The Excess Sensitivity of Consumption to Sentiments: Does the PIH hold for India?

Workshop on Open Economy Macroeconomics and Economic Integration in Emerging Market Economies

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March 13, 2025

Outline I

Section 1

Introduction

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- Consumption and GDP

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- Wide swings in business cycles - Covid Pandemic and Even current slowdown

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- Consumption and GDP
- Wide swings in business cycles - Covid Pandemic and Even current slowdown
- Consumer Sentiments and its role - forecast spending and understand consumer behaviour

Motivation

- Sentiments role in predicting consumption (Acemoglu & Scott, 1994; Carroll et al., 1994)

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- Role of demographics and hetrogeneity in sentiments (Blendon et al., 1997; Souleles, 2004)

Our Paper

We examine **Excess Sensitivity** to Consumption through *Euler Equation* framework

To this end, we make use of

- a large dataset with cross-sectional heterogeneity
- we derive a measure of real consumption expenditure
- also make use of household level inflation instead of aggregate inflation
- compare the results for two essential basket of goods: *Food* and *Food and Fuel*

Literature

Relationship between Sentiments and Consumption

- **Positive** - Acemoglu & Scott (1994), Carroll et al. (1994), Choi et al. (2024), Matasuka & Sbordone (1995)
- **Negative** - Souleles (2004)
- importance of sentiment data in forecasting consumption - Lahiri & Zhao (2016), Lahiri et al. (2016)

Our Advanatage over Souleles (2004): Single data

Highlights

- we find presence of excess sensitivity to consumption - **positive**
- violation of **PIH**
- precautionary motive

Section 2

Data and Model

Data

- We use novel dataset from CMIE - CPHS
- Period : April, 2016 to October,2022
- Contains demographic as well as information about sentiments in a long pooled data
- Other data we use is the CPI data from MOSPI
- For sentiments, we use household financial conditions (FP) and economic conditions (BC)
- Expenditure data on 8 Food groups and Fuel and light

Model I

We solve the following expenditure minimisation problem to obtain real consumption bundle

$$\text{minimize} \quad e^j_{h,t} = \sum_{i=1} p^j_{i,t} c^j_{i,ht}\,; \quad h = 1, 2, ..., H; \quad j = rural, urban$$

$$\text{subject to} \quad c^j_{h,t} = \prod_{i=1}^{n} \left(c^j_{i,ht}\right)^{a^j_{i,ht}}\,; \quad \sum_{i=1}^{n} \alpha^j_{i,ht} = 1;$$

$$c^j_{h,t} = \frac{k^j_{h,t}\, e^j_{i,h,t}}{p^j_{h,t}} \tag{1}$$

$$p^j_{h,t} = \prod_{i=1}^{n} \left(p^j_{i,t}\right)^{\alpha^j_{i,ht}}\,; \tag{2}$$

Model II

and,

$$k_{h,t}^{j} = \prod_{i=1}^{n} \alpha_{i,ht}^{j} {}^{\alpha_{i,ht}^{j}}$$

Next, the generic household h solves an intertemporal problem to decide the time path of consumption.

Model III

$$\begin{aligned}
\text{maximize} \quad & E_0 \sum_{t=0}^{\infty} \beta^t \log\left(c_{h,t}^j\right) \\
\text{subject to} \quad & a_{h,t}^j - c_{h,t}^j = \frac{a_{h,t+1}^j}{R_{t+1}}, \\
& a_{h,0}^j = \text{given} \qquad \text{(Initial condition)} \\
& \lim_{t\to\infty} R^{-(t+T)} a_{h,t}^j \geq 0 \qquad \text{(Transversality Condition (TVC))}
\end{aligned}$$

Under logarithmic utility function, and $\beta = R^{(-1)}$, the Euler equation gives

$$\Delta ln(c_h(t+1)^j) = \delta_{h(t+1)}^j \tag{3}$$

Presence of Heterogeneity I

- aggregate price level remains same across all households
- ignores cross sectional heterogeneity
- we use household specific price level (Equation 2) and household specific y-o-y inflation to circumvent this issue

$$\pi^{j}_{h(t+1)} = \ln\left(p^{j}_{h,(t+1)}\right) - \ln\left(p^{j}_{h,(t+1)-12)}\right)$$

- From the measure of real consumption described above, we calculate its growth rate as follows-

$$\Delta \ln\left(c^{j}_{h(t+1)}\right) = \Delta \ln\left(e^{j}_{h(t+1)}\right) + \Delta \ln\left(k^{j}_{h(t+1)}\right) - \pi^{j}_{h(t+1)}$$

- we validate the presense of inflation and consumption heterogeneity across demographic characteristics

Figure 1: Average Inflation Rate among occupational class vis-a-vis CPI

Figure 2: Average Inflation Rate among educational groups vis-a-vis CPI

Figure 3: Average Inflation Rate among age groups vis-a-vis CPI

Figure 4: Average Consumption Growth among occupational class vis-a-vis Aggregate Consumption Growth

Figure 5: Average Consumption Growth among educational class vis-a-vis Aggregate Consumption Growth

Figure 6: Average Consumption Growth among age class vis-a-vis Aggregate Consumption Growth

Section 3

Results

Aggregate Consumption and Sentiments I

- following Lahiri & Zhao (2016), we calculate an Index of Consumer Sentiments (ICS)
- we use only two components to create the index
- significant co-movement between the household sentiments, and their consumption growth

Aggregate Consumption and Sentiments II

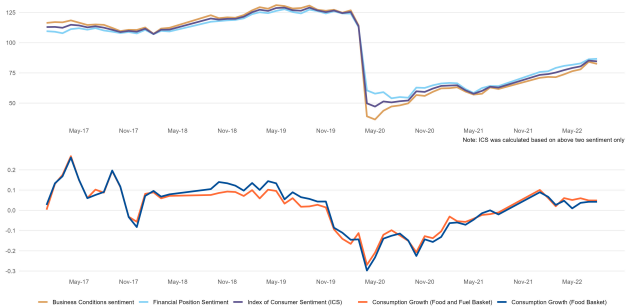

Figure 7: Index of Consumer Sentiment and Aggregate Consumption Growth

- we also calculate correlation matrix

Aggregate Consumption and Sentiments III

Table 1: Correlation Matrix

	Consumption Growth (Food Bundle)	Consumption Growth (Food & Fuel Bundle)	Business Conditions	Financial Position	ICS
Business Conditions	0.66^{***}	0.59^{***}	–	–	–
Financial Position	0.62^{***}	0.54^{***}	0.99^{***}	–	–
ICS	0.65^{***}	0.57^{***}	1^{***}	1^{***}	–

The Baseline OLS Estimation I

- PIH predicts consumption growth is unpredictable
- we assume consumption growth is not random; instead depend on
  - the aggregate shocks (like Covid-19 shock or government policy shocks) that uniformly affects all households
  - the preference shocks, $W_{h(t+1)}$ that varies across households and over time
- we estimate equation (4)

$$\Delta ln\left(c^{j}_{h(t+1)}\right) = b_0 time + b_1 W_{h(t+1)} + b_2 Q^{j}_{h(t)} + \eta_{h(t+1)} \tag{4}$$

- we use time dummies to control for aggregate shocks
- We use household's own financial position (Q_{FP}), and the overall business condition (Q_{BC}) as the measures of their sentiments in our baseline estimation

The Baseline OLS Estimation II

- A significant, b_2 signifies the presence of the excess sensitivity of consumption to sentiments among Indian households.

The Baseline OLS Estimation III

Table 2: OLS Estimation for Food and Food & Fuel

	Food		Food & Fuel	
	(1)	(2)	(1)	(2)
Q_{FP}	0.009***		0.054***	
	(0.002)		(0.002)	
Q_{BC}		0.003***		0.003***
		(0.002)		(0.002)
Age	-0.000***	-0.000***	-0.000***	-0.000***
	(0.002)	(0.000)	(0.002)	(0.000)
Δ kids	0.011***	0.011***	0.07***	0.07***
	(0.012)	(0.012)	(0.002)	(0.002)
Δ adults	0.038***	0.038***	0.028***	0.002***
	(0.002)	(0.002)	(0.002)	(0.002)
Time Dummies	Yes	Yes	Yes	Yes
Observations	58,871	58,871	58,871	58,871

The Baseline OLS Estimation IV

- results imply contraditcion of PIH and also precautionary savings motive
- results in line with previous studies based on aggregate data (Acemoglu & Scott, 1994; Carroll et al., 1994) and differes from micro study of Souleles (2004)

The GMM Estimation I

- Souleles (2004) - uses GMM, negative b_2
- the household sentiments explained by their demographic characteristics, location, and income matters the most; instead of raw sentiments itself (also, Blendon et al., 1997)

The GMM Estimation II

Table 3: GMM Estimation for Food and Food & Fuel

	Food		Food & Fuel	
	(1)	(2)	(1)	(2)
Q_{FP}	0.555***		0.695***	
	(0.00)		(0.030)	
Q_{BC}		0.345***		0.661***
		(0.038)		(0.037)
Age	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Δ kids	0.009	-0.007	0.010	-0.015
	(0.37)	(0.009)	(0.012)	(0.012)
Δ adults	0.018	0.041**	-0.342	-0.010
	(0.46)	(0.021)	(0.026)	(0.026)
Time Dummies	Yes	Yes	Yes	Yes
Number of Observations	56,211	56,211	56,211	56,211

The GMM Estimation III

- importance of household demographics, and their neighborhood to shape their sentiments as argued by Blendon et al. (1997)
- positive sign of the excess sensitivity parameter re-establishes the absence of the precautionary savings motive among the Indian households

Covid-19 I

- relationship in pre-covid period
- alters consumption behaviour
- sentiments lower than consumption growth

Table 4: GMM Estimation for Food Bundle and Food & Fuel Bundle - Pre-Covid and Covid Periods

	Pre-Covid Period (2016 April - 2020 February)				**Covid Period (2020 March - 2022 October)**			
	Food		**Food & Fuel**		**Food**		**Food & Fuel**	
	(1)	(2)	(1)	(2)	(1)	(2)	(1)	(2)
Q_{FP}	0.34***		0.766***	0.22***			0.43***	
	(0.01)		(0.030)		(0.05)		(0.030)	
Q_{BC}		0.20***		0.749***		0.03		0.36***
		(0.01)		(0.038)		(0.05)		(0.04)
Age	-0.001***	-0.001***	-0.001***	-0.001***	-0.002***	-0.001***	-0.002***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Δ Kids	0.03	-0.01	0.02	-0.015	0.00	-0.04	0.01	-0.04
	(0.08)	(0.01)	(0.01)	(0.012)	(0.01)	(0.01)	(0.01)	(0.01)
Δ Adults	-0.02	0.03	-0.07	0.03	-0.01	0.00	-0.01	0.00
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Time Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	38,131	38,131	38,131	38,131	17,400	17,400	17,400	17,400

The Spurious Excess Sensitivity - The Role of Forecast Error I

- possibility of spurious excess sensitivity
- we contol for stong assumption that aggrgate shocks hit all people equally
- Souleles (2004) find that forecast errors in sentiment variables are unsystematic and varry with demographics
- we use forecast errors of the sentiment variables to augment Equation 4 to check for spurious excess sensitivity

$$\Delta ln\left(c^{j}_{h(t+1)}\right) = b_0 time + b_1 W_{h(t+1)} + b_2 Q^{j}_{ht} + b_3 FE_{PC,ht} + \omega_{h(t+1)} \tag{5}$$

- for PIH to hold, we expect $b_2 = 0$ and $b_3 > 0$
- our results however contradict PIH and add robustness to our baseline results

The Spurious Excess Sensitivity - The Role of Forecast Error II

Table 5: Estimation for Food Bundle and Food & Fuel Bundle after Controlling for Forecast Error

	OLS		GMM	
	Food	Food & Fuel	Food	Food & Fuel
Q_{FP}	0.03***	0.023***	0.476***	0.461***
	(0.003)	(0.003)	(0.00)	(0.00)
FE_{FP}	0.027***	0.023***	0.53***	0.497***
	(0.002)	(0.002)	(0.00)	(0.00)
Age	-0.000***	-0.000***	-0.001	-0.000
	(0.000)	(0.000)	(0.96)	(0.92)
Δ kids	0.011***	0.06***	0.017	0.003
	(0.012)	(0.003)	(0.012)	(0.02)
Δ adults	0.039***	0.029***	0.009	0.011
	(0.002)	(0.002)	(0.71)	(0.62)
Time Dummies	Yes	Yes	Yes	Yes
Observations	53,312	53,312	53,312	53,312

The Spurious Excess Sensitivity - The Role of Forecast Error III

Table 6: GMM Estimation for Food Bundle and Food & Fuel Bundle - Pre-Covid and Covid Periods after controlling for Forecast Errors

	Pre-Covid (2016 April - 2020 February)		**Covid (2020 March - 2022 October)**	
	Food	Food & Fuel	Food	Food & Fuel
Q_{FP}	0.25***	0.717***	0.31***	0.20***
	(0.002)	(0.030)	(0.06)	(0.06)
FE_{FP}	0.613***	0.613***	0.42***	0.68***
	(0.061)	(0.061)	(0.009)	(0.061)
Age	-0.001***	-0.001***	-0.001***	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)
Δ Kids	0.017	0.017	-0.03	-0.03
	(0.012)	(0.012)	(0.02)	(0.02)
Δ Adults	-0.009	-0.009**	-0.01	-0.01**
	(0.71)	(0.71)	(0.06)	(0.06)
Time Dummies	Yes	Yes	Yes	Yes
Observations	37,717	37,717	12,615	12,615

The Spurious Excess Sensitivity - The Role of Forecast Error IV

- we observe excess sensitivity more significant for own sentimemt variable compared to aggragte sentiment variable
- some excess sensitivity still persists and is not due to hetrogeneity in forecast errors alone

Conclusion

- household sentiments explained by geographical location, income level, educational attainment, and demographic characteristics are superior predictors of con sumption growth
- households' sentiments should be appropriately incorporated in econometric models when forecasting India's business cycle
- Future works involve incorporating health related risks, liquidity constraints

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Thank You