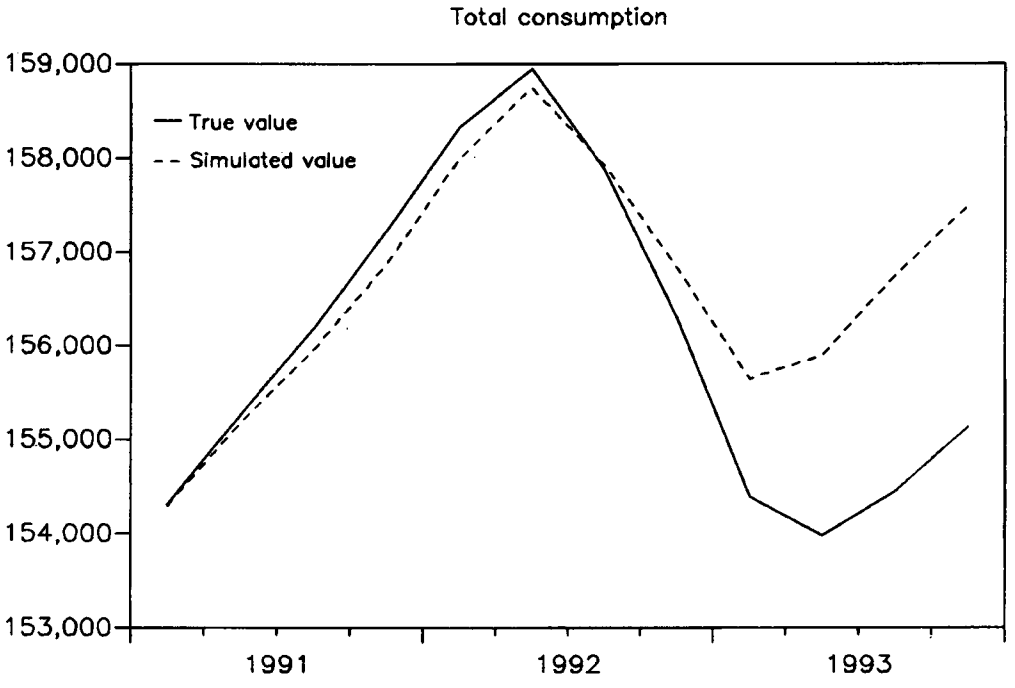
As a matter of fact, the Isco climate confidence index steadily fell during these years, reaching an historical minimum at the end of 1993. As a consequence of the confidence crisis, most standard macroeconometric models, like that of the Bank of Italy, have systematically overestimated private consumption.

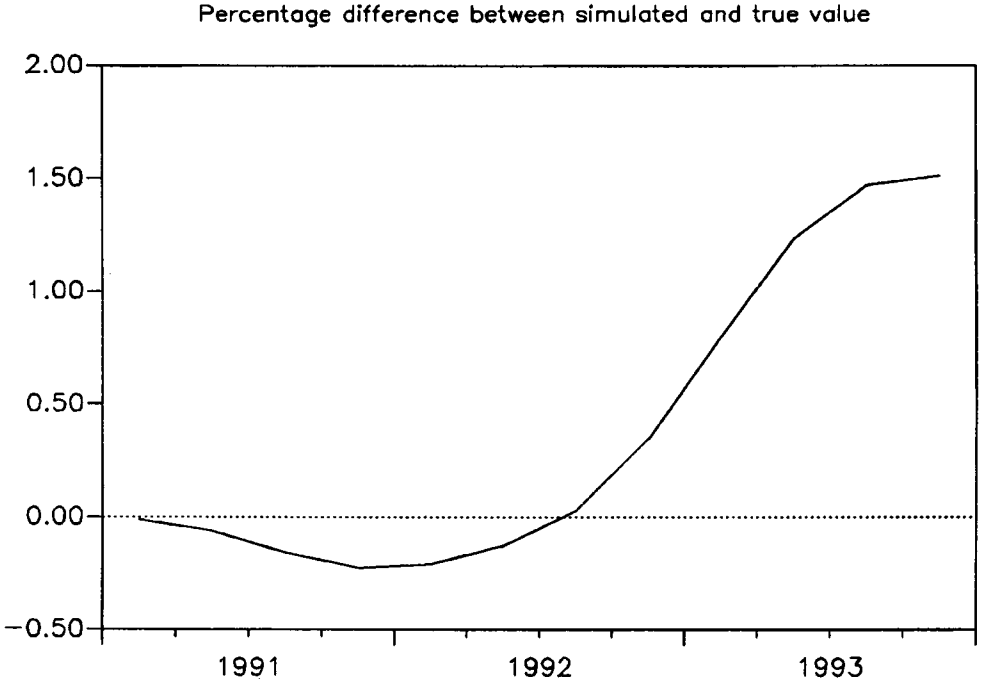
Econometric models tend to represent future actions by extrapolating from past decisions. This choice, mainly dictated by the unavailability of appropriate data, implies that when a sudden change in agents behaviour occurs, the model may be unable to reproduce the real evolution of the main variables. This is what happened, for example, to the non-durables consumption equation of the quarterly macroeconometric model of the Bank of Italy. The brisk change in individual behaviour occurred at the end of the second quarter of 1992, followed by a deep fall in households expenditure. As shown by Locarno and Rossi (1994), the model consistently overestimated consumption for the second half of 1992 and the whole 1993. This is what would have happened to our model had we not included in the specification the climate variable. To ascertain this, we conducted a counterfactual experiment. We simulated our model with the historical records for all the predetermined variables except the climate index, which was kept fixed at the level reached in 1990.Q4. The simulated values are obtained using the estimated model over the entire period 1983.Q1-1993.Q4. This is justified by the remarkable stability of all the coefficients over the sample period.

Figure 7 compares for total private consumption the hypothetical no-confidence-crisis values to the true values.

Fig. 7

THE EFFECT OF THE CONFIDENCE CRISIS





As can be seen, since the second half of 1992 the simulated series is sistematically above the true series, the gap increasing systematically till the end of 1993. In the last quarter of 1993, when consumers' confidence is at an historical minimum, the gap between the two series is estimated equal to 1.5 per cent. For the entire 1993, consumption in real terms is lower, because of the confidence effect, by more than 7,700 billions lire.

8. Conclusions

In this paper we presented a simple macroeconometric model aimed at providing real time estimates of consumption expenditure of Italian households. Our study builds upon previous work originated in the US already in the 70s, aimed at exploiting the information contained in early indicators of economic activity. These first attempts were limited by their lack of a clear theoretical foundation. As a consequence, short-term forecasting based on early indicators has remained almost neglected for quite a long period of time, so long as the preference of applied economists has stood in favor of structural macroeconometric modelling. However, as we showed in this study for the case of consumption, there is no reason why these two lines of research should follow two different roots. We showed how leading indicators such as attitudinal and expectational variables may represent useful complements of some theoretical specifications. Among these, a prominent role was assigned to the confidence climate index built by Isco, which provides a direct measure of consumers' expections about trend and fluctuations in future earnings.

We verified the estimation properties and forecasting performance of our model using an extensive battery of econometric tests and simulations. The results appear quite

satisfactory. The model outperformes in prediction the best purely time-series models for each of the consumption components. In the final part of the paper we used the model to obtain a direct measure of the effect of the severe confidence crises which affected consumers' behaviour during the last two years. This was accomplished by simulating our model helding the climate index fixed at its 1990.Q4 value. For 1993, the (negative) impact on househols expenditure has been estimated equal to about 7.700 billions lire, which account for a gap of nearly 1.5 per cent.

The main caveat to be kept in mind when interpreting our result, is that, although more structural, our consumption model is still to be considered as a short term forecasting tool. For complex econometric excercises such as simulations and long-term forecasts, the model should be completed with much more structure and detail.

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