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Money illusion under test

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Abstract

We propose a test for the presence of money illusion based on subjective survey information on individual satisfaction with income. Using data from the German Socio-Economic Panel for the period 1993–2003, we cannot reject the null hypothesis of no money illusion.

Keywords: Cost of living; Subjective well-being; Fixed effects

JEL classification: I31; D12

1. Introduction

This paper proposes a novel test for the existence of money illusion. It is based on people's self-reported satisfaction with their income, as elicited in a large household panel survey for Germany. In the absence of money illusion, reported income satisfaction should be unchanged if commodity prices and nominal income increase or decrease by the same proportion. In other words, satisfaction then depends on real rather than on nominal income. If, on the other hand, a proportional increase in prices and nominal income increases subjective well-being, then we have evidence for money illusion. This proposition can be tested.

Formally, suppose that an indirect utility function $v(y, p)$ can be approximated as

$$v(y,p) \approx \beta_0 + \beta_1 \ln y + \beta_2 \ln p \tag{1}$$

where y is income and p is an appropriately defined price level. Then the absence of money illusion means that $\beta_1 = -\beta_2$. In order to test this restriction, we follow the recent literature in empirical welfare

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economics (Frey and Stutzer, 2001) and take survey responses to a question such as "How satisfied are you with your income at present" (on a scale from 0 to 10) as proxies for $v(y, p)$. The regression of v_i on individual log income $\ln y_i$ and the relevant log price level $\ln p_i$ yields unbiased estimators for β_1 and β_2 only if $\ln y_i$ and $\ln p_i$ are uncorrelated with the approximation error. With panel data, a better estimator can be based on a two-way fixed effects model. Because the dependent variable is discrete and ordinal, we apply the Probit adjusted least squares method (POLS) suggested by van Praag and Ferrer-i-Carbonell (2004).

The analysis is based on data from a large, representative household panel survey, the German Socio-Economic Panel (GSOEP), for the years 1993 to 2003, incorporating information on income, satisfaction with household income, and regional cost of living indices provided by Roos (2006). Satisfaction with household income serves as a proxy for individual utility in order to assess money illusion, which is a new approach. The results show that people's satisfaction with their financial situation indeed responds to changes in the relevant price level — as postulated by standard economic theory. Moreover, the hypothesis of no money illusion cannot be rejected.

2. Background

The term "money illusion" was coined by Keynes. Irving Fisher (1928) devoted an entire monograph to it. Money illusion provides a basis for explaining involuntary unemployment and cyclical developments in the economy, but direct empirical evidence is rare. In the 1970s, it became unfashionable to build models around money illusion, because it was not in line with the prevailing theory of the utility-maximizing decision making that should be based on real – rather than nominal – quantities.[1]

In the wake of the emergence of behavioral economics the topic has attracted renewed attention lately. Money illusion counts among one of the many potential "anomalies" in human decision making. Whether it exists or not is an empirical matter, and Shafir, Diamond and Tversky (1997) and Fehr and Tyran (2001) are among the recent contributions. Fehr and Tyran (2001) conclude, from experimental evidence, that there is only "a small amount of money illusion at the individual level, as expected, but beyond that there is no individual irrationality" (p. 1251). In contrast, Shafir et al. (1997) find ample evidence for money illusion from surveys where participants had to evaluate different (hypothetical) income and price scenarios. In addition, they found that framing matters: "[…] when the emphasis is not purely economic, however, the attribution of well-being is driven primarily by a nominal rather than a real evaluation." (p. 352).

The question whether and to what extent money illusion at the individual level is empirically relevant is not yet settled, and therefore warrants further investigation. We approach the issue with a methodology that is completely different from – and in some respects superior to – that of the previous studies. We use evidence from a large, representative household survey rather than an experimental student population. We avoid hypothetical questions and framing effects. The information we use refers to the real current situation of the respondent, and it has been collected – from the respondent's point of view – in a context unrelated to the issue of nominal versus real assessment.

[1] James Tobin (1972, p. 3) characterized the situation in the following way: "an economic theorist can, of course commit no greater crime than to assume money illusion."

3. Data and methods

Our primary data source is the GSOEP, a large representative longitudinal study of private households in Germany. The GSOEP surveys the same households annually since 1984. In 1990, it was expanded to include households from the former German Democratic Republic. As the GSOEP does not contain information about prices, another source is consulted. Roos (2006) calculates a cross-sectional cost of living index for the federal states of Germany in 1993 and extrapolates it over time using information on regional inflation rates. Since the available cost of living series only starts in 1993, we use the period 1993 to 2003 as our observation span.

The regression equation can be written as

$$v_{ijt} = h(\beta_0 + \beta_1 \ln y_{ijt} + \beta_2 \ln p_{jt} + \beta_3 \ln n_{ijt} + \delta_t + \theta_j + \alpha_i + \varepsilon_{ijt}) \quad (2)$$

where $j=1, \ldots, 12$ is the index for the federal state and $t=93, \ldots, 03$ is the index for the survey year. v_{ijt} is the response to the financial satisfaction question, measured on an eleven point response scale. The model postulates that individual satisfaction with income is a function of nominal income, price level, household size, all in logs, as well as time (δ_t), regional (θ_j) and individual (α_i) fixed effects. The control for regional fixed effects is particularly important, as regions with attractive local amenities will also tend to have high cost of living.

In Eq. (2), $h(\ )$ denotes a step-function that provides a mapping from the set of real numbers to the discrete responses $\{0, 10\}$. It is common to base this step function on an ordered probit (or ordered logit) formulation, and estimate the model parameters by maximum likelihood. Recently, van Praag and Ferrer-i-Carbonell (2004) have proposed a considerable simplification, the Probit adjusted ordinary least squares (POLS), whereby a linear model is estimated for a transformed regressand, namely the expectation of a double truncated standard normal variate, where the truncation points are derived from the marginal distribution of v_{ijt} (see van Praag and Ferreri-i-Carbonell, 2004, for further details). This estimator has the virtue of being easily extendable to panel data modelling, an important advantage in our application.

Ideally we would like to measure prices at the individual level, i.e., for a basket of goods that is typically consumed by that household. However, such a price index is not available, and the next best alternative is to use regional cost of living indices p_{jt}. Such indices are available for 13 out of the 16 states (Roos, 2006).[2] Moreover, there is no separate coding in the GSOEP for the federal states Rhineland-Palatinate and Saarland, so that the cost of living index for these two states had to be combined, leaving us with 132 distinct price observations (12 regional indices over 11 years). There is substantial variation in regional prices. The difference in the 1993 cost of living index between the most expensive (Hessen) and the least expensive (Sachsen-Anhalt) state amounts to 23.4%. The average annual growth rates range from a low of 1.1% in Berlin to a high of 1.9% in Sachsen-Anhalt.

Income is measured as current monthly household net income.[3] Rather than using a pre-defined equivalence scale, we include the log of the household size n_{ijt} as an additional regressor. Economies of scale exist as long as $|\beta_3| < \beta_1$.

The data form an unbalanced panel. After restricting the sample to those aged 25 to 64, there is a total of 116,169 observations on 23,073 distinct persons. In principle, the panel dimension can be incorporated

[2] Bremen, Hamburg and Schleswig-Holstein do not report inflation rates.

[3] This is the total monthly income of all household members, after the deduction of tax and social security contributions, and including regular transfer payments such as rent subsidy, child benefit, government grants and subsistence allowances.

Table 1
Regression results for satisfaction with income (N=116,169)

	(1)	(2)	(3)
Log income	0.922** (0.010)	0.658** (0.009)	0.611** (0.008)
Log price	0.707** (0.051)	−0.809* (0.0486)	−0.871** (0.477)
Log household size	−0.338** (0.011)	−0.230** (0.011)	−0.206* (0.011)
Age			−0.016 (0.014)
Age squared/100			0.003 (0.004)
Good health			0.257** (0.005)
Unemployed			−0.311** (0.009)
Fixed effects [a]	No	Yes	Yes
p-value ($\beta_1 = -\beta_2$)		0.757	0.585

Source: German Socio-Economic Panel 1993–2003.
[a] Time, region and individual effects.

in the estimation procedure in a number of ways. At a minimum, the standard errors should be corrected to account for clustering at the individual level. Alternatively, the model can be estimated conditional on the fixed effects (using the within estimator) or by GLS, treating the individual specific error component as random.

4. Results

Table 1 presents three sets of regression results. The simple POLS estimates of model (2), without fixed time, region and individual effects, is shown in the first column. The second column shows the results for the model with fixed effects. In the third column, the fixed effects model is extended by including additional regressors. Random effects versions of models (2) and (3) were estimated as well. They are not displayed, however, since Hausman tests rejected the exogeneity hypothesis. The number of observations is 116,169 in each case.

The estimated income and size effects are similar to those found in the previous literature (e.g., van Praag and Ferrer-i-Carbonell, 2004, Table 2.8). For example, a 10% increase in income is predicted to lead to a movement up by 0.09 points on the transformed response scale. Keeping income constant, satisfaction with income is a decreasing function of household size. What is puzzling, though, is a positive price level effect. This spurious effect arises since the model ignores an important determinant of satisfaction. It is well-documented that East Germans report substantially lower satisfaction levels than West Germans in all satisfaction domains, including income satisfaction. At the same time, the cost of living is much lower in the East than in the West.

To account for this effect, we include in the second column a set of regional dummy variables, in addition to fixed time and individual specific effects.[4] The price effect now turns negative, i.e., a higher price level is associated with a lower income satisfaction. The effect is statistically significant at the 10% level. The point estimate (−0.809) is even larger in absolute value than the income effect (+0.658). Such a result would be consistent with other evidence that people in Germany actually overestimate the inflation during and following the introduction of the Euro in January 2002 (Brachinger, 2005). Another

[4] Regional effects can be identified separately from individual fixed effects since people move between regions.

explanation might be that people dislike inflation *per-se*, in accordance with the results by Di Tella, MacCuloch and Oswald (2001). However, a formal test of the hypothesis that $\beta_1 = -\beta_2$ cannot be rejected (p-value = 0.757). The absolute values of the two coefficients are not statistically significantly different from each other, and therefore, we do not find evidence for money illusion.

This conclusion is confirmed in an extended specification, where we include in addition a second order polynomial in age and two indicator variables for self-reported good health and unemployment. These are important variables in life satisfaction models (Frey and Stutzer, 2001). Their inclusion in a model for income satisfaction may be less obvious. In fact, health (positive) and unemployment (negative) are found to be important explanatory factors of financial satisfaction. Either the answers in the various satisfaction domains are interdependent, or health and unemployment have indeed direct effects on financial satisfaction. For example, the expenditures associated with bad health may reduce income satisfaction for a given income. Similarly, a given income may lead to lower satisfaction when it comes from government transfers in the case of unemployment rather than own earnings. Whatever the explanation, the effect of this alternative specification on the estimated income and price coefficients is minimal, and we find again, that the hypothesis of no money illusion cannot be rejected.

5. Conclusions

The primary objective of this paper was to investigate the phenomenon of money illusion at the individual level, using GSOEP data drawn from the survey years 1993 to 2003. Satisfaction with household income serves as a proxy for individual utility in order to test for money illusion. The results do not support the presence of money illusion. In two models with fixed effects, the null hypothesis that the sum of the coefficient of logarithmic nominal income and the coefficient of the logarithmic price index is 0 cannot be rejected at any conventional significance levels. We are aware that not rejecting a null-hypothesis is not the same as proving it. But the evidence is at least compatible with the notion that a proportional increase of nominal income and of prices leaves the income satisfaction of people unaffected.

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References

Brachinger, H.W., 2005. Theory and Index of Perceived Inflation, Working Paper, Seminar for Statistics, University of Fribourg.
Di Tella, R., MacCulloch, R., Oswald, A., 2001. Preferences over inflation and unemployment: evidence from surveys of happiness. American Economic Review 91, 335–341.
Fehr, E., Tyran, J.R., 2001. Does money illusion matter? American Economic Review 91, 1239–1262.
Fisher, I., 1928. Money Illusion. Adelphi Company, New York.
Frey, B.S., Stutzer, A., 2001. Happiness and Economics. Princeton University Press.

Roos, M.W.M., 2006. Regional price levels in Germany. Applied Economics 38, 1553–1566.
Shafir, E., Diamond, P., Tversky, A., 1997. Money illusion. Quarterly Journal of Economics 112 (2), 341–374.
Tobin, J., 1972. Inflation and unemployment. American Economic Review 62 (1), 1–18.
van Praag, B., Ferrer-i-Carbonell, A., 2004. Happiness Quantified — A Satisfaction Calculus Approach. Oxford University Press.