

**SURVEY-BASED ESTIMATES OF BIASES IN CONSUMER PRICE INDICES
DURING TRANSITION: EVIDENCE FROM ROMANIA**

RANDALL K. FILER* and JAN HANOUSEK**

Running Head: Survey Estimates of CPI Bias

* Professor of Economics, Hunter College and The Graduate Center, The City University of New York, 695 Park Avenue, New York, NY 10021 USA and CERGE-EI, a joint workplace of Charles University and The Academy of Sciences of the Czech Republic, e-mail: rfiler@hunter.cuny.edu;

** Citibank Associate Professor of Economics, CERGE-EI, corresponding author: CERGE-EI, Politických vězňů 7, 111 21 Prague 1, Czech Republic, e-mail: jan.hanousek@cerge.cuni.cz. Both Filer and Hanousek are Research Associates of the William Davidson Institute.

Abstract:

Mismeasurement of inflation is likely to be more severe in a transition economy than in a more stable environment. Comparisons of self-reported changes in economic welfare with changes in incomes suggest that official Romanian inflation measures may be overstated by between 100 and 300 percent at a reported annual inflation rate of 40 per cent.

JEL Codes: C8, E3, P2

1. Introduction

The extent of biases in traditional measures of consumer prices in transition economies is a controversial issue. Koen and De Masi (1997) and Filer and Hanousek (2000) assert that all the well-understood reasons for conventional indices to overstate inflation are exacerbated in the transition. Among these are larger changes in relative prices leading to consumer substitutions, substantial improvements in quality in even the most mundane goods, and the rapid proliferation of new, low-cost distribution channels. On the other hand, Brada, King and Kutan (2000) find conflicting evidence and claim that substantial bias in inflation measures² is inconsistent with the observed productivity trend in the Czech Republic although biases may exist in Hungary. Given the uncertainty over the practical importance of the theoretical possibilities for significant bias, there is a clear need for empirical research. We modify a test of possible biases in inflation based on consumers' self-reported changes in economic well-being used by Nordhaus (1998) and Krueger and Siskind (1998) for the United States and apply it to data from Romania for 2000.

2. Methodology

The intuition behind the test is that, if inflation measures are biased upwards, some consumers will report themselves to be better off when their real income adjusted for the official inflation rate will appear to have declined. An appropriate, unbiased inflation rate would be one at which only consumers who report themselves as worse off experienced an apparent decline in real income. Krueger and Siskind (1998) suggest estimating the regression:

$$Y_t = \alpha + \beta Z_t + \epsilon_t$$

where Y is the net percentage of families who report an improvement in their financial situation, i.e. those reporting an improvement minus those reporting a decline, and Z is the net percentage whose real income actually increased. Under the assumptions that measures of Y are accurate, in particular that there is no money illusion, and that the deflator used to calculate Z is unbiased, α should equal zero and β should equal 1. Using time series data, Krueger and Siskind perform a grid search over various possible CPI deflators and associated implied biases in the official CPI, and suggest that the value maximizing the P -value for the joint test of these restrictions is an appropriate selection for the true, unbiased CPI. For the U.S., they find that this value is close to, and may even be slightly greater than, the official inflation rate.

Although this is a clever strategy, it has limited usefulness in a transition economy. First, estimating the proposed regression requires several years of data.³ Second, there is an implicit assumption that the coefficients are stable over time, i.e. the extent of bias in the CPI is constant. In transition economies, inflation rates are both high and highly variable, and economies have moved from seriously distorted to relatively normal over the course of a decade in which local statistical offices have become increasingly sophisticated. Hence, an assumption of stability is highly questionable.

Fortunately, it is possible to develop a similar technique that uses only a single year's data. Below we outline such a methodology and apply it to measures of inflation in 2000 for Romania. Romania lends itself to such analysis because, among the Central European countries with reasonably advanced statistical offices,⁴ it retains a high inflation rate. Officially, consumer prices in January 2001 were 39.9 per cent higher than in January 2000. Monthly rates of increase in the CPI during 2000 ranged from a low of 1.8 per cent in March, May and August to a high of 6.0 per cent

in July.⁵

The cross-section variant of the Krueger and Siskind technique works as follows. Suppose a sample of individuals is asked their current monthly household income and their monthly income one year ago. For a hypothetical inflation rate r , denote by r^+ families whose real income has risen and by r^- those whose real income has fallen. Similarly, denote as s^+ those who report that their financial situation has improved and s^- as those who report a worsening in their situation. Table 1 is a 2 x 2 contingency table where misclassifications are denoted as $n^{+-} + n^{-+}$. The total number of such misclassifications, denoted $n = n^{+-} + n^{-+}$ will vary as the assumed inflation rate r changes. The value of r that minimizes misclassifications seems a reasonable candidate for the true or unbiased inflation rate. The main advantage of this technique is that it does not require any information on actual incomes, only their year to year change.

[INSERT TABLE 1 ABOUT HERE]

3. Data

We asked a random probability sample of 1513 Romanian households⁶ the following two questions, adapted from those used by Krueger and Siskind.

Question #1 A household's income can change for many reasons. A member of the household may get a new job or be promoted, or someone may lose their job or retire. Someone could start working after leaving school or maternity leave or someone may add or leave a part-time job or start or end some private business. Someone in the household may become eligible for or lose government benefits. Considering all of these AND any other changes you can think of, by what PERCENTAGE was your household's

income for the year 2000 greater or less than for 1999? Please note that we do NOT want you to tell us actual incomes, only the percentage change (record increases as + and decreases as -).

Question #2 Of course, prices also changed last year, some by more than others. Considering everything together, including the change in your family's income, changes in prices and changes in what you bought, overall how would you say that your standard of living in 2000 has changed, compared with 1999? We are only concerned with your actual current economic condition, not any changes in your personal situation, the country as a whole, or your beliefs about the future. Using this definition, please tell me how was your standard of living in 2000 compared to 1999?

Responses to Question #2:

1. A great deal better
2. Somewhat better
3. About the same
4. Somewhat worse
5. A great deal worse

Table 2 shows that a majority of Romanians believed that their financial situation deteriorated during 2000. Almost half, however, said that their situation either improved or remained about the same over the past year. Interesting, among those who said their situation remained about the same, the average increase in income was only 7.3 percent, far below the official inflation rate of 39.9 per cent. Indeed, even among those who reported that their situation improved, the average increase in income of 26.3 percent was well below the official inflation rate. These

percentages indicate that Romanians do not think that they need an income increase as large as the recorded increase in the CPI to maintain their standard of living.

[INSERT TABLE 2 ABOUT HERE]

The pattern of beliefs regarding changes in economic well-being is consistent with the general patterns in transition. Younger respondents, those under age 45, are substantially more likely to report an improvement in their economic situation (21 percent) than those aged 45 to 60 (15 per cent) or those over 60 (8 percent). Similarly, urban residents are more likely to report an improvement in their condition (23 per cent) than rural residents (17 per cent), while the highest frequency of respondents reporting an improvement occurs in the capital city , Bucharest (34 per cent).

4. Results

Given these results, we performed a grid search over various possible true inflation rates ranging from 0 per cent to 40 per cent. This last value is slightly over the official rate of 39.9 per cent. There is considerable heaping of responses at even multiples of 5 per cent to the question asking for nominal income changes. Over 96 percent of respondents gave an answer that was a multiple of 5 per cent. Therefore, we limited our grid search to these round number inflation rates.⁷ Table 3 presents the results of this exercise. To interpret these results, consider the first row. The numbers show that 304 respondents in the weighted sample reported that their standard of living was better in 2000 than in 1999 and would have had a higher real income if the inflation rate were 0 percent while 555 respondents reported themselves as worse off in 2000 and would have had a lower real income if the inflation rate were 0 per cent. We regard these respondents as correctly classified for a 0 per cent inflation rate.⁸ Similarly the 1 respondent who reported his situation as better off

but who would have had a lower real income with 0 per cent inflation and the 238 respondents who reported themselves as worse off but who would have had a higher real income if inflation were 0 per cent are considered incorrectly classified.

Our objective is to pick the inflation rate that minimizes the number of such incorrect classifications. As is apparent in the table, the lowest number of misclassifications occurs in the range between 5 and 20 per cent. The lowest actual number of misclassifications occurs at a rate of 10 per cent, which is only slightly higher than the 7.3 per cent change in nominal incomes of those who reported their financial situation to be about the same.⁹

[INSERT TABLE 3 ABOUT HERE]

We have tried various modifications of our specification. In particular, results are not changed when we adopt a loss function that weights misclassification by two categories, e.g. reporting one's situation as a great deal better off when real income has actually decline,) as twice as bad a failure as misclassification by only one category. Neither are they changed when individuals whose real income was unchanged are considered misclassified if they reported themselves as either better or worse off. Results do change slightly if we include those who reported their economic well-being as about the same. Including these respondents reduces the misclassification minimizing apparent inflation rate to zero per cent for the year 2000. We prefer a more cautious conclusion and will base further discussion on the results presented in Table 3.¹⁰

It can be seen in Table 3 that many inflation rates lower than the official rate of approximately 40 per cent predict individuals' self-report of changes in their financial well-being better than the official rate. Table 3 does not, however, establish whether this difference in predictive accuracy is statistically significant. Table 4 presents Z statistics and associated

probabilities from a nonparametric test of whether the assumed inflation rates that minimize misclassifications, i.e. 10 per cent and 20 per cent, are significantly better at predicting self reports of changes in economic well-being than various alternative inflation rates. As discussed in the appendix, Antoch and Hanousek (1999), and Hanousek (2000), this test of whether or not one inflation rate dominates the other in terms of predictive accuracy is equivalent to testing for symmetry in the contingency table of correct and incorrect predictions of reported well-being changes between the two alternative inflation rates.

[INSERT TABLE 4 ABOUT HERE]

The pattern of results in Table 4 is quite clear. For both of the suggested true inflation rates, there is no significant difference when compared with each other or with alternative low possible inflation rates. On the other hand, each suggested rate is significantly better at predicting consumers' self-reports of the change in their economic standard of living than any possible alternative inflation rate of 25 per cent per year or more. While there is considerable uncertainty as to the actual best inflation rate, we can confidently rule out any rate greater than 25 per cent per year, which includes the official rate of 40 per cent per year.

Table 5 presents further confirmation that an inflation rate in the range of 10 to 20 percent is consistent with Romanian's self-perception of changes in their economic well-being. For the entire sample, substantially more Romanians report that their standard of living deteriorated than improved during 2000. The self-reports of changes in economic well-being for those who reported a 10 per cent increase in their nominal incomes were, however, symmetric around a modal value of no change in their economic status, with 29 percent reporting an improvement and 28 per cent a worsening. This pattern is consistent with random measurement errors around a true value of

constant economic well-being for those whose incomes increased by 10 per cent. For those with a 20 per cent increase in nominal incomes, the modal respondent reported an improvement in their standard of living.

[INSERT TABLE 5 ABOUT HERE]

5. Interpretation and Conclusions

If we accept the upper bound of 20 percent a year on the true change in the cost of living, the official inflation rate for the year 2000 is twice what Romanians themselves say would be required as an income increase to enable them to maintain their standard of living. At the 8 percent annual increase in income actually received by Romanians who say that their standard of living was about the same year-to-year, the official inflation rate is five times the actual rate. Thus, we provide strong support for the position that conventional inflation measures may be seriously misleading in the context of the transition. These results do not suggest, however, that the Romanian Statistical Office has mismeasured inflation. Indeed, we have provided no evidence that there are inaccuracies in the official measures of changes in consumer prices. Rather, the implication is that conventional measures of price inflation, even when properly calculated, are an especially poor proxy for true changes in consumer welfare in the uncertain transition environment.¹¹

Of course it is possible that self-reports of economic well-being are themselves biased and that Romanians are for some reason misreporting changes in their standard of living. Such would be the case if respondents suffered from severe money illusion and focused on changes in their nominal income rather than their real income. We suspect, however, that a true price increase of 40 per cent in a given year would be hard for consumers to miss. Indeed, given the extensive

documentation in the Romanian press of the problem of inflation, we might expect respondents to overestimate the problem caused by rising prices rather than to suffer from money illusion. Furthermore, the short-time frame over which we conducted the analysis will tend to understate the extent to which conventional inflation measures overstate true changes in consumer well-being. If there are lags in consumers' adjustment to changing relative prices due to adaptive learning behavior and the persistence of habitual consumption patterns, the decline in utility will be greater in the initial period(s) following price shocks, before consumers have fully adjusted their spending patterns, than the eventual decline in utility after appropriate adjustments have been made. Thus, we conclude that the official measure of increases in consumer prices in Romania for the year 2000 overstates substantially the true change in the cost of living faced by Romanian consumers.

The fact that changes in the cost of living in Romania appear to be substantially lower than would be the case if changes in real income were measured using changes in consumer prices has several policy implications. Given the uncertainty that brackets our estimates and the fact that they were produced for only one country and in only one year, it would be inappropriate to interpret these results as a point estimate of the degree of inaccuracy of using conventional CPI measures as indicators of changes in the true cost of living in transition economies. The results strongly suggest, however, that statistical offices in the region should pay more attention to the relationship between inflation as measured by the CPI and true changes in economic well-being. The latter should be calculated and reported whenever possible since our results suggest that the former substantially overstates the latter.

Further work is needed to refine the estimate this overstatement. Nevertheless, policies should be based on changes in economic well-being and not on changes in statistical constructs. To

the extent that it is desirable for wages and public assistance payments to increase in order to compensate recipients for losses due to inflation, differences between these two measures imply that these increases should be smaller than previously supposed. Such reductions will obviously reduce strains on tight local budgets and enable growth-promoting reductions in tax rates. Furthermore, if consumers suffer less from inflation than would be suggested by CPI increases, regional central banks have room to adopt a more accommodating monetary policy, which would have positive implications for investment and rates of growth. the decline in actual utility will be greater

References

- Antoch, Jaromír and Hanousek, Jan, “A Specification Test for Discrete Choice Models.” Discussion Paper 32. Prague: CERGE-EI, Nov.1999.
- Anderson, Erling, B., *The Statistical Analysis of Categorical Data (3rd ed.)*. Berlin: Springer-Verlag, 1994.
- Brada, Josef C., King, Arthur E. and Kutan, Ali Muhammad, “Inflation Bias and Productivity Shocks in Transition Economies: The Case of the Czech Republic.” *Economic Systems*. 24, 2: 119-138, June 2000.
- Filer, Randall K. and Hanousek, Jan, “Output Changes and Inflationary Bias in Transition.” *Economic Systems*. 24, 3:285-294, Sept. 2000.
- Gibbons, Jean D., *Nonparametric Methods for Quantitative Analysis (3rd ed.)*. Columbus, Ohio: American Sciences Press, 1997.
- Hanousek, Jan, “Note on Specification Tests of (Binary) Choice Models: A Non-Parametric Approach.” *Central European Journal of Operation Research*. 8, 3:259-264, Nov. 2000 .
- Hanousek, Jan and Filer, Randall K., “Consumers’ Opinion of Inflation Bias Due to Quality Improvements in Transition in the Czech Republic.” Working Paper 184. Prague: CERGE-EI

Aug. 2001.

Koen, Vincent and De Masi, Paula, "Prices in Transition: Ten Stylized Facts." Working Paper 97/158. Washington: IMF, Nov. 1997.

Krueger, Alan, B. and Siskind, Aaron, "Using Survey Data to Assess Bias in the Consumer Price Index," *Monthly Labor Review*. **121**, 4:25-33, April 1998.

National Bank of Romania. *Monthly Bulletin*. January 2001.

Nordhaus, William D., "Quality Changes in Price Indexes." *Journal of Economic Perspectives*. **12**,1: 59-68, Winter 1998.

Serfling, Robert J., *Approximation Theorems of Mathematical Statistics*. New York: Wiley, 1980.

Zvára, Karel, "True Level of the Tests about the Parameters in the Binomial Distribution." *Bulletin of the Czech Statistical Society*. **6**, 4:27-31, Nov. 1995.

Table 1
Contingency Table for Misclassification Analysis

	Reported Standard of Living Risen s^+	Reported Standard of Living Fallen s^-
Real Income Risen r^+	n^{++}	n^{+-}
Real Income Fallen r^-	n^{-+}	n^{--}

Table 2.
Average Income Change by Reported Change in Standard of Living

Standard of Living in 2000	Weighted No. of Observations	Weighted Average Income Change
A Great Deal Better Than 1999	50	49.7%
Somewhat Better Than 1999	255	21.7%
About the Same as 1999	415	7.3%
Somewhat Worse Than 1999	486	-8.4%
A Great Deal Worse Than 1999	307	-20.2%
TOTAL	1513	0.5%

Table 3
Relationship between Reported Well-Being and Changes in Real Income for Various Inflation Levels

ASSUMED INFLATION	Correctly classified			Incorrectly classified		
	BETTER	WORSE	TOTAL	BETTER	WORSE	TOTAL
0	304	555	859	1	238	239
5	282	604	885	23	190	213
10	260	652	912	45	142	186
15	199	692	891	106	101	207
20	177	723	900	128	71	198.22
25	130	738	868	175	55	230
30	100	759	859	205	34	239
35	66	771	836	239	23	262
40	59	778	837	246	15	261

Note: All outcomes were weighted in order to obtain a fully representative sample of Romanian population. Figures presented are rounded to the nearest integer and may not sum to the total sample due to rounding errors.

Table 4
Tests of Significance of Differences in Predictive Accuracy for Various Inflation Rates

	Predictive Accuracy of 10% Rate	Predictive Accuracy of 20 % Rate
Tested Against 0% Rate	2.57 (p=.01)	1.96 (p=.05)
Tested Against 5% Rate	3.12 (p=.001)	0.96 (p=.169)
Tested Against 10% Rate	n.a.	0.98 (p=.171)
Tested Against 15% Rate	2.01 (p=.022)	0.96 (p=.119)
Tested Against 20% Rate	0.95 (p=.171)	n. a.
Tested Against 25% Rate	2.97 (p=.001)	4.03 (p=.000)
Tested Against 30% Rate	3.20 (p=.000)	3.80 (p=.000)
Tested Against 35% Rate	4.25 (p=.000)	5.02 (p=.000)
Tested Against 40% Rate	4.10 (p=.001)	4.73 (p=.000)

Table 5
 Distribution of Reported Change in Standard of Living
 for Various Nominal Income Changes

Standard of Living in 2000	Number of Observations for Full Sample	Number of Observations for Those Reporting a 10% Change in Income	Number of Observations for Those Reporting a 20% Change in Income
A Great Deal Better Than 1999	51 (3.4%)	4 (1.9%)	2 (1.7%)
Somewhat Better Than 1999	254 (16.8%)	56 (27.1%)	45 (37.2%)
About the Same as 1999	425 (28.9%)	89 (43.0%)	42 (34.7%)
Somewhat Worse Than 1999	484 (32.0%)	37 (17.9%)	23 (19.0%)
A Great Deal Worse Than 1999	299 (19.8%)	21 (10.1%)	9 (7.4%)
TOTAL	1513	207	121

Appendix

A Nonparametric Test of the Significance of Differences in Predictive Accuracy

The following nonparametric test is used to determine whether there is a significant difference in the accuracy of two different inflation rates. See Antoch and Hanousek (1999) and Hanousek (2001) for more details. The joint distribution of correct and incorrect predictions of economic status is summarize by the following contingency table:

	Inflation Rate 2 Predicts Correctly	Inflation Rate 2 Predicts Incorrectly	Σ
Inflation Rate 1 Predicts Correctly	n_{11}	n_{12}	n_{1x}
Inflation Rate 1 Predicts Incorrectly	n_{21}	n_{22}	n_{2x}
Σ	n_{x1}	n_{x2}	n

The hypothesis of whether or not one method dominates the other in terms of predictive accuracy is equivalent to testing for symmetry in the contingency table.

The frequencies in contingency tables represent a sample from the multinomial distribution with four categories and related probabilities equal to p_{11} , p_{12} , p_{21} , and p_{22} . The test of the null hypothesis $H_0: p_{11} = p_{22}$ is a test of whether the probability of correct prediction is the same for both models. In the 2 x 2 framework, this is equivalent to $H_0: p_{12} = p_{21}$. Using well-known results for the multinomial distribution, we obtain the conditional distribution of n_{12} and n_{21} given n_{11} and n_{22} as follows:

$$Pr(n_{12}, n_{21} | n_{11}, n_{22}) = \frac{(n - n_{11} - n_{22})!}{n_{12}! n_{21}!} \left(\frac{p_{12}}{1 - p_{11} - p_{22}} \right)^{n_{12}} \left(\frac{p_{21}}{1 - p_{11} - p_{22}} \right)^{n_{21}} \quad (1)$$

For fixed n , n_{11} and n_{22} , it must be the case that $n - n_{11} - n_{22} = n_{12} + n_{21}$, and, analogously, $1 - p_{11} - p_{22} = p_{12} + p_{21}$. Under the validity of the null hypothesis, $p_{12} = p_{21}$, and, therefore,

$$p_{12} / (p_{12} + p_{21}) = p_{21} / (p_{12} + p_{21}) = \mathcal{Z}.$$

Hence, (1) reduces to:

$$Pr(n_{12}, n_{21} | n_{11}, n_{22}) = \binom{n_{12} + n_{21}}{n_{12}} \left(\frac{1}{2} \right)^{n_{12} + n_{21}}, \quad (2)$$

which is a binomial distribution with parameters $n_{12} + n_{21}$ and \mathcal{Z} . Then the test statistic is:

$$\chi^2 = \frac{[n_{12} - (n_{12} + n_{21})/2]^2}{(n_{12} + n_{21})/2} + \frac{[n_{21} - (n_{12} + n_{21})/2]^2}{(n_{12} + n_{21})/2} = \frac{(n_{12} - n_{21})^2}{n_{12} + n_{21}}, \quad (3)$$

which, under the null hypothesis, has an asymptotically χ^2 distribution with one degree of freedom. The proof follows from the central limit theorem and the distribution of quadratic forms (Anderson, 1994 and Serfling, 1980).¹² We would get the identical test statistic using the central limit theorem approximation of the binomial distribution. Indeed, consider:

$$Z = \frac{\hat{p}_{12} - \hat{p}_{21}}{\sqrt{\hat{p}(1 - \hat{p}) \left(\frac{1}{n_{1x}} + \frac{1}{n_{x1}} \right)}} = \frac{\frac{n_{12}}{n_{1x}} - \frac{n_{21}}{n_{x1}}}{\sqrt{\frac{(n_{12} + n_{21})(n_{11} + n_{22})}{n^2} \left(\frac{1}{n_{1x}} + \frac{1}{n_{x1}} \right)}} \sim N(0, 1). \quad (4)$$

Because $Z^2 = \chi_1^2$, the test statistics described by (3) and (4) are equivalent.¹³

NOTES

1. This research was supported in part by grants P97-8119-R from the PHARE/ACE program of the European Union and II/75831 from the Volkswagen Foundation.

2. As has become conventional, we use the term “bias in inflation measures” somewhat inappropriately to mean the difference between the conventionally measured changes in consumer prices and a true cost of living index indicating the change in incomes needed to enable consumers to maintain constant utility levels.

3. Krueger and Siskind use 27 years between 1968 and 1995.

4. In preparation for European Union accession, Romania’s National Institute of Statistics has received considerable technical assistance from the EU’s PHARE program including various twinning arrangements with West European statistical agencies.

5. These data are from National Bank of Romania, (2001), Table 2. Original data were provided by National Institute of Statistics and Economic Studies of Romania.

6. The questions were added to the March 2000 Omnibus Survey conducted by the market research firm Mercury. We were referred to this firm through corporate supporters of CERGE-EI who use them for survey work in Romania. The omnibus survey provides a representative sample of urban and rural Romanian households stratified on urbanization level. Households are selected using a random route (Kish method) with random starting points. Respondents within selected households are chosen using a random method based on birthdays. All interviews are conducted in person and between 25 and 50 percent are verified by follow-up questioning either in the field or by telephone. In addition to the responses to our questions, we were provided with full demographic data on respondents and weights to enable adjustment of sample respondents to

national norms by age, gender, region and income level. The raw sample is divided evenly between men and women and reflects accurately the age distribution in Romania (29 percent aged 15 - 29, 27 percent 30 to 44, 25 percent 45 - 59 and 20 percent 60 or older). Results reported below use weighted observations in which the importance assigned to each individual observation is adjusted by a ratio correction based on these characteristics. Unweighted results are always almost exactly the same as the weighted results and are available from the authors on request.

7. A search over all inflation rates yields similar results with very small changes in misclassifications between multiples of 5 per cent. Results for all inflation levels are available at <http://195.113.12.52/hanousek/romania/default.htm>.

8. The analysis of correct and incorrect classification is based on those who reported their standard of living as better or worse in 2000 than in 1999 and ignores those who reported their situation as about the same. In the grid search, we must, therefore, decide how to classify those whose reported nominal income change exactly matches the inflation rate being used. We have classified those with a nominal income change equal to the assumed inflation rate as correctly classified if they report their financial situation as somewhat better or somewhat worse and incorrectly classified if they report their situation as a great deal better or a great deal worse. Assuming that all of these cases are incorrectly classified, recalculation does not change the results.

9. The existence of local minima at both 10 per cent and 20 per cent might seem somewhat odd. Recall, however, that a respondent who reported a nominal income change of 10 per cent will be deemed correctly classified if he reported his financial situation as either somewhat better or

somewhat worse when analyzing a 10 per cent assumed inflation rate. Thus, the number of correct classifications will depend in part on the number of observations at that rate. There were 207 respondents who reported a 10 per cent increase in their nominal income and 121 who reported a 20 per cent increase. This contrasts with only 62 respondents who reported a 15 per cent increase in their nominal income.

10. Results from all of the alternative specifications are available at

<http://195.113.12.52/hanousek/romania/default.htm>.

11. Such a large discrepancy is consistent with results in Hanousek and Filer (2001) who find that Czech consumers believe that almost half of the reported inflation rate during the first decade of transition is due to unmeasured improvements in the quality of the goods and services they purchase.

12. Although formally the χ^2 test holds only asymptotically, it is well-established that this approximation works very well if $(n_{12} + n_{21}) \geq 8$ (Gibbons, 1997).

13. In the literature, several modifications of the test statistics (3) and (4) have been suggested based on an arcsin transformation that stabilizes the variance. However, it has been shown in Monte Carlo simulations that these arcsin transformations for sample sizes ≤ 100 cannot be used in practice. For an extensive simulation study, see Zvára (1995).