A STUDY ON INFLATION CREDIBILITY AMONG STUDENTS AT THE UNIVERSITY OF PRETORIA

Jannie Rossouw
SA Reserve Bank and Department of Economics, University of Pretoria
Vishnu Padayachee
SA Reserve Bank

Abstract

Following on five pilot studies on inflation credibility in South Africa aimed at the construction of inflation credibility barometers and a literature review of the international measurement of inflation perceptions, this paper reports the findings of a study on inflation credibility among 493 students at the University of Pretoria. Credibility barometers are reported for different genders, for Asians, blacks, coloureds and whites, and for students in different faculties. The main conclusions are that the inflation perceptions by the different genders in this study do not correspond with international experience in this regard; international use of inflation barometers will ensure comparability of inflation credibility; and that inflation-targeting countries should sample inflation credibility and calculate an inflation credibility barometer.

JEL E31, E52, E58

1 Introduction

There is nothing ambiguous about the conduct of monetary policy in countries targeting inflation, because the central banks in such countries adjust monetary policy to achieve their inflation targets. Owing to the forward-looking nature of such a policy and uncertainty about the achievement of their targets, central banks in inflation-targeting countries have generally adopted three measures of support for their policy frameworks (Rossouw, 2005: 295): inflation forecasting, explanation or escape clauses, and the measurement of inflation expectations. Broadly speaking, the first two measures fall within the sphere of control of the authorities, but inflation expectations are not within their immediate control (Mishkin, 2004: 419). Inflation expectations are formed over time by consistent policy application, and are monitored by means of inflation opinion surveys. In South Africa, the survey results are published bi-annually in the *Monetary Policy Review* (S. A. Reserve Bank, 2006: 30, 31).

Whereas the monitoring and measurement of inflation expectations have received considerable attention (see, for instance, Bryan & Ventaku, 2001a; De Wet, 2003; Kershoff & Smit, 2002; Mishkin, 2004; Saunders, 2003; Sveriges Riksbank, [S.a.]), the measurement of the public's perceptions of the credibility of inflation figures as an anchor for expectations has received little attention in related literature. This paper contributes to the existing literature by reporting on the use of inflation credibility barometers to measure inflation credibility in South Africa. An inflation credibility barometer measures out of 100 the degree of acceptance of inflation figures by respondents as an accurate reflection of price increases.

Section 2 of this paper provides an analysis of the salient features of the international measurement of inflation perceptions. Section 3 comprises an overview of the findings of five domestic pilot studies on inflation credibility.

Section 4, the main part of this paper, discusses the methodology for and findings of this study measuring inflation credibility among students at the University of Pretoria. Section 5 presents the conclusions and recommendations arising out of this study.

2
Review of literature on the measurement of inflation perceptions

A review of the literature revealed the measurement of inflation perceptions by the Swedish Riksbank (the central bank of Sweden), the European Union (EU), the Reserve Bank of New Zealand and the Federal Reserve Bank of Cleveland (Bechtold & Linz, 2005; Bryan & Ventaku, 2001b; Cigan, 2005; European Central Bank, 2005; Howard, 2005; Palmqvist & Stromberg, 2004; Reserve Bank of New Zealand, 2005). Mexico uses the international ISO 9001 and ISO 9002 certification to confirm the technical accuracy of the measurement of its inflation figures (Banco de Mexico, [S.a.]), rather than as a measurement of inflation perceptions, and is therefore not considered in this paper.

Despite further literature reviews, no other examples of the international measurement of inflation perceptions could be identified. Accordingly, the salient features of measuring inflation credibility or perceptions in Sweden, New Zealand and the European Union, and those used previously by the Federal Reserve Bank of Cleveland, are summarised in Table 1. The Federal Reserve Bank surveyed perceptions monthly up to April 2002 as part of a poll conducted by the Ohio State University for the *Columbus Dispatch* newspaper. When the newspaper decided not to renew the research contract with the University, the bank also concluded its survey (Bryan, 2006).

The literature review reveals considerable diversity in the approaches followed by the countries and jurisdictions, with two important implications for research on inflation credibility. First, the measurement and reporting of inflation perceptions in different countries and jurisdictions cannot be compared internationally, owing to differences in the measurement techniques employed. Secondly, a broad research project measuring and reporting inflation perceptions for a country or region should provide for the separate reporting of the inflation perceptions of male and female respondents.

The literature reports higher inflation perceptions among female respondents than among male respondents. In this regard, Jonung (1981: 968) states that "…the inflation rates perceived by women should be more strongly influenced by food prices than the rates perceived by men. The difference between men and women apparently indicates that perceived rates are influenced by individual expenditure patterns". This view is supported by Del Giovane and Sabbatini (2005: 4) and by Brachinger, who states that the consumer "…will perceive inflation the more powerfully the more often she buys goods which have become significantly more expensive. In contrast, she will barely notice a reduction in the price of goods she rarely buys, or of goods which she acquires without explicitly purchasing them and whose price is deducted every month from her bank account … " (2005: 1).

In the case of the Federal Reserve Bank of Cleveland, the finding was that "…men and women hold very different views on the rate at which prices are changing" (Bryan & Ventaku, 2001b: 1). This concurs with the findings of Jonung (1981: 968) and Brachinger (2005: 1) on differences in perceived inflation between genders. However, in the case of Cleveland, women still perceived historic inflation as 1,9 percentage points higher than did men, even after adjustments to account for differences in education levels, income, age, race, education and income (Bryan & Ventaku, 2001b: 1). The conclusion of Bryan and Ventaku (2001b) that the differences in inflation perceptions between genders cannot be explained differs considerably from those of Jonung (1981: 968) and Brachinger (2005: 1) in respect of Sweden.

Table 1
Comparison of measures used for assessing inflation perceptions

	Cleveland	European Union	New Zealand	Sweden
Frequency of samples	Monthly*	Monthly	Quarterly	Monthly
Sample size	421**	21 000	1 000	2 100
Anonymity in sampling	Y	Y	Y	Y
Distinction between perceptions of genders	Y	N	N*****	Y
Measure perception of historic inflation rate	Y	Y	Y	Y
Calculate and publish a confidence interval	Y***	N****	Y******	N

* The survey was conducted monthly for the period spanning August 1998 to April 2002.

** The sample size varied a little, but it averaged 421 respondents per month.

*** The Federal Reserve Bank of Cleveland did not calculate or publish a confidence interval. However, based on information obtained from the bank (Bryan, 2006), a confidence interval could be calculated. The mean of the perceptions on inflation for the full sample was 5**,8**, with a standard deviation of 10,2 for the average sample size of 421. Using the formula $\bar{x} - 1,645\frac{\sigma x}{\sqrt{n}} \leq \mu_x \leq \bar{x} - 1,645\frac{\sigma x}{\sqrt{n}}$, this implies a confidence level of 90% for the population.

**** Confidence interval depends on individual sampling procedure, which differs across countries in the European area (Cigan, 2005).

***** No distinction is made in terms of the measurement of perceptions according to gender in the survey process, but inflation perceptions are reported for various demographic groups, including gender (Campbell, 2006).

****** Confidence interval calculated but not published (Campbell, 2006).

Sources: Brachinger, 2005; Bryan, 2006; Bryan and Ventaku, 2001b; Campbell, 2006; Cigan, 2005; Jonung, 1981; Ribe, 2006.

The next section highlights the findings of five of the pilot studies on inflation credibility in South Africa.

3
Findings of five pilot studies on domestic inflation credibility

The research reported in Section 4 of this paper on students at the University of Pretoria was preceded by five pilot studies on inflation credibility. Salient features of four of the pilot studies were documented and reported in recent articles in the *South African Journal of Economics* (Rossouw & Joubert, 2005a), and in the *South African Journal of Economic and Management Studies* (Rossouw & Joubert, 2005b). The first four domestic pilot studies addressed and answered the questions posed in Table 2.

Table 2
Questions raised and answers obtained from the first four pilot studies on inflation credibility in South Africa

Question raised	Answer obtained
Can an inflation credibility barometer be calculated?	An inflation credibility barometer can be calculated.
Do respondents generally accept inflation figures as accurate?	Respondents do not necessarily accept the inflation figures as accurate.
Do respondents have a clear understanding of the meaning and measurement of inflation, or is more information required?	Dissemination of information improves the understanding of inflation and increases the credibility of inflation figures.
What is the optimal scope of a questionnaire to be used in measuring inflation credibility?	A short questionnaire should be used for measuring inflation credibility.
Which particular measurement of inflation (CPI or CPIX) shows a higher degree of credibility?	Changes in the CPI have measured a higher reading on the inflation barometer and should be used for sampling inflation credibility

Sources: Rossouw and Joubert, 2005a; Rossouw and Joubert, 2005b

These first four pilot studies did not consider any possible gender differences in inflation credibility highlighted in international measurement of inflation perceptions. It was therefore decided to conduct a fifth pilot study, the results of which have not previously been published, in order to ascertain differences in the credibility of inflation between genders in South Africa. Moreover, given the composition of South Africa's population, a further aim was to ascertain differences in inflation credibility among Asians, blacks, coloureds and whites.

As this pilot study was conducted during the planning stage of the study among university students reported in the next section, an additional objective was to ascertain whether these respondents could be used as enumerators in the next study. Exposure as sample respondents would have provided them with insight into the use of the questionnaire, as it was used in the fifth pilot study and the study among university students.

Briefly stated, the findings of the fifth study were that inflation credibility differs between genders and among Asians, blacks, coloureds and whites. Moreover, as participants in the fifth pilot study experienced no difficulty in completing the questionnaire, they could be regarded as suitable for use as enumerators in the study among university students, reported in the next section.

4
Sampling inflation credibility among students at the University of Pretoria

In view of the selection of respondents (students at the University of Pretoria), it was necessary to obtain approval from the Ethics Committee of the Faculty of Economic and Management Sciences and the Dean of Student Affairs to conduct the study at the University of Pretoria.

Following the literature review on the measurement of inflation perceptions, and basing the approach on the results of the five pilot studies, the sampling of the credibility of the CPI was undertaken by means of a short questionnaire (attached as Annexure A). The objectives of this study were to ascertain:

- whether an inflation credibility barometer provides more user-friendly results than the measurement methodology followed in other countries and jurisdictions;
- whether respondents studying in different faculties demonstrate differences in their perceptions of the accuracy of the official rate of inflation;
- gender differences in inflation perceptions in South Africa; and

- differences in inflation perceptions by Asians, blacks, coloureds and whites in South Africa.

As respondents sampled in the fifth pilot study were used as unsupervised enumerators in this survey, enumerators could not be prevented from personally completing more than one or even all the questionnaires, which might cast some doubt on the validity of the results of this study. It was also impossible to ascertain whether respondents provided responses to more than one enumerator, which means that the response of one respondent might have been recorded and analysed more than once.

Responses from 497 respondents were submitted. However, the responses by four "respondents" were clearly photocopies of the same original, and were discarded for purposes of analysing this survey. Moreover, seven respondents preferred not to identify themselves as Asian, black, coloured or white. Their questionnaires were consequently discarded for purposes of calculating inflation credibility barometers, other than in respect of the University's faculties, highlighted in Table 5 below, and in the calculation of confidence intervals. The overall credibility barometer reads 52,7 out of a possible 100, as 256 respondents out of a sample of 486 accepted the CPI as an accurate indication of price increases. The details of the responses are highlighted in Table 3.

Table 3
Responses by Asians, blacks, coloureds and whites in South Africa

	Number of respondents	Barometer
Asian	54	53,7 (29/54)
Black	221	51,6 (114/221)
Coloured	32	56,3 (18/32)
White	179	53,1 (95/179)
Total	486	52,7 (256/486)

The barometer readings for Asians, blacks, coloureds and whites are broadly similar, ranging from 51,6 for blacks to 56,3 for coloureds, although this figure is based on a relatively small sample in the last instance. The details of the responses are highlighted in Table 4.

Contrary to findings in Sweden and by the Federal Reserve Bank of Cleveland, the inflation credibility barometer reading for female respondents is higher than that of male respondents: 54,3 for this group of female respondents, as compared with 51,0 for the male respondents. The barometer ranges from 45,5 at the lower end for coloured males and 61,9 for coloured females, albeit for relatively small samples in both cases.

Table 4
Distribution of inflation credibility barometers in sub-samples according to gender in terms of Asians, blacks, coloureds and whites

	Male			Female		
	Accurate	Not accurate	Total	Accurate	Not accurate	Total
Sub sample	123	118	241	133	112	245
Asian	20	15	35	9	10	19
Black	55	47	102	59	60	119

Coloured	5	6	11	13	8	21
White	43	50	93	52	34	86
	Credibility barometer			Credibility barometer		
Sub sample	51,0 (123/241)			54,3 (133/245)		
Asian	57,1 (20/35)			47,4 (9/19)		
Black	53,9 (55/102)			49,6 (59/119)		
Coloured	45,5 (5/11)			61,9 (13/21)		
White	46,2 (43/93)			60,5 (52/86)		

The barometer reflecting responses from the nine faculties at the University of Pretoria is summarised in Table 5. In this instance, the responses of the seven respondents who did not select an indication of Asian, black, coloured or white are included. The credibility barometers of these respondents show that the highest reading was obtained from theology students and the lowest reading from veterinary science students. However, the samples of students from these two faculties are so small that no conclusions can be drawn. In respect of larger samples (i.e. n > 30; see Wegner, 1993: 197) of respondents from specific faculties, the highest credibility is measured amongst students in the Faculty of Economic and Management Sciences and the lowest amongst law students. This finding confirms a positive relationship between knowledge and information and inflation credibility, insofar as it can be assumed that students studying in the fields of accounting, economics, finance and management sciences will be the best informed on inflation and the accuracy of its measurement.

The literature review showed that the Federal Reserve Bank of Cleveland reported inflation perceptions with a 90% confidence interval, based on the formula:

$$\bar{x} - 1,645\,\frac{\sigma x}{\sqrt{n}} \leq \mu_x \leq \bar{x} - 1,645\,\frac{\sigma x}{\sqrt{n}}$$

(Bryant, 2006).

The same confidence interval was calculated for the respondents in the broad sample.

Table 5

Inflation credibility barometer of CPI figures according to faculty, based on acceptance of CPI figures by respondents

	Number of respondents			**Barometer**
	Accurate	Not accurate	Total	
Economic and Management Sciences	143	115	258	55,4
Education	14	8	22	63,6
Engineering, the Build Environment and Information Technology	33	36	69	47,8
Health Sciences	13	12	25	52,0
Humanities	5	7	12	41,7
Law	18	21	39	46,1
Natural and Agricultural Sciences	30	29	59	50,8
Theology	30	29	59	75,0
Veterinary Science	2	3	5	40,0
Total/weighted average	261	232	493	52,9

Sampling techniques aim at limiting errors in results when the opinions of a sample of a population are obtained. This is to ensure that the results reflect as closely as possible the opinions or views of the entire population (Wikipedia, [S.a.]), in this case students at the University of Pretoria. To this end, confidence intervals provide an estimate of the possible size of any error in sampling data, highlighting the degree or level of accuracy or confidence in the statistical estimates. Confidence intervals are dependent on:

- a value of a statistical estimate;
- the standard error (SE) of the measure; and
- the required size of the confidence interval (for example, a 90% confidence interval), implying that it can be declared with the relevant degree of certainty that the results obtained from the sample reflect the view of the population from which the sample was drawn.

For the purpose of calculating a 90% confidence interval, the following information was used:

number of observations in the sample	(n)	493
number of successes	(x)	261
proportion	(p)	$261 \div 493 = 0{,}529$; $\therefore q = 0{,}471$
standard error	(SE)	$\sqrt{\frac{0{,}529 \times 0{,}471}{493}} = 0{,}0224$
normal probability distribution	(z)	1,645 for a 90% confidence interval

The confidence interval at a level of 90% is calculated as $[0{,}529 - 1{,}645\ (0{,}0224)] \leq \prod \leq [0{,}529 + 1{,}645\ (0{,}0224)]$
$0{,}4922 \leq \prod \leq 0{,}5658$

This implies that there is a 90% probability that the percentage of students at the University of Pretoria who believe that the official rate of inflation is an accurate indication of price increases lies between 49,2% and 56,6%, which gives an inflation credibility reading of between 49,2 and 56,6.

The next section highlights the conclusions and recommendations.

5
Conclusions and recommendations

The first conclusion is that the inflation credibility barometer delivers more user-friendly results than those resulting from the approaches followed internationally, inasmuch as it (i) provides an immediate indication of the degree of acceptance of the accuracy of current inflation data; (ii) highlights any change in the degree of such acceptance over time at each occasion of measurement; (iii) is easily comprehended by the general public; and (iv) provides for international comparison of inflation credibility.

Secondly, this study reports a great difference in credibility among students in different faculties. As far as the faculties represented by larger samples ($n > 30$) are concerned, it has been confirmed that knowledge and information enhance the credibility of inflation figures.

The third conclusion is that inflation perceptions differ between genders, but the findings of Brashinger (2005), Bryan and Ventaku (2001 b) and Jonung (1981) that women attach less credibility to inflation figures than men do, was not confirmed by this study. On the contrary, the inflation credibility barometer for female respondents read 54,3, as opposed to a reading of 51,0 for male respondents. This sample was conducted among students, particularly female students, who are normally not responsible for purchasing food or other goods for larger households, but have spending patterns corresponding with those of their male counterparts. This finding casts doubt on the conclusion by Bryan and Ventaku that "…it does not appear that women have a higher perception of inflation than men because of the things they buy …" (2001b: 4), and supports Jonung's conclusion that "… women are responsible for the major share of the food purchases … (implying that) … they are more exposed to movements in food prices than men" (1981: 968). However, Jonung's statement covers surveys of genders with different spending

patterns, as opposed to the respondents with similar spending patterns, irrespective of gender, covered by this survey.

The last conclusion is that there are differences in the inflation perceptions by Asians, blacks, coloureds and whites in South Africa.

The first recommendation is that countries using inflation targets should consider measuring the credibility of their inflation figures by means of an inflation barometer serving as an early indication of any possible de-linking of inflation expectations from the current rate of inflation. This instrument is recommended on account of its accessibility for understanding and use. It would also be in the interests of international comparability, as opposed to the measurement tools currently deployed, the results of which cannot be compared among countries or jurisdictions.

The second recommendation is that countries following inflation-targeting policies should support their policy initiatives by means of communication strategies aimed at improving the general level of understanding of inflation and its measurement, seeing that this study records a positive link between knowledge, information and inflation credibility.

Endnote

The opinions and views expressed in this paper are those of the authors and do not necessarily represent those of either the Reserve Bank or of the universities.

References

1 BANCO DE MEXICO [S.a.] http://www.banxico.org.mx/inpc/ (Accessed 23 June 2005) Translation assistance by Ms I Gaspar, S A Reserve Bank.

2 BECHTOLD, S. & LINZ, S. (2005) "Enhancing the credibility of the consumer price index", http://www.oecd.org/dataoecd/22/46/35281409.pdf (Accessed 9 November 2005).

3 BRACHINGER, H.W. (2005) "*Measuring perceived inflation: A prospect theory approach*", International Statistical Institute, Voorburg, the Netherlands, 55th session, Sydney, Australia, 5-12 April.

4 BRYAN, M.F. (2006) Personal communication by E-mail, Mr Michael Bryan, Vice President and Economist of the Federal Reserve Bank of Cleveland. michael.f.bryan@clev.frb.org, 21 February.

5 BRYAN, M.F. & VENTAKU, G. (2001a) "The curiously different inflation perspectives of men and women", *Economic Commentary*, Federal Reserve Bank of Cleveland, November.

6 _____ (2001b) "The demographics of inflation opinion surveys", *Economic Commentary*, Federal Reserve Bank of Cleveland, October.

7 CAMPBELL, A. (2006) Personal communication by E-mail, Ms Alison Campbell, PA to Board of Directors and Communications Team, Reserve Bank of New Zealand, Alison.Campbell@rbnz.govt.nz, 27 January.

8 CIGAN, H-R. (2006) Personal communication by E-mail, Ms Heidi Cigan of the Economic and Financial Unit at Monetary Affairs of the European Commission. at Heidi-Renata.CIGAN@cec.eu.int, 20 January.

9 DE WET, W.A. (2003) "Thinking like a Governor: central banking under an inflation target", *The South African Journal of Economics*, 71(4).

10 DEL GIOVANE, P. & SABBATINI, R. (2005) "The introduction of the Euro and divergence between officially measured and perceived inflation: the case of Italy", paper presented at the OECD seminar on Inflation Measures: Too High - Too Low - Internationally Comparable? Paris, 21-22 June.

11 EUROPEAN CENTRAL BANK (2002) *Monthly Bulletin*, July.

12 _____ (2005) *Monthly Bulletin*, April.

13 HOWARD, G. (2005) Personal communication by E-mail, Mr Graham Howard of the Reserve Bank of New Zealand, Graham.Howard@rbnz.govt.nz, 20 June.

14 JONUNG, L. (1981) "Perceived and expected rates of inflation in Sweden", *American Economic Review*, 71 (5).

15 KERSHOFF, G.J. & SMIT, B.W. (2002) "Conducting inflation expectation surveys in South Africa", *The South African Journal of Economics*, 70(3).

16 MISHKIN, F.S. (2004) *The Economics of Money, Banking and Financial Markets*, (7th ed.) Addison-Wesley Publishing Company, Inc: USA.

17 PALMQVIST, S. & STROMBERG, L. (2004) "Households' inflation opinions – A tale of two surveys", *Economic Review*, 4, http://www.riksbank.com/upload/ Dokument_riksbank/Kat_publicerat/Artiklar_PV/ER04_2.pd (Accessed 19 July 2005).

18 RESERVE BANK OF NEW ZEALAND (2005) "J5 Marketscope survey - expectations of inflation" http//.www.rbnz.govt.nz (Accessed 8 June 2005).

19 RIBE, M. (2006) Personal communication by E-mail, Mr Martin Ribe, Senior Statistician, Swedish Riksbank, at martin.ribe@scb.se, 9 February.
20 ROSSOUW, J. (2005) "Monetêre beleid in Suid-Afrika sedert 1965: die vordering vanaf direkte beheer tot inflasieteikens", *Tydskrif vir Geesteswetenskappe*, Suid-Afrikaanse Akademie vir Wetenskap en Kuns, 45(2), Junie.
21 ROSSOUW, J. & JOUBERT, F. (2005a) "A perspective on inflation credibility", *South African Journal of Economic and Management Science*, 8 (4), December.
22 _____ (2005b) "Supporting an inflation targeting policy with the measurement of inflation credibility", *The South African Journal of Economics*, 73(2), June.
23 S. A. RESERVE BANK (2006) *Monetary Policy Review*, May.
24 SAUNDERS, S. (2003) "The experience of inflation targeting in Australia: lessons for South Africa", *The South African Journal of Economics*, 71(2), June.
25 SPECKMAN, M.T. (2006) Personal communication by E-mail, Prof McGlory T. Speckman, Dean of Student Affairs, University of Pretoria, at m.speckman@up.ac.za, 9 May.
26 SVERIGES RIKSBANK [S.a.] "Inflation expectations", http://www.riksbank.com/ templates/ Page.aspx?id=10551 (Accessed 1 July 2005).
27 WEGNER, T. (1993) *Applied Business Statistics: Methods and Application*: Juta & Co, Ltd.
28 WIKIPEDIA [S.a.] "The free encyclopedia", http://en.wikipedia.org/wiki/ Confidence_interval (Accessed 19 January 2006).

Annexure A

Questionnaire

Department of Economics, University of Pretoria

Researcher: Jannie Rossouw Tel number: (012) 315 5420

Participation in this questionnaire is voluntary and participants can withdraw at any time, in which case their data will be destroyed. Anonymity of participants is assured and information will be treated as confidential. Completion of the attached form will be considered to be your informed consent to participation in this project. The contents of this questionnaire must be kept absolutely anonymous. Do not write your name on this form.

This is a research project to establish the credibility of published official inflation figures.

Please answer the questions by making a cross [x] in the block of your choice

1.	**Gender**		Mark with a cross [x]
	Male	1	
	Female	2	
2.	**Preferred population group**		
	Asian	1	
	Black	2	
	Coloured	3	
	White	4	
3.	**Faculty**		
	Economic and Management Sciences	1	
	Education	2	
	Engineering, the Build Environment and Information Technology	3	
	Health Sciences	4	
	Humanities	5	
	Law	6	
	Natural and Agricultural Sciences	7	
	Theology	8	
	Veterinary Science	9	
4.	**South Africa's official rate of inflation (CPI) was 3,9 % in February 2006. Is this a true reflection of price increases?**		
	Yes	1	
	No	2	