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On the Effects of Inflation Shocks in a Small Open Economy

Sushanta K. Mallick† and Mohammed Mohsin‡*
† School of Business and Management, Queen Mary, University of London
‡ Department of Economics, The University of Tennessee

Abstract

The effects of monetary policies remain always an important topic in macroeconomics. In the literature (closed and open economy), there is no theoretical as well as empirical consensus regarding the effects of monetary policies. In this paper we examine the real effects of inflation in an open economy. Australia is a classic example of a small open economy and is known to exercise inflation targeting. Using quarterly data from Australia and employing vector autoregressive (VAR) analysis, we provide evidence that inflation, both in the short and long run, negatively affects durable and non-durable consumption and investment, and has a positive effect on the current account. Further, we show that consumption of durable goods is more sensitive than the consumption of non-durables during the initial periods following inflationary shocks.

1. Introduction

The long-run real effects of monetary policies on employment, capital accumulation, consumption and the current account have always been of interest to macroeconomists.[1] The existing literature covering both theoretical and empirical studies provides no clear-cut conclusion. The present paper intends to contribute to the empirical side of the literature by working out the effects of changes in inflation rates on the important macroeconomic variables in a small open economy. We consider Australia for the empirical study and investigate the effects of inflation shocks on the major macro variables both in the short run and the long run.

Using seasonally adjusted quarterly data from Australia and estimating simple correlations and impulse response functions, we find changes in inflation negatively influence consumption and investment, and have a positive impact on the current account balance. The correlation coefficient between Australian inflation and real consumption of durable and non-durable goods is found to be −0.12 and −0.20 respectively. Similarly, real investment is negatively correlated with inflation with the estimated coefficient of −0.25. The real current account balance and inflation, on the contrary, are positively correlated with a coefficient of 0.29. Correlation coefficients with lags ranging from 0 to 10 are found to be good representations of short-run effects. The results are reported in Figure 1. To trace the effects of inflation on any individual variable over the longer time horizon, we estimate the generalized impulse response functions within a vector autoregressive (VAR) setup. From the estimates (Figures 2 and 3), we claim that in the long run inflation shocks negatively affect output and

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Figure 1 Cross-Correlations with Inflation

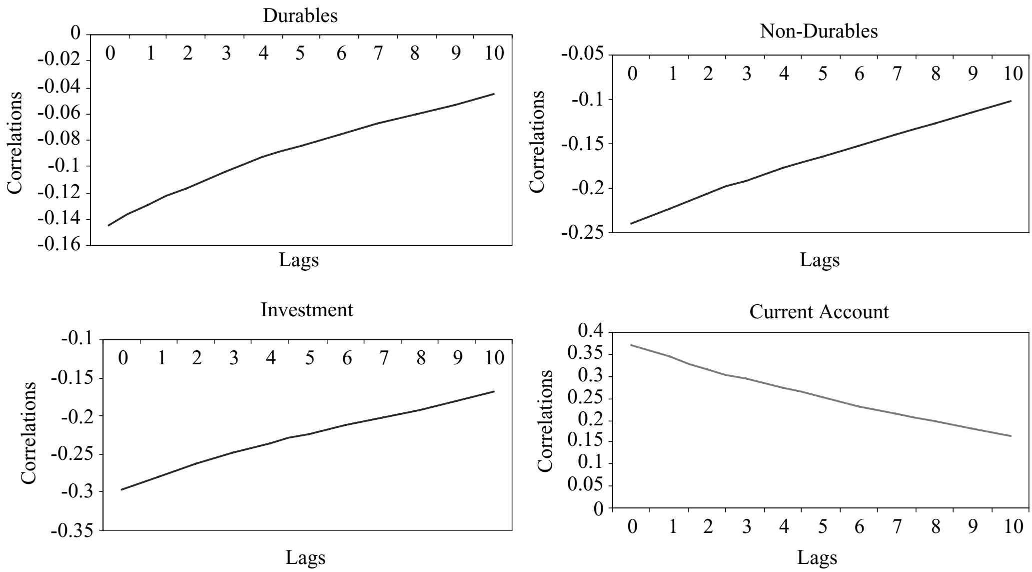
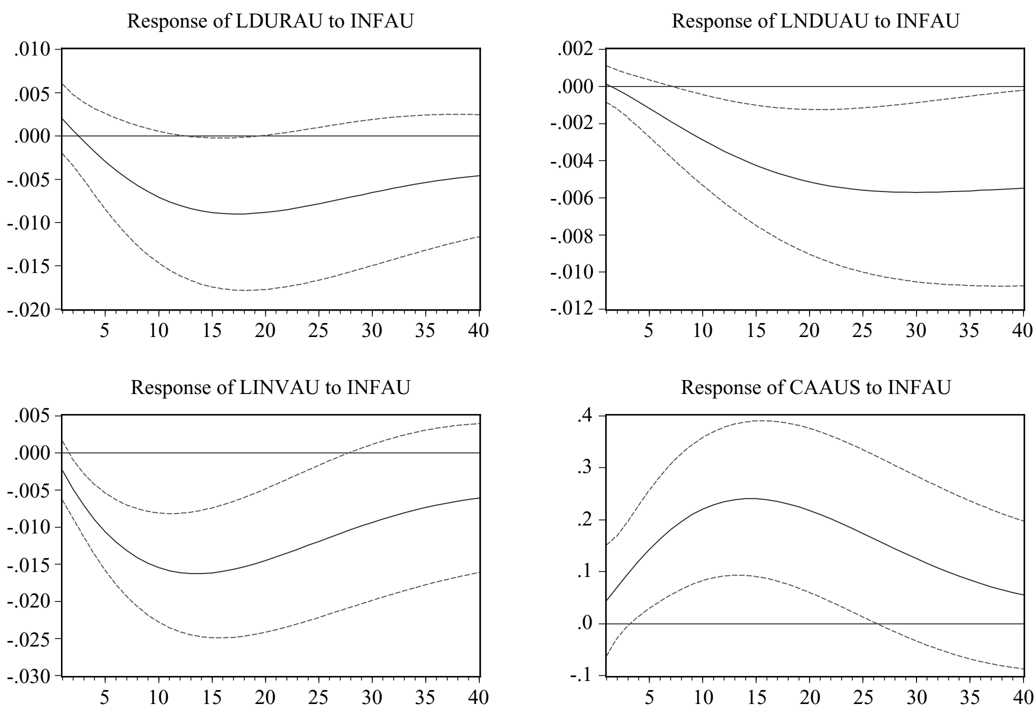


Figure 2 Impulse Responses to Generalized One S.D. Innovations ± 2 S.E.



the consumption of durable and non-durable goods, and positively influences the current account in the long run. From the impulse response functions it is also clear that consumption of durable goods tends to be more sensitive than non-durable consumption to inflationary shocks during the early adjustment transitional period.

These empirical observations are consistent in a small open economy model with cash in

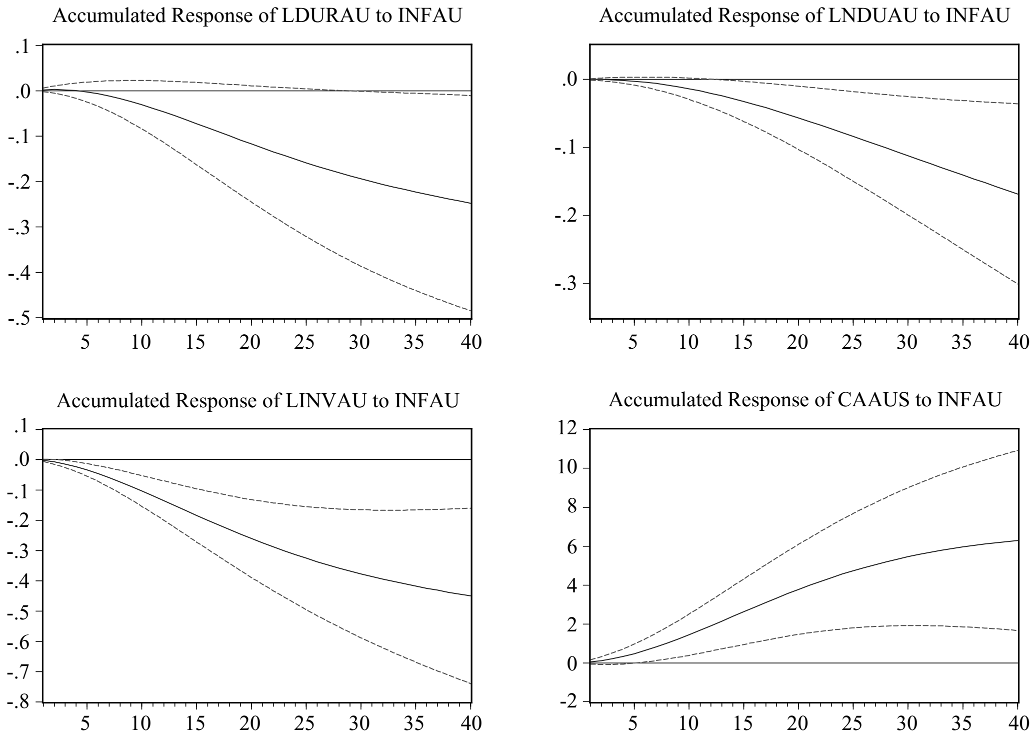


Figure 3 Accumulated Response to Generalized One S.D. Innovations ± 2 S.E.

advance (CIA) constraints on all transactions involving consumption and investment as developed in Mallick and Mohsin (2005). With both durable and non-durable consumption in their model, they argued that a higher inflation would lead to lower steady-state level of consumption of both goods. The economy would also experience a decline in investment. The reason is that with a CIA constraint on consumption expenditure, higher inflation increases the opportunity cost of holding real balances. This makes consumption more expensive. With a similar CIA constraint on investment expenditure, higher inflation acts as a tax on investment and thus reduces investment. The current account improves during the transitional period as the fall in consumption dominates the fall in output.[2]

The important contribution of this empirical paper is to incorporate both aggregate durable and non-durable consumption in the analysis. Such an exercise with Australian data is first of its kind. There are many compelling reasons why we incorporate both durable and non-durable consumption in our analysis. First, durables and semi-durables are known to make a substantial contribution to business cycle fluctuations (Baxter 1996; Iscan 2002), yet most of the intertemporal optimizing growth models (as well as the related empirical studies) have incorporated mainly non-durable goods. To be more realistic one should study the effects of macroeconomic policies in presence of durable and non-durable goods.[3] Second, many researchers reported that durable goods exhibit initial high volatility in response to monetary shocks. In the context of a closed economy, the larger volatility in durable consumption has also drawn significant attention from researchers, especially in the context of residential investment.[4] Erceg and Levin (2002) documented the effects of external shocks across the two sectors of the economy. In US quarterly data, they found that the durable goods sector is much more interest sensitive (roughly five-fold) than the non-durable sector. In an open economy, De Gregorio, Guidotti and Vegh (1998) pointed out that in Chile expenditure on durable goods more than doubled from the beginning of the (stabilization) program in the late 1970s and peaked in the early 1980s, while total consumption increased by only 26 per cent. Similarly, in Israel, consumption of durable goods rose by 70 per cent in the analogous period while total private consumption increased by 25 per cent.

It will therefore be worthwhile to examine how durable and non-durable consumption responds following inflationary shocks in Australia. We consider Australia as a small open economy, where the changes in monetary policy are more likely to be channeled through the exchange rate movements, thus enhancing the relative attractiveness (or otherwise) of Australian assets to international investors. The paper seeks to establish the extent to which a shock in inflation is transmitted to the real macro variables in such a small open economy. An aggregate inflation target is likely to stabilize inflation,[5] but changes in both interest rates and the exchange rate may affect the inflation process, which in turn could cause variability in the real sector. In addition, the dynamics of the current account can capture the evolution of the fundamentals and reflect the growth of the net external asset position.

The paper is organized as follows. In Section 2 we provide an overview of the existing literature and highlight the theoretical underpinnings of the present study. The details of our empirical investigation are documented in Section 3. Section 4 concludes the paper.

2. Theoretical Underpinnings and the Existing Literature

We claim through our empirical investigation that in a small open economy such as Australia, higher inflation reduces the level of durable and non-durable consumption, capital stock in the long-run, and improves the current account balance of the economy. What are the theoretical underpinnings and the transmission mechanisms that could explain such empirical observations? Although the contribution of the paper is empirical in nature, a proper answer to the questions above will help us to situate this paper in the literature.

The debate on the effects of monetary policies in an economy has always remained an important topic for academics and policy-makers alike. In the modern literature, the debate started with Tobin's (1965) non-optimizing portfolio adjustment model where he argued that higher rates of inflation could be associated with higher levels of capital stock and investment—known as the 'Tobin Effect'.[6] The two prominent optimizing models that have been used to discuss this issue (in a closed economy setting) are the money in utility model (MIU) (Sidrauski 1967) and the cash in advance model (CIA) (Stockman 1981; Abel 1985). These two alternative models give rise to sharp and contrasting results.[7] Though, both strands of thought are equally used in the literature, the CIA framework has drawn much attention due to the well-specified role of money in this model. Moreover, the assumption-specific results of CIA models are resolved if one allows for labour leisure choice (see Lucas and Stokey 1987). Higher inflation in CIA models in general leads to lower levels of consumption and capital stock in the long run—the opposite of the 'Tobin Effect'.[8]

The open economy literature has also shown ample interest in the effects of monetary policies on macro variables and has grown accordingly. The seminal papers which consider these policy issues in an optimizing framework are by Obstfeld (1981a, 1981b). In both papers he used the MIU framework and claimed that, although in the short-run higher inflation leads to lower levels of consumption and demand for real balances, the economy will in the long run experience current account surpluses and higher levels of consumption.[9] In a very recent study Mansoorian and Mohsin (2006) developed a comprehensive CIA model for a small open economy to claim higher inflation to be associated with lower consumption and improved current account balances in the long run—a model consistent with their closed economy versions.[10] All these models ignore durable consumption completely.

As argued in the introduction, a comprehensive model should incorporate both durable and non-durable consumption. The theoretical motivation for this empirical investigation is due to Mallick and Mohsin (2005). The model developed there is an infinite horizon optimizing model of a small open economy where agents consume both durable and non-durable goods and are required to hold real balances in advance for all consumption expenditures. With inelastic labour supply, output is produced with capital only. Firms are also required to hold real balances in advance for all transactions. In this model the monetary authority is targeting inflation. Although the detailed model is not outlined here, a brief summary of the results and the economic intuitions will help us explain the transmission mechanisms clearly. Higher inflation (positive inflation shocks) would lead to lower levels of investment and consumption of both durable and non-durable consumption.[11] However, the current account improves. The results are straightforward and intuitive—higher inflation increases the opportunity costs of investment and hence reduces the effective rates of return on capital. In other words, higher inflation acts as a tax on investment. This explains why the long-run capital stock in the economy will decline and why, moreover, the return on foreign bonds remains unaffected. As a result, the relative return from international bonds (compared with capital) enjoyed by households is higher. The latter will prefer more foreign bonds rather than supplying their savings for accumulating domestic physical capital. The current account balance will improve and, moreover, consumption is also subject to CIA restrictions. Higher inflation increases the opportunity cost of holding real balances. This will make consumption of durables and non-durables more expensive due to price effects. It is shown that as long as the nominal interest rate is positive,[12] the model predicts a reduction in the consumption of both goods. The current account improves during the transitional period as the fall in consumption dominates the fall in output. The empirical observations that are summarized earlier and are discussed at length in the following section are very consistent in an open economy model as we have just outlined.

3. An Empirical Analysis

3.1 The Data and Its Properties

As mentioned earlier, the objective of this study is to examine the effects of inflation at the empirical level on the key macro variables, namely the consumption of durable and non-durable goods, investment and the current account balance in a small open economy—Australia (1960:1 to 2005:2). We made use of different components of household final consumption expenditure at constant prices, and defined 'durables' as the sum of furnishings and equipment and purchase of vehicles, accounting for 10 per cent of total household final consumption expenditure. Non-durables are defined as the total final consumption expenditure less durables. The source for all the variables is the Australian Bureau of Statistics, and they are compiled from Datastream. The quarterly series used in this paper are seasonally adjusted observations on real durable consumers' expenditure, real non-durable consumers' expenditure, the consumer price index, real investment, and the real current account balance. To express the nominal current account balance in real terms (CA), we used the average of the national accounts deflators for exports and imports of goods and services to convert the nominal current account balance.

The natural logarithms of durables, non-durables and investment (all expressed in real terms) are denoted as DUR, NDUR, and INV. Inflation (INF) is calculated as the fourth lag difference of log CPI. As current account contains negative values for most of the years, we expressed the series in levels without logs.

First we examine the cross-correlations up to 10 lags between DUR, NDUR, INV, CA, and inflation. Before doing so we smooth all the data series through the Hodrick-Prescott (HP) filter.[13] The HP filter separates the cyclical behaviour from the long-run path of the economic series. The benefit of the HP decomposition is that it uses a uniform method to extract the long-run component from a set of variables. The correlations for the three countries are calculated with the smoothed series using the HP

Table 1 Single Equation-Based Unit Root Tests

	$ADF(t_{\alpha c})$	$ADF(t_{\alpha ct})$	*DF-GLS*	*KPSS*	*ZA*
DUR	−0.8015	−1.9803	3.1310	1.6389**	−3.6344 [1985:02]
NDUR	−1.3855	−1.7639	1.5078	1.7384**	−3.0856 [1982:03]
INV	0.4316	−1.5529	4.2354	1.7061**	−3.3368 [1997:01]
CA	−0.6338	−4.0142**	−0.0126	1.4644**	−5.0219* [1997:03]
INF	−1.8877	−1.9866	−1.6040	0.3587	−5.9944** [1972:04]

Notes: (a) $ADF(t_{\alpha c})$ *and* $ADF(t_{\alpha ct})$ are the test statistics on the lagged variable in the Augmented Dickey-Fuller test regression with constant, and constant and time trend respectively. *DF-GLS* and KPSS tests are known as Dickey-Fuller test with GLS detrending, and the Kwiatkowski, Phillips, Schmidt, and Shin test respectively. The KPSS test differs from other unit root tests in the sense that the time series is assumed to be stationary under the null. Zivot-Andrews (ZA) test allows for structural break in intercept.
(b) * and ** denote rejection of the null at 5 per cent and 1 per cent level of significance respectively. The asymptotic 5 per cent critical values are: ADF test: −2.8777 (with constant) −3.4354 (with constant and trend); DF-GLS: −1.9426 (with constant); KPSS: 0.4630 (with constant).
(c) ZA Critical Values are −5.34 and −4.80 for 1 per cent and 5 per cent respectively. Numbers in brackets are the estimated structural breaks based on the ZA test.

filter.[14] Figure 1 reveals that the correlation of durables and non-durables expenditure and investment with inflation is initially negative, and remains negative even with higher order lags. With regard to the current account and inflation, the correlations indicate a positive coefficient, which tends to decline with higher order lags.

We find all the time series to have different orders of integration under different test assumptions, as indicated by the results of Augmented Dickey–Fuller (ADF) and other tests. The results of the unit root tests[15] are presented in Table 1. Current account and inflation series turned out to be stationary or I(0)[16] by ADF and KPSS tests respectively. To further check for unit root in all the five variables in the presence of a structural break, we used the Zivot-Andrews unit root test. The results also confirm that it is possible to reject the unit root null hypothesis for the current account and inflation at the conventional levels of significance. Thus, given the different orders of integration for the variables involved in our analysis, we need to carry out an unrestricted VAR exercise for these variables with one lag, as found to be optimal by most lag selection test criteria.[17] The VAR estimates are presented in Table 2. From the estimated coefficients, it is revealed that inflation negatively influences future investment significantly, possibly via a reduction in future cash flows, as a result of a reduction in durable consumption. Lower investment in turn leads to lower consumption (both durable and non-durable) and a current account surplus, as the coefficients are significant in the respective equations. Given the sign and magnitude of the impact of inflation, we further check the direction of causation in the VAR model using VAR Granger causality tests. The test results, presented in Table 3, seem to confirm that inflation causes investment, not the other way round. Inflation also causes other variables, albeit at a 10 per cent level of significance. As all the variables are endogenous in the VAR, the Wald test does show that inflation is Granger caused by consumption demand. The linkages can be summed up as follows: inflation ⇒ investment ⇒ consumption (durables and non-durables) ⇒ current account and inflation. Given the direction of causation, we need to examine the precise net impact by carrying out a shock analysis by deriving impulse response functions with the reduced form VAR model. Since we are not adopting the traditional approach of deriving impulse responses within a VAR model, a brief attention to the econometric issues is warranted here.

3.2 The Impulse Responses Methodology

The traditional approach has been to use Cholesky decomposition to generate impulse responses, but the method is sensitive to the ordering of variables so we explore generalized

Table 2 Vector Autoregression Estimates

	LDURAU	*LNDUAU*	*LINVAU*	*CAAUS*	*INFAU*
LDURAU(−1)	0.9681	0.0088	0.0721	−0.8824	5.2162
	[28.2658]	[1.0430]	[2.1294]	[−0.9705]	[4.1181]
LNDUAU(−1)	−0.0332	0.9687	0.0120	1.8853	−5.6552
	[−0.9344]	[110.795]	[0.3429]	[1.9987]	[−4.3037]
LINVAU(−1)	0.0741	0.0234	0.9280	−1.8951	0.8694
	[2.1292]	[2.7327]	[26.9619]	[−2.0506]	[0.6753]
CAAUS(−1)	0.0034	0.0006	0.0003	0.8509	0.0359
	[2.3363]	[1.6466]	[0.1822]	[22.2786]	[0.6745]
INFAU(−1)	−0.0012	−0.0003	−0.0028	0.0299	0.9159
	[−1.7337]	[−1.6257]	[−4.0419]	[1.6120]	[35.3362]
C	−0.0709	0.0457	−0.0107	5.0493	8.8377
	[−0.7972]	[2.0892]	[−0.1215]	[2.1384]	[2.6867]
R-squared	0.9959	0.9998	0.9970	0.9491	0.9430
Adj. R-squared	0.9958	0.9998	0.9969	0.9476	0.9414
S.E. equation	0.0271	0.0067	0.0268	0.7188	1.0013
F-statistic	8562.505	164335.3	11735.74	652.5682	579.1313
Determinant residual covariance (dof adj.)		0.0000			
Determinant resid covariance		0.0000			
Log likelihood		1030.415			

Notes: Sample (adjusted): 1960Q2–2005Q2 (Number of observations: 181 after adjustments); *t*-statistics in []; LDURAU—Log of durables; LNDUAU—Log of non-durables; LINVAU—Log of investment; CAAUS—Log of investment; INFAU—Inflation.

impulse response functions (GIRF) to analyse the impact of shocks to specific equations on each of the variables in the system (Koop, Pesaran and Potter 1996; Pesaran and Shin 1998). GIRF is invariant to ordering and is based on the historical covariance structure of idiosyncratic shocks.[18] To calculate GIRFs, the VAR needs to be written as an infinite moving average representation as $y_t = \sum_{i=0}^{\infty} A_i \varepsilon_{t-i}$, where A_i is a 5×5 matrix of parameters that is obtained using the following recursive relations:

$$A_i = \Phi_1 A_{i-1} + \Phi_2 A_{i-2} + \cdots + \Phi_p A_{i-p} \quad i = 1, 2, \ldots$$

$$\text{with } A_0 = I_m \quad \text{and} \quad A_i = 0 \quad \text{for} \quad i < 0$$

With a shock ε_t^0, $IR_y = A_n \varepsilon_t^0$, which is independent of the 'history' of the process but depends on the composition of shocks ε_t^0. Assuming that ε_t has a multivariate normal distribution,

$$E(\varepsilon_t | \varepsilon_{jt} = \delta_j) = (\sigma_{1j}, \sigma_{2j}, \ldots, \sigma_{nj})' \sigma_{jj}^{-1} \delta_j = \sum e_j \sigma_{jj}^{-1} \delta_j$$

where $\delta_j = (\sigma_{jj})^{-\frac{1}{2}}$ denotes one standard error shock. Hence, the $m \times 1$ GIRF vector of the effect of a shock in the *j*th equation at time *t* on y_{t+n}, ε_t^0, on the *i*th variable at horizon '*n*' is given by:

$$IR_{y,n} = \frac{A_n \sum e_j}{\sqrt{\sigma_{jj}}}, \quad n = 0, 1, 2, 3 \ldots$$

where e_j is an 5×1 selection vector with 1 as its *j*th element and 0 elsewhere, and σ_{jj} is a one standard deviation (SD) shock.

The time path for the generalized responses measures the effect of one SD shock to the *j*th equation at time *t* on expected values of *y* at time $t + n$, and provides insights about the speed of convergence of the model to its equilibrium relations (see Pesaran and Shin 1998). The IRs are calculated using econometric software Eviews 5.1. The results of the GIRFs are presented in Figures 2 and 3.

3.3 The Results of Inflation Shocks Within a VAR

Here we intend to track the response of durables, non-durables, investment and the current account to inflation shocks. As mentioned earlier, we have carried out the

Table 3 VAR Granger Causality/Block Exogeneity Wald Tests

Excluded	*Chi-sq*	*Prob.*
Dependent variable: LDURAU		
LNDUAU	0.8731	0.3501
LINVAU	4.5335	0.0332
CAAUS	5.4585	0.0195
INFAU	3.0058	0.0830
All	16.8140	0.0021
Dependent variable: LNDUAU		
LDURAU	1.0879	0.2969
LINVAU	7.4676	0.0063
CAAUS	2.7112	0.0996
INFAU	2.6431	0.1040
All	18.5001	0.0010
Dependent variable: LINVAU		
LDURAU	4.5343	0.0332
LNDUAU	0.1176	0.7316
CAAUS	0.0332	0.8554
INFAU	16.3375	0.0001
All	16.9533	0.0020
Dependent variable: CAAUS		
LDURAU	0.9419	0.3318
LNDUAU	3.9947	0.0456
LINVAU	4.2050	0.0403
INFAU	2.5986	0.1070
All	18.1692	0.0011
Dependent variable: INFAU		
LDURAU	16.9588	0.0000
LNDUAU	18.5215	0.0000
LINVAU	0.4559	0.4995
CAAUS	0.4549	0.5000
All	23.7167	0.0001

Notes: Sample: 1960:1 2005:2; Included observations: 181. For individual variables, the degrees of freedom (df) is 1, whereas for all the variables in an equation, it is 4.

unrestricted VARs with one lag. The estimated coefficients are presented in Table 2, and we have shown the results obtained from the VAR (1) model through the generalized impulse response functions (GIRFs) as displayed in Figure 2. The impulse response functions displayed in Figure 2 help us to examine the steady-state (long-run) effects, after having considered all the dynamic interactions between the variables in the model.

Generalized impulse response analysis shows how the above endogenous variables in the model react to the inflationary disturbances using the reduced form VAR model. We carry out the GIRFs, as the method is not sensitive to the ordering of variables in a VAR. The shocks are in terms of one standard deviation of inflation residuals. We plot the estimated response coefficients up to a forecast horizon of 40 quarters (or 10 years). There are four responses: durables, non-durables, GDP and the current account. The responses are expressed as deviations from the base values following the one standard deviation positive shock to inflation residuals. In other words, the impulse response functions in Figure 2 display the expected changes in the endogenous variables following a shock to inflation disturbances. The dashed curves represent a two-standard error confidence interval around the estimated response functions, computed from a typical Monte Carlo integration exercise with 1000 replications.

The exact magnitude of the inflationary impact is revealed when we carry out the shock analysis using the model. In the long run, we find that a positive inflation shock produces a negative significant effect on durables consumption, and this response is higher in the case of durables than in the non-durables, which proves our hypothesis. This result jibes well with the finding of Madsen (2003), which uses a mean variance model of portfolio selection and finds that the demand for durables is significantly adversely affected by inflation using quarterly data for the USA and annual panel data for the OECD countries. We find that the durable demand is more sensitive than the non-durable demand to inflation shocks, and the current account remains in positive territory as durable demand continues to decline. In the context of the model, the rise in inflation directly reduces real money balances, creating a negative wealth effect; indirectly the negative income effect could dominate the intertemporal substitution effect thereby reducing households' income and consumption. This initial response in consumption gradually converges to a lower steady-state level. A very similar pattern is found for a shock to inflation, when the accumulated responses are considered. Such cumulative plots are given in Figure 3.

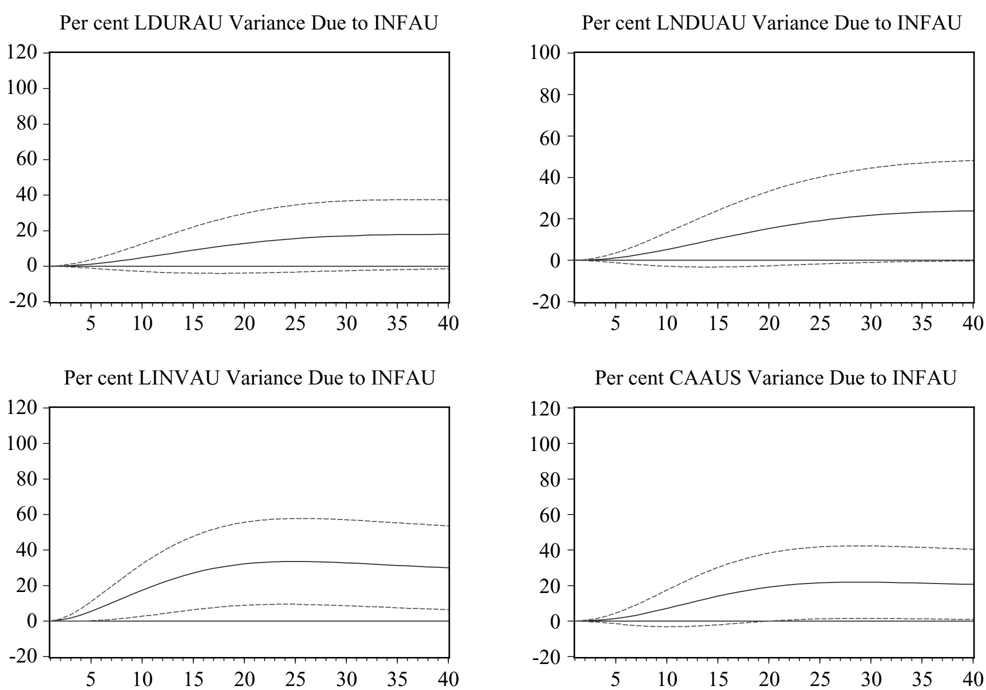
The decline in durable goods due to inflation shocks continues up to 15 quarters to the extent of 1 per cent before it converges to the steady state, whereas non-durable goods also decline, but the magnitude of the impact is only to the extent of 0.5 per cent (see Figure 2). The opposite is the case with respect to the current account response. With a 1 per cent inflation shock, the current account initially improves up to the extent of A$0.25 billion surplus a quarter and then it worsens until the current account is balanced in the long run.[19] The link between durables (non-durables) and the current account needs to be understood via the intertemporal savings channel. Following an inflation shock, durable consumption declines, implying a rise in savings and thus an improvement in the current account balance, whereas, as consumption declines, income also goes down and hence savings could fall. From Figure 2, the net effect appears to be an increase in savings, which is reflected in external asset holdings, leading initially to a rise in the current account balance that remains positive in the long run.

By and large, the responses in Figure 2 reveal that there is a larger reaction of durable goods consumption and the magnitude of the impact on durables is high relative to non-durables for Australia. Interestingly, the large reaction in durable consumption is more pronounced than the investment response, which is more in line with the behaviour of non-durables consumption. This is intuitive as non-durables account for big part of the GDP.

We have also carried out variance decomposition analysis to identify the contribution of inflation shocks in explaining the variation in the four real variables considered here. We decompose variation in the percentage change of the forecast error variance of durables, non-durables, investment and the current account that are due to a shock in inflation at the 1–40 quarter horizons. Figure 4 presents the variance decomposition plots. The results suggest that inflation shocks account for about 20–30 per cent of the variability of the real variables over a long time-horizon. Although each variable's own shock accounts for big part of the variability, they die out in the long run.

Overall, our empirical observations suggest that, in the long run, inflation negatively affects

Figure 4 Forecast Error Variance Decompositions ± 2 S.E.



the consumption of durables, non-durables and investment, and has a positive effect on the current account balance of the economy. Moreover, our estimates also suggest that households respond significantly differently in terms of the consumption of durables and non-durables in the short run following inflationary (positive or negative) shocks. It is intuitive to expect larger reactions for durable consumption, because the demand for durables may be saturated more quickly than the demand for non-durables. Following Álvarez-Peláez and Díaz (2005), we could suggest that there always exists a minimum level of durable goods purchase, whatever the level of inflation.

In terms of the effect on monetary policy, the fact that a positive inflation shock has a negative effect on real demand suggests that the Reserve Bank of Australia does not have to increase the nominal interest rate to stabilise inflation. The reason being, a positive inflation shock not only leads to a fall in real labour income, but also results in a decline in real wealth, thus having a negative effect on aggregate demand. Therefore, in an inflation targeting (IT) regime, the monetary authority need not react to a positive inflation shock, as the shock itself has a negative effect on aggregate demand. It is worth mentioning here the models proposed in the New Keynesian body of literature on the current monetary analysis (see Clarida, Gali and Gertler 1999; Woodford 2003) predict that an inflation shock has contractionary effects only if it raises the real interest rate. The negative real effect in our paper suggests that the monetary authority need not have to increase the nominal interest rate more than the increase in inflation for a contractionary effect.

4. Conclusion

This paper provides evidence that a positive inflation shock leads to a decline in durable consumption and other real demand-side variables for Australia as a small open economy. This evidence is motivated by a CIA model which predicts inflation having a negative effect on consumption and a positive effect on current account balance. As inflation has some undesirable consequences for demand, we examine the effects of inflation on both durable and non-durable consumption in Australia. This empirical exercise is important, as durable consumption is known to be a significant contributor in the business cycle fluctuations. Using both correlation coefficients and impulse response functions we claim that inflation negatively affects consumption and investment and positively influences the current account position in Australia. Our empirical results support three important aspects: (i) non-neutrality of monetary policies, (ii) consistency with theoretical models that incorporate CIA constraints, and (iii) larger sensitivity of durable consumption compared to its non-durable counterpart due to monetary shocks.

In this paper we tried to gauge the real effects (both short-run and long-run) of inflation in a small open economy like Australia where inflation targeting policies are adopted. We report that higher inflationary shock leads to lower consumption expenditures, and investment and *improved* current account position of the economy. Since we did not pursue any welfare analysis, it will not be possible to claim anything about what monetary policy should or should not be doing. Moreover, from the existing literature it is well known that the empirical evidence on the effect of inflation targeting on the level of inflation is inconclusive (see Ball and Sheridan 2003). In that context, we need to be more careful in interpreting our empirical results. However, it would be safe to claim that the inflation targeting regime in which the policy explicitly commits to an inflation target, the conclusion to adopt the regime is unwarranted at least when new lower levels of consumption and capital stock occurs following an inflation shock. We can also conclude that this empirical evidence could potentially hold for other small open economies, currently practicing policies of inflation targeting.

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Endnotes

1. In the conventional growth literature, the effects of monetary policies are examined by estimating the effects of changes in the growth rate of money supply. In the long run (steady state), the growth rate of money supply is identical with the rate of inflation. This is the reason why many researchers while examining the long run effects of monetary policies, estimate the effects of changing inflation rate. However, this is not true during the transitional period. For details, see Fischer (1979).

2. Models with flexible prices are often perceived to generate neutrality results. However, CIA models are known to break the neutrality proposition. In fact in an open economy model with CIA constraints (even without durable goods), Mansoorian and Mohsin (2006) claimed the effects of inflation on consumption, investment and the net asset position to be significant (pp. 311–12). In a model with both durable and non-durable consumption, the effects are expected to be larger as durable consumption tends to be more responsive to monetary shocks.

3. It is well documented in Dunn and Singleton (1986), Ferson and Constantinides (1991), and Heaton (1993, 1995) that the introduction of durable goods in asset pricing models helped improve the empirical performance of those models (see also Mohsin 2006).

4. Especially it has been recognized that residential investment (including investment in other consumer durables) leads business investment over the business cycles. Important studies include Baxter (1996), Benhabib, Rogerson and Wright (1991), Chang (2000), Fisher (1997), Greenwood, Rogerson and Wright (1995), Hornstein and Praschnik (1997). For details see Fisher (2001).

5. Macfarlane (1999) describes the evolution of Australia's monetary policy over 25 years, particularly from the period between the end of monetary targeting (1985) and the introduction of inflation targeting (1993) in Australia.

6. However, Tobin's model encounters criticisms due to lack of micro-foundations.

7. With Sidrauski's MIU formulation, an increase in the rate of growth of money will have no steady state effects. Similarly in Stockman's CIA economy where money is needed solely for consumption purchases, monetary policies will have no long run real effects. On the other hand, if there are CIA constraints on all transactions, including transactions involving assets, then an increase in the rate of growth of money will reduce the steady state capital stock and hence on output and consumption.

8. So far all the models we considered assumed perfect flexibility of prices and wages. There is another brand of models with price and wage rigidity, known as New Keynesian models. For details, see Clarida et al. (1999) and Woodford (2003). These models rely on temporary nominal price rigidities to generate friction to provide non-neutral effects of monetary policies in the short run.

9. To overcome the problem of degenerate dynamics, Obstfield used Uzawa type time preferences, which was required for saddle point stability rather than for any economic reason (see Mohsin 2006 for details). Moreover, the requirement of a fixed level of utility in the steady states is the driving force of the results. Needless to say, such models encountered criticisms.

10. Other related papers which employ CIA constraints in an open economy setting include Calvo and Vegh (1995) and Edwards and Vegh (1997).

11. Lawler (1997) also finds similar non-neutrality associated with an anticipated monetary expansion, being reflected in terms of a fall in output and employment during the transition to the steady-state. Also see Arestis and Sawyer (2004) for the possibility of monetary non-neutrality even in the long-run. When an economy suffers from excess capacity, as in recessions/depressions, there can be positive non-neutrality as opposed to

negative non-neutrality, as more expansionary monetary growth rate can raise steady-state capital intensity and thus investment and output.

12. Australia had positive short-term nominal interest rates during the sample period considered.

13. The conceptual framework represented by Hodrick-Prescott filter can be summarized as follows: $y_t = \tau_t + c_t$. A given series $y_t$is the sum of growth component τ_t and cyclical component c_t. The growth component is determined from solving the problem:

$$\min_{\{\tau_t\}} \sum_{t=1}^{T} (y_t - \tau_t)^2 + \lambda \sum_{t=2}^{T-1} [(\tau_{t+1} - \tau_t) - (\tau_t - \tau_{t-1})]^2$$

The parameter λis a positive number which penalizes variability in the growth component: the larger its value, the smoother τ_t. Following the literature λis assumed to be 1600.

14. We have also checked the cross correlation coefficients without filtering the data. The results are comparable with the filtered data.

15. In Table 1, we have reported the tests for the variables in levels, not the tests for variables in first differences, which are available from the authors upon request.

16. In the context of Canada, a similar small open economy, Otto (1992) and Iscan (2002) have found that Canada's current account balance is stationary in levels.

17. On the basis of different lag order selection criteria, we found lag 1 to be the optimum lag length by FPE (Final prediction error), AIC (Akaike information criterion), HQ (Hannan-Quinn information criterion) and SC (Schwarz information criterion).

18. A key feature of the GIRF is that instead of shocking all the elements of ε_t, we can choose to shock only one element. Thus GIRF results are more robust than the orthogonalized method. Pesaran and Shin (1998) discuss these issues in detail.

19. As the current account balance is expressed in levels, the regression coefficients or impulse responses need to be interpreted in terms of billions.

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