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Welfare cost of inflation in an emerging economy: a case of Pakistan

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Introduction

- Inflation is costly.
- Policy makers should know:
  - what are the costs of Inflation?
  - how they vary with Inflation?
- Wide gap between the popular view of Inflation and the cost of inflation economists can identify.
- Inflation cost are not well understood for the case of Pakistan.
Primary Effects
- Smaller holdings of real money balances
- Debtor gain at the expense of Creditor
- People hesitate to Invest
- Loss of output in LR

Secondary Effects
- Fall in number of Firms
- Raises markups of the remaining firms
- Decline in the marginal return on Investment
- Output will be lower

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INFLATION TRENDS IN PAKISTAN
# Inflation Dynamics

<table>
<thead>
<tr>
<th></th>
<th>Headline Inflation</th>
<th>Food Inflation</th>
<th>Core Inflation</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Min</strong></td>
<td>-11.26</td>
<td>-15.99</td>
<td>1.77</td>
</tr>
<tr>
<td><strong>Max</strong></td>
<td>29.29</td>
<td>35.58</td>
<td>14.61</td>
</tr>
<tr>
<td><strong>Median</strong></td>
<td>7.35</td>
<td>7.65</td>
<td>8.04</td>
</tr>
<tr>
<td><strong>Mean</strong></td>
<td>7.14</td>
<td>7.97</td>
<td>7.69</td>
</tr>
<tr>
<td><strong>Std.Dev</strong></td>
<td>6.07</td>
<td>7.60</td>
<td>3.05</td>
</tr>
<tr>
<td><strong>Mean + Std.Dev</strong></td>
<td>13.21</td>
<td>15.57</td>
<td>10.74</td>
</tr>
<tr>
<td><strong>Mean − Std.Dev</strong></td>
<td>1.07</td>
<td>0.36</td>
<td>4.64</td>
</tr>
</tbody>
</table>
Rationale of the study

The welfare cost of Inflation depend on the threshold level of Inflation that maximizes the steady state welfare. Threshold level of inflation for Pakistan is 9 percent.*

This paper comprehensively investigates the welfare cost/gain of inflation and implications of inflation on other agents of the society not just household in a developing country like Pakistan with large informal sector.*

Cash-in-Advance (CIA) Model by Cooley and Hansen (1989) has been applied because traditional consumer surplus approach fails to incorporate labor-leisure decisions while estimating the welfare loss of inflation.

*Mubarik (2005)
*Reed and Ghossoub (2010) observed that the Inflation costs are higher in developing countries because of higher inflation rate and a higher reliance on cash. Informal sector in developing countries may be as large as 76 percent of the economy.
Literature Review

Partial Equilibrium Analysis
  Consumer Surplus Approach
  Compensating Variation Approach

General Equilibrium Analysis
  New Classical
  New Keynesian
<table>
<thead>
<tr>
<th>Author (Year)</th>
<th>Journal</th>
<th>Country</th>
<th>Data &amp; Methodology</th>
<th>Findings</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bailey (1956)</td>
<td>Journal of Political Economy</td>
<td>Seven hyper inflation European countries</td>
<td>Cagan's* data (Monthly) &amp; Consumer Surplus</td>
<td>He shows that anticipated inflation cost members of the society more than the government revenue.</td>
</tr>
<tr>
<td>Lucas (2000)</td>
<td>Econometrica</td>
<td>United States</td>
<td>Data (1990-94) &amp; General Equilibrium (The Sidrauski Framework)</td>
<td>Gain from reducing the annual inflation rate from 10% to 0 is equivalent to an increase in real income of slightly less than 1%.</td>
</tr>
<tr>
<td>Ben Craig &amp; Guillaume Rocheteau (2008)</td>
<td>Journal of Money, Credit and Banking</td>
<td>United States</td>
<td>A Search theoretic Monetary Approach</td>
<td>The welfare cost associated with 10% inflation is ranging from 0.5% to 1.5%</td>
</tr>
<tr>
<td>Author (Year)</td>
<td>Journal</td>
<td>Country</td>
<td>Data &amp; Methodology</td>
<td>Findings</td>
</tr>
<tr>
<td>--------------</td>
<td>---------</td>
<td>---------</td>
<td>--------------------</td>
<td>----------</td>
</tr>
<tr>
<td>Wing Leong Teo &amp; Po Chieh Yang (2011)</td>
<td>Pacific Economic Review</td>
<td>United States</td>
<td>New Keynesian DSGE Model</td>
<td>An annual Inflation rate of 10% entails the welfare cost of 1.8% of the steady state consumption.</td>
</tr>
<tr>
<td>Mushtaq et al. (2012)</td>
<td>Pakistan Development Review</td>
<td>Pakistan</td>
<td>Annual data (1960-2007) Consumer Surplus Approach and Compensating Variation Approach</td>
<td>The welfare loss associated with the inflation rate of 7% is 0.64% of income.</td>
</tr>
<tr>
<td>Riaz &amp; Ahmad</td>
<td>Pensee Journal</td>
<td>Pakistan</td>
<td>Consumer Surplus Approach</td>
<td>Reducing the inflation rate from 10% to 0% gives a welfare gain equivalent to an increase of 0.027% in annual income.</td>
</tr>
</tbody>
</table>
This paper considers two specifications for money demand following Lucas (2000): the log–log specification and Semi log specification:

\[
\begin{align*}
\ln(m) &= \alpha - \eta \ln(r) \\
\ln(m) &= \beta - \xi r
\end{align*}
\]

Where \( m \) is the monetary aggregate divided by the real GDP and \( r \) is the short term interest rate. The welfare cost measure \( w(r) \) as described by Lucas for both money demand specifications respectively:

\[
\begin{align*}
w(r) &= \alpha \frac{\eta}{1 - \eta} r^{1 - \eta} \\
w(r) &= \frac{\beta}{\xi} [1 - (1 + \xi r)e^{-\xi r}]
\end{align*}
\]

For the semi log money demand specification, quadratic approximation is used to measure the welfare cost of Inflation:

\[
w(r) = \frac{1}{2} m(0) \eta r^2
\]

For the double log money demand specification, square root formula is used to measure the welfare cost of Inflation:

\[
w(r) = \left[1 - (e^\alpha) r_t^{1 - \beta}\right]^{\beta - 1} - 1
\]
Data on variables like Monetary Aggregates (Currency in circulation, M₁, and M₂), the nominal income (nominal gdp), cpi, and short term interest rate (money market rate) is taken from International Financial Statistics (IFS) for the period 1960-2007.

<table>
<thead>
<tr>
<th>Interest Rate</th>
<th>Semi-Log Model</th>
<th>Double-Log Model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Consumer’s Surplus Approach</td>
<td>Compensating Variation Approach</td>
</tr>
<tr>
<td>0.10</td>
<td>0.495</td>
<td>0.013</td>
</tr>
<tr>
<td>0.10</td>
<td>0.510</td>
<td>0.018</td>
</tr>
<tr>
<td>0.10</td>
<td>0.717</td>
<td>0.063</td>
</tr>
</tbody>
</table>

Using Currency in Circulation
Using M1
Using M2
Estimation through Macroeconomic Model

The model provides a setting in which the welfare costs of inflation can be assessed for the reason that money can have important real effects:

- It allows inter-temporal substitution among cash and credit good.
- This framework permits the interaction of inflation and taxation*

Welfare in the steady state is:

\[ W = \sum_{t=0}^{\infty} \beta^t (\ln C + BH) = (1 - \beta)^{-1} (\ln C + BH) \]

where, \( B = \left[ \frac{\ln(1 - h_0)}{h_0} \right] \)

*the CIA constraint applies only to consumption good and during higher inflationary period household can only reduce cash holding by reducing consumption.
# Findings

<table>
<thead>
<tr>
<th></th>
<th>0%</th>
<th>4%</th>
<th>8%</th>
<th>25%</th>
<th>100%</th>
<th>400%</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Corresponding g</strong></td>
<td>1</td>
<td>1.0099</td>
<td>1.0194</td>
<td>1.0574</td>
<td>1.1892</td>
<td>1.4142</td>
</tr>
<tr>
<td><strong>Output</strong></td>
<td>1.4486</td>
<td>1.4345</td>
<td>1.421</td>
<td>1.37</td>
<td>1.2181</td>
<td>1.0243</td>
</tr>
<tr>
<td><strong>Consumption</strong></td>
<td>1.2387</td>
<td>1.2266</td>
<td>1.2151</td>
<td>1.1715</td>
<td>1.0416</td>
<td>0.8759</td>
</tr>
<tr>
<td><strong>Investment</strong></td>
<td>0.2099</td>
<td>0.2079</td>
<td>0.2059</td>
<td>0.1985</td>
<td>0.1765</td>
<td>0.1484</td>
</tr>
<tr>
<td><strong>Capital Stock</strong></td>
<td>8.3971</td>
<td>8.3152</td>
<td>8.2371</td>
<td>7.9415</td>
<td>7.0611</td>
<td>5.9377</td>
</tr>
<tr>
<td><strong>Hours Worked</strong></td>
<td>0.344</td>
<td>0.3406</td>
<td>0.3374</td>
<td>0.3253</td>
<td>0.2893</td>
<td>0.2432</td>
</tr>
<tr>
<td><strong>Welfare Loss %</strong></td>
<td>0</td>
<td>0.968</td>
<td>1.9134</td>
<td>5.7007</td>
<td>19.1608</td>
<td>42.2179</td>
</tr>
</tbody>
</table>
Conclusion and Recommendations

- In general, results derived from varying growth rate of money supply show that there is substantial welfare gain by reducing the inflation rate to zero.
- Specifically, it is found that the welfare loss of 8 percent inflation is 1.9 percent.
- The results from the macroeconomic model display a larger variance as compared to econometric estimation of welfare cost of inflation.
- It is recommended that price stability should be the key objective of monetary policy for the case of Pakistan since the estimated gains of reducing inflation are positive.
Drawback of the study

- The model used in the paper ignores other cost of inflation like its variability, and impact on relative prices.

- The framework used in this paper doesn’t provide the role of monopolistic competition and nominal price and wage rigidities.