

Regional consumption dynamics and risk sharing in Italy: an econometric investigation ¹

Risk sharing e la dinamica del consumo regionale in Italia

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Riassunto: In questo lavoro viene analizzata la dinamica dei consumi regionali in Italia, con particolare attenzione ai meccanismi di condivisione del rischio (risk sharing). Rispetto alla letteratura esistente viene utilizzata una nuova metodologia che permette di studiare la presenza di risk sharing sia nel breve che nel lungo periodo. L'analisi empirica su dati annuali relativi al periodo 1960-1995 evidenzia come: (i) vi siano squilibri territoriali nel processo di allocazione delle risorse; (ii) esistano meccanismi di risk sharing di lungo periodo in grado di neutralizzare gli shock regionali; (iii) le regioni del sud Italia siano caratterizzate da risk sharing di lungo periodo principalmente attraverso il canale della spesa pubblica.

Keywords: Regional risk sharing, Consumption, Vector Error Correction Model, Cointegration.

1. Introduction

Assessing the occurrence of risk sharing among the regions or macro-areas belonging to a given country or monetary union represents a fundamental step for understanding the role of central government and market institutions in the allocation process of resources. Risk sharing refers to situations in which agents (regions, countries) pool part of all of the idiosyncratic risk they face. If agents are regulated by a “benevolent” social planner or have access to complete markets, per capita consumption streams should be insured against income cyclical fluctuations and should not depend on idiosyncratic shocks, see e.g. Asdrubali et al. (1996). A consequence of risk sharing is that differences in consumption changes across regions should be unrelated to idiosyncratic income fluctuations. The basic testable implication of the risk sharing theory is that

$$c_t^i = \theta_i c_t^W + \gamma^i + \xi^i t + \eta_t^i \quad (1)$$

where c_t^i is the (logged) per capita consumption of region i , $c_t^W = (1/N) \sum_{i=1}^N c_t^i$ stands for per capita aggregate (national) consumption and the term η_t^i is a function of idiosyncratic preference shocks in the region. Equation (1) suggests that net of preference shocks region i 's logged per capita consumption c_t^i comoves linearly with per capita national consumption c_t^W and does not depend on idiosyncratic factors.

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Italy is an interesting case study for risk sharing because of its well-recognized large interregional disparities. The empirical analysis of risk sharing among the twenty Italian regions has been developed in e.g. Decressin (1999) and Dedola et al. (1999), *inter alia*. Results obtained so far lead to contradictory conclusions.

In order to overcome these contradictions, following Gardini et al. (2001) we propose a methodology for testing risk sharing among countries (or regions) at both long run and short run frequencies simultaneously, without relying on a preliminary transformation or filtering of the data. The idea is to exploit VAR models and the close connection between the notions of cointegration and error correction behavior, which allow to evaluate risk sharing at both long run and at short run frequencies. This analysis proves to be meaningful because the different channels through which consumption insurance takes place are likely to be effective over different time horizons.

2. Modeling and testing risk sharing

In this section we specify an econometric model which allows to analyze simultaneously risk sharing at both long run and short run frequencies among Italian regions. Let $\tilde{y}_t^i$, $i = 1, \dots, N$, be a regional idiosyncratic factor in region i ; the quantities c_t^i and c_t^W have been defined in the previous paragraph. It is furthermore assumed that regional and national consumptions are integrated variables of order one, $I(1)$; this hypothesis is well recognized in the literature and therefore it should not be considered too restrictive. For each region $i = 1, \dots, N$, a vector autoregressive (VAR) process is assumed to be the generating process of $X_t = (c_t^i \ c_t^W \ \tilde{y}_t^i)'$, i.e. $A(L)X_t = \mu_t + \varepsilon_t$ where $A(L) = I_3 - A_1L - \dots - A_kL^k$ is a polynomial matrix of order k , each A_j , $j = 1, \dots, k$ is a 3×3 matrix of parameters, μ_t is a 3×1 vector which includes all the deterministic components of the system and $\varepsilon_t = (\varepsilon_{ct}, \varepsilon_{wt}, \varepsilon_{yt})'$ is a zero mean Gaussian white noise with covariance matrix Ω . The model can be reparametrized as the Vector Error Correction Model (VECM)

$$\Delta X_t = \Pi X_{t-1} + \sum_{j=1}^{k-1} \Gamma_j \Delta X_{t-j} + \mu_t + \varepsilon_t \quad (2)$$

where Π and Γ_j , $j = 1, \dots, k-1$ are 3×3 matrices which depend opportunely on A_j , $j = 1, \dots, k$. In the presence of cointegration it follows (see Johansen, 1996) that the impact matrix Π has reduced rank r , $0 < r < 2$, so that $\Pi = \alpha\beta'$ where α and β are full-rank $3 \times r$ matrices. The scalar r is the cointegration rank of the system. From the inspection of the impact matrix $\Pi = \alpha\beta'$ it is possible to establish whether consumption risk sharing holds in the given region at the long run frequency. In particular the following cases may occur:

- A1. if the cointegration rank r is equal to zero ($r = 0$) no long run relation between regional and national per capita consumption is found, and the existence of risk sharing against permanent shocks is ruled out;
- A2. if $r = 1$, a necessary condition to the existence of risk sharing is that the cointegrating vector β has the form $\beta = (1, -b_1, 0)'$, where $b_1 = \theta^i$; this implies that the quantity $\beta' X_t = c_t^i - \theta_i c_t^W$ is stationary (or trend-stationary), i.e. that departures of c_t^i from its optimal long run level $\theta_i c_t^W$ are transitory;

A3. if $r = 2$, i.e. if two cointegrating relations exists, a necessary condition for the existence of regional risk sharing is that, in addition to $c_t^i - b_1 c_t^W$, the second cointegrating vector corresponds to idiosyncratic output so that the quantity $(\beta_1' X_t, \beta_2' X_t) = (c_t^i - b_1 c_t^W, \tilde{y}_t^i)$ is a bivariate (trend-)stationary process².

An implication of A1–A3 is that lack of consumption risk sharing at long run frequencies will occur whenever in (2) $r = 0$, or $r > 1$ with β not satisfying A2. Additionally risk sharing is not achieved when $\beta' X_t = (c_t^i - b_1 c_t^W - b_2 \tilde{y}_t^i)$ is (trend-) stationary with $b_2 \neq 0$ which entails a long run dependence of per capita consumption on idiosyncratic output in addition to per capita world consumption.

System (2) can be used not only to analyze the long run properties of the data, but also to test consumption risk sharing at the short run frequency. In fact, from the VECM it is possible to derive the conditional error-correction model

$$\begin{aligned} \Delta c_t^i = & \omega_1 \Delta c_t^W + \omega_2 \Delta \tilde{y}_t^i + a_1 \beta_1' X_{t-1} + a_2 \beta_2' X_{t-1} \\ & + \text{lags}\{\Delta c_t^i, \Delta \tilde{y}_t^i, \Delta c_t^W\} + \mu_c + v_t \end{aligned} \quad (3)$$

whose parameters depend opportunely on those of (2). According to the theory, a necessary condition for risk sharing to hold is that all terms in (3) which involves the idiosyncratic variable (in levels or in first differences) should not be significant, see Gardini et al. (2001) for further details.

3. Empirical results

Results of the risk sharing test are reported in Table 1. For $X_t = (c_t^i \ c_t^W \ \tilde{y}_t^i)'$ the VECM model (2) is estimated by means of maximum likelihood. Per capita consumption c_t^i includes private consumption and public consumption, therefore it is possible to evaluate the role of public expenditure in the risk sharing process. The idiosyncratic variable $\tilde{y}_t^i$ is defined as $\tilde{y}_t^i = y_t^i - y_t^W$ where y_t^i is region i 's per capita output and $y_t^W = (1/N) \sum_{i=1}^N y_t^i$ is per capita aggregate (national) output. According to the parsimony principle, the number of lags of the VECM is the minimum integer which ensures well-behaving residuals. For each estimated VECM the cointegration rank has been selected through Johansen's Trace and λ -max tests; the case $r = 3$, which would imply the joint stationarity of the system, is ruled out due to the non-stationarity of the considered variables. When required, a linear trend in the cointegration relations is included and justified in the light of (1). Note that $r \geq 1$ is a necessary condition, although not sufficient, for risk sharing against permanent shocks.

The selected r 's are reported in the second column. For the cases where r is found to be equal to 1 the estimated cointegration vector β under the just-identification restriction $\beta = (1, -b_1, -b_2)'$ (third column) and under the consumption risk sharing hypothesis $\beta = (1, -b_1, 0)'$ are reported, together with the corresponding LR test for the implied over-identification restrictions (fourth column). For the cases where $r = 2$ we reported the estimates of the first cointegrating vector only.

²Note that this situation would suggest that in the given region consumption risk sharing is also supported by the convergence of per capita output, see e.g. Gardini et al. (2001).

Table 1: Test of consumption risk sharing at long run frequency between the four Italian macro-regions over the 1960-1995 period. ^a a linear trend was restricted to belong to the cointegration space; ^b the hypothesis that $b_1 = 1$ is not rejected.

Macro Region	r	$\beta' = (1, -b_1, -b_2)$	$\beta' = (1, -b_1, 0)$	$LR: b_2 = 0$ <i>p-value</i>	Short run test
NW ^a	1	(1, -1.58, 0.50) 0.53 1.13	(1, -1.63, 0) 0.22	0.11 ^b 0.74	not rejected
NE	1	(1, -1.70, 0.76) 0.29 2.85	(1, -1.53, 0) 0.11	0.05 ^b 0.82	rejected
C ^a	1	(1, -0.91, 0.04) 0.03 0.21	(1, -0.90, 0) 0.03	0.01 ^b 0.91	not rejected
S	1	(1, -1.16, -0.69) 0.03 0.26	(1, -0.87, 0) 0.04	0.63 ^b 0.43	rejected

Risk sharing seems to hold in the long run and in the light of the results concerning the twenty regions of Table 1, there is clear evidence of macro-regional risk sharing which is not equally distributed among the regions belonging to each macro-area.

4. Conclusions

Contrary to previous findings, our results point that: (i) risk sharing among the Italian regions can be found not only at cyclical frequency but over longer horizons as well; (ii) consistently with Decressin (1999), public consumption has a leading role in determining consumption insurance in the long run; (iii) geographical biases affect the allocation process of resources; (iv) southern regions are better insured against permanent shocks, mainly due to the public consumption channel; however, transitory idiosyncratic income fluctuations play a significant role in determining regional consumption expenditures over shorter horizons.

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