Article

A Comparative Study of the Alternate Consumption-based Capital Asset Pricing Models: Evidence from India

Nirma University Journal of Business and Management Studies
9(2) 160–182, 2026
© The Author(s) 2026
DOI: 10.1177/njb.261484991
njb.spectrumjps.com

M. Mallikarjun[1]

Abstract

The consumption-based capital asset pricing model (CCAPM) is considered to be one of the ingenuous and most instinctive of all asset-pricing models. Studies by Rubinstein (1976), Breeden and Litzenberger (1978), and Breeden (1979) demonstrate that equilibrium expected excess returns are proportional to their 'consumption betas'. CCAPM is an extension of the first-order condition for a utility-maximizing individual's intertemporal consumption and investment choice problem. This contrasts with the market-oriented capital asset pricing model based on a single-period economy by Sharpe (1964, *The Journal of Finance*, 19, 3, 425–442) and Lintner (1965, *Review of Economics and Statistics*, 47, 1, 13–37). In this study, two models of CCAPM are tested. The first one replaces the market premium with the growth rate of consumption. The second variant is the canonical consumption-based model proposed by Hansen and Singleton (1982, *Econometrica*, 50, 5, 269–286). The canonical model imposes the power utility Euler equation under lognormality. By transitioning from the unconstrained linear model to the canonical log-linearized CCAPM, we change the fundamental question we are asking the data. The simple CCAPM measured immediate wallet shocks—how raw, discrete changes in spending correlated with asset returns. The canonical CCAPM measures intertemporal human psychology—how households smooth their proportional consumption over time. This article attempts to provide an empirical comparison across these two models using Consumer Pyramids Household Survey data from the Centre for Monitoring

[1]Institute of Management, Nirma University, Ahmedabad, Gujarat, India

Corresponding author:
M. Mallikarjun, Institute of Management, Nirma University, Ahmedabad, Gujarat 382481, India.
E-mail: mmallikarjun@nirmauni.ac.in

Creative Commons Non Commercial CC BY-NC: This article is distributed under the terms of the Creative Commons Attribution-NonCommercial 4.0 License (http://www.creativecommons.org/licenses/by-nc/4.0/) which permits non-Commercial use, reproduction and distribution of the work without further permission provided the original work is attributed.

Indian Economy, granular unit-level data. The data collected for the study were monthly, ranging from January 2014 to August 2023. Average consumption expenditure per household across 24 major states and union territories (rural, urban and combined) was considered.

Keywords

CAPM, CCAPM, Canonical Consumption based Model, Consumption Expenditure

Introduction

Indian capital market has grown and developed phenomenally over the last three decades. Its evolution is a powerful narrative of economic transformation, from a modest beginning with the setting up of Bombay Stock Exchange (BSE) in 1875 to becoming the world's fifth-largest stock market, crossing the threshold of $5 trillion in market capitalization in 2024. The journey in rupee terms has been more dramatic, from ₹10 lakh crore in September 2003, the market cap surged 40 times to ₹400 lakh crore in April 2024.

The relationship between the economy and the capital market is not one-way; it is two-way and multidimensional. Research studies have established a strong, significant (statistically) association between stock and other asset prices and macroeconomic variables, such as gross domestic product (GDP), inflation, interest rates, exchange rate, foreign direct investment (FDI) and consumption expenditure.

Domestic demand continues to be the main driver of India's economic growth. The driver for this demand happens to be consumption, supported by a positive macroeconomic environment, characterized by low and stable inflation and employment conditions. Both rural and urban consumption expenditure have been quite stable over the years. India's private final consumption expenditure (PFCE) has been consistently accounting for more than half of its GDP. The share of PFCE in GDP rose to 61.5% in FY26, the highest level since FY12. An important aspect of India's consumption story is the steady rise of rural spending, which is providing the impetus to domestic demand. Monthly per capita expenditure (MPCE) in rural India has nearly tripled, jumping from ₹1,429 in 2012 to ₹4,122 in 2024. This rise is also narrowing the gap between urban and rural India.

Indian households, on one hand, are spending more as well as differently, which has brought a structural shift in their consumption basket. The share of expenditure on food has declined across both rural and urban India, falling from 52.9% (2011–2012) to 47% (2023–2024) in rural areas and from 42.6% to 39.7% in urban areas. This has been followed by an increase in the relative share of non-food expenditure, rising from 47.1% to 53.0% in rural areas and from 57.4% to 60.3% in urban areas.

This shift has been witnessed due to increased spending on durable goods and services, especially in rural India, where it has increased by more than 200% per person.

India's capital market is interlinked with its real economy and its growth. This relationship is driven by a critical variable: consumption expenditure. The

allocation of consumption over time also involves a saving decision, that is, a one way (the other being the return on assets) through which wealth can be increased or depleted. The intertemporal consumption framework is developed by examining the individual's choice decision regarding consumption (*Ct*) in the present period versus consumption (*Ct*+1) in the future time period. It is assumed that the individual is 'bestowed' with a given quantity of goods in each of the two periods and, to the extent that *Ct* and *Ct*+1 differ from the amount held in *t* and *t* + 1, the individual would be saving or borrowing in the present. It is assumed that the given amount held takes the form of wealth (*Wt*) and this is available at the start of the present period (assuming the wealth was accumulated in the past). The difference between wealth and present consumption, *Wt* – *Ct*, becomes saving (if positive) or borrowing (if negative). In either situation, it can be seen that wealth is transferred between *t* and *t* + 1 at a given rate of interest, *rt*+1.

The capital asset pricing model (CAPM), originally developed by Sharpe–Lintner–Mossin, establishes a general equilibrium relationship in the capital markets. It relates the expected rate of return for any security or portfolio with the relevant risk measure under a set of assumptions. Following the introduction of the CAPM, numerous extensions were proposed. They all boil down to relaxing one or more of the assumptions and result in models that bear a more or less close resemblance to the CAPM according to the changes in the assumptions. One of the most important classes of modifications to the CAPM involves modifying the underlying mean-variance (single-period) structure to allow for an intertemporal decision-making process. The outcome of these models has been jointly labelled as either the intertemporal CAPM (ICAPM) or the consumption-based CAPM (CCAPM) models. These models provide a framework for making intertemporal arrangements by investors, who are now assumed to have the opportunity to revise their present portfolio decisions and to consume later a part of their wealth as per their preferences.

Understanding Asset Pricing Through Macroeconomic Framework

Traditional risk models, such as the CAPM, measure a security's riskiness by looking at how its returns move in relation to the broader market. However, this framework offers little insight into the underlying forces that actually make the market volatile in the first place. Macroeconomic theory helps us understand this gap. It provides us with insights into identifying the relevant connecting variables, such as national income, corporate earnings, interest rate policy, and government spending, which help researchers identify the sources of systemic uncertainty and trace the pathways through which they impact returns.

Within the world of stochastic macroeconomic modelling, the CCAPM has emerged as a distinct model, where it focuses on the behavior of asset prices and returns in the financial decisions of households with regard to how much to spend, how much to save, and how to allocate wealth across different assets.

A large number of research studies have examined the comparative performance of CCAPM and other market-based models. One of the early works by Working (1960) analyzed quarterly asset returns and their covariance in the spot consumption rate. The study observed that the variance in consumption measured across intervals was approximately two-thirds of that observed at the spot rate. Tiao (1972) generalized these results for empirical validation of CCAPM later.

Grossman et al. (1987) used maximum likelihood estimation to correct distortions in the measurement of consumption over time rather than at a precise moment. They validated the fact that the CCAPM estimates the asset prices based on shifts in total consumption between two defined points. Marsh (1980), while proposing an alternate method, suggested a latent variable framework to estimate the model's parameters. His results validated the notion that asset returns and individual consumption trajectories follow continuous stochastic processes and that, over discrete periods, their joint distribution approximates normality. Independently, Breeden's (1979) study demonstrated that betas calculated relative to a portfolio with the highest possible correlation to aggregate consumption growth can serve as a valid substitute for betas computed directly against aggregate consumption figures.

One major problem in testing the CCAPM is the difficulty of obtaining reliable consumption data across extended time periods. Researchers use expenditure data on non-durable goods and services as a proxy, following the approach advocated by Hall (1978). The major measurement issues identified have been: the gap between what people spend and what they actually consume; the use of averaged consumption figures instead of instantaneous readings; the infrequency of consumption reporting compared to the frequency of asset return data; and ordinary sampling error arising from the fact that only a fraction of real-world consumption activity is ever captured in official statistics.

Pricing Risk in Financial Markets

The CCAPM is an outcome of multiperiod consumption and portfolio selection decisions. In the CCAPM, the rate of growth of consumption plays a role similar to the rate of return on the market portfolio in the static CAPM. The major distinction between CAPM and CCAPM is what each treats as the central driver of risk.

The basic construct of the CCAPM is straightforward: both aggregate consumption and asset returns are assumed to trace an optimal trajectory that, over time, approximates a normal distribution.

The CAPM operates entirely within market dynamics. Developed by Sharpe in 1964 and Lintner in 1965, it introduced the beta coefficient as its primary measure of risk—a single number that expresses how much systematic risk a given security carries relative to the market as a whole. He further developed this framework to the statistical relationship between a security's expected return and the covariance of that return with the market. When covariance = 0, price accurately reflects underlying value—a stable, equilibrium state. Negative covariance causes prices

to fall short of fundamental value, while positive covariance inflates them beyond it. These departures from fair value generate speculative activity that nudges prices back towards equilibrium: undervalued assets attract buyers, pushing prices up, while overvalued ones face selling pressure that brings them down.

In essence, the two models share the same destination—a rational, equilibrium-based explanation of how assets are priced—but arrive there by entirely different routes. The CAPM traces risk through market behavior; the CCAPM grounds it in the consumption choices of the households that make up the broader economy.

Methodology

The first model specified below postulates a consumption factor within the conventional static CAPM by replacing the market premium with consumption growth.

$$Y = a + bR_{t+1}$$

where Y is the asset return and R is the consumption return (proxy for the growth rate of consumption). While b is the measure of sensitivity of the asset's return to the growth rate in real aggregate average consumption, they are unconstrained estimates with regard to CCAPM.

The second variant is the canonical consumption-based model with time-separable power utility based on the classic form studied by Hansen and Singleton (1982). In the suggested model, the risk-return relationship is proposed as:

$$Y_{t+1} = \frac{\beta\left(Ct+1\right)^{-\eta}}{ct}$$

where Y symbolizes the excess returns, C is consumption, β is the market premium, and η is the consumption utility or premium. By taking logarithms, the canonical consumption-based model with power utility can be specified as:

$$y_{t+1} = \ln(\beta) - \eta \ln\left(c_{t+1} - c_t\right)$$

where c represents consumption (per capita). The benefit of this model is that it is able to measure the dynamic intertemporal structure of the original CCAPM model in a simple manner while providing a general framework for evaluating CCAPM in diverse market situations.

Data

Data for this study were taken from the Consumer Pyramids Household Survey (CPHS) data of the Centre for Monitoring Indian Economy (CMIE). The CPHSs of the CMIE are repetitive large-scale longitudinal surveys of people. These surveys have been covering the same sample of houses (covering 160,000 plus households) thrice a year, every year since 2014. CPHS captures data to create a

monthly time-series of two sets of indicators. These are indicators that help estimate the total income of a household and estimate the distribution of expenses. The estimate of expenses has been used as a measure for consumption expenditure. In this study, average total expenditure, expenditure on food, electricity, transport, and health were considered from each household across 24 major states and union territories (UTs) with rural and urban categorization. Average consumption expenditure per household was calculated across rural, urban, and combined levels for these 24 states and UTs and at an all-India level. The corresponding market indices, S&P BSE Sensex, Fast Moving Consumer Goods, Power, Auto, and Healthcare, were considered accordingly. A monthly time series was constructed from January 2014 to August 2023. Nominal values were converted to real values using respective state-wise consumer price index (CPI) data for the given time period.

This data was collected across 9 broad categories: food (32 items); intoxicants, restaurants, and entertainment (9 items); clothing and cosmetics (5 items); toiletries and home care products (13 items); bills, rents, EMIs, and appliances (11 items); fuel, transport, and communication (14 items); education (10 items); health (8 items); and miscellaneous expenses (15 items). Rapid minor has been used for these calculations.

Analysis

The 2014–2023 decade was one of the most dynamic periods in Indian financial history. It encompassed the initial 2014 structural bull run, the disruptions of demonetization and GST, the 2018 NBFC credit crisis, the unprecedented 2020 COVID-19 crash, and the massive liquidity-driven recovery that culminated in all-time highs by late 2023.

Evaluating the BSE Sensex, S&P BSE FMCG, BSE Power, BSE Auto, and BSE Healthcare indices over this specific 10-year period reveals vastly different structural behaviors. While the BSE Sensex represents the diversified market baseline, the sectoral indices showcase how investors were compensated (or penalized) for taking on concentrated economic risks (Table 1).

The Sensex acts as the baseline for the equity risk premium. Because it is highly diversified, its standard deviation (volatility) remained balanced. Whether the economy was booming in 2017 or locked down in 2020, the fast-moving consumer goods (FMCG) index exhibited the lowest standard deviation of the group. Healthcare acted as the ultimate uncorrelated hedge, as it provided protection exactly when the rest of the economy failed. Automobiles are a highly discretionary, interest-rate-sensitive sector. The 10-year chart is a rollercoaster: a massive boom from 2014–2017, followed by a severe multi-year bear market driven by the IL&FS credit crunch, the BS-VI emission transition, and pandemic supply-chain shock. For the first half of the decade (2014–2020), the Power sector was a wealth destroyer, plagued by non-performing assets (NPAs), stranded thermal capacities, and debt. Its volatility was immense.

Table 1. Descriptive Statistics for Monthly Returns.

Year	Ln Returns	Bse Sensex	SP FMCG	SP Power	SP Auto	SP Health	Simple Returns	Bse Sensex	SP FMCG	SP Power	SP Auto	SP Health
2014	AVG	0.0218	0.0140	0.0173	0.0349	0.0323	AVG	0.0226	0.0146	0.0223	0.0366	0.0343
	SD	0.0353	0.0347	0.1000	0.0478	0.0553	SD	0.0358	0.0354	0.1075	0.0492	0.0564
2015	AVG	–0.0043	0.0011	–0.0056	–0.0005	0.0117	AVG	–0.0037	0.0017	–0.0045	0.0004	0.0131
	SD	0.0347	0.0340	0.0484	0.0433	0.0544	SD	0.0345	0.0341	0.0471	0.0435	0.0540
2016	AVG	0.0016	0.0027	0.0013	0.0075	–0.0115	AVG	0.0026	0.0036	0.0034	0.0095	–0.0108
	SD	0.0468	0.0441	0.0679	0.0650	0.0376	SD	0.0471	0.0443	0.0668	0.0654	0.0371
2017	AVG	0.0205	0.0228	0.0151	0.0232	0.0004	AVG	0.0211	0.0236	0.0159	0.0241	0.0015
	SD	0.0273	0.0339	0.0394	0.0369	0.0502	SD	0.0278	0.0343	0.0401	0.0375	0.0494
2018	AVG	0.0048	0.0084	–0.0146	–0.0208	–0.0051	AVG	0.0058	0.0098	–0.0130	–0.0191	–0.0033
	SD	0.0470	0.0537	0.0568	0.0575	0.0625	SD	0.0471	0.0538	0.0562	0.0559	0.0635
2019	AVG	0.0112	–0.0030	–0.0031	–0.0100	–0.0030	AVG	0.0117	–0.0026	–0.0020	–0.0076	–0.0024
	SD	0.0305	0.0318	0.0494	0.0723	0.0363	SD	0.0310	0.0321	0.0501	0.0712	0.0361
2020	AVG	0.0122	0.0084	0.0057	0.0099	0.0399	AVG	0.0172	0.0093	0.0098	0.0198	0.0442
	SD	0.1053	0.0455	0.0952	0.1503	0.0840	SD	0.0999	0.0457	0.0921	0.1402	0.0901
2021	AVG	0.0166	0.0074	0.0436	0.0147	0.0158	AVG	0.0174	0.0083	0.0471	0.0158	0.0166
	SD	0.0385	0.0435	0.0716	0.0477	0.0395	SD	0.0395	0.0441	0.0765	0.0482	0.0402
2022	AVG	0.0036	0.0128	0.0192	0.0128	–0.0108	AVG	0.0045	0.0138	0.0238	0.0140	–0.0098
	SD	0.0439	0.0432	0.0979	0.0493	0.0446	SD	0.0445	0.0449	0.1007	0.0495	0.0439
2023	AVG	0.0143	0.0201	0.0236	0.0315	0.0262	AVG	0.0149	0.0207	0.0282	0.0331	0.0277
	SD	0.0324	0.0272	0.0961	0.0468	0.0482	SD	0.0330	0.0278	0.0959	0.0480	0.0496

Table 2. Simple and Log Yield and Risk Across Indices.

Ln Returns	Bse Sensex	SP FMCG	SP Power	SP Auto	SP Health	Simple Returns	Bse Sensex	SP FMCG	SP Power	SP Auto	SP Health
Annual % yield	12.2745	11.2873	10.2076	11.6316	11.2347		12.9920	11.6730	12.9978	13.8273	12.4450
Risk	16.5454	13.5560	25.2664	23.7651	18.5223		16.2659	13.7164	25.7027	23.0660	18.9745

When annualized returns and their corresponding annualized volatility (Table 2) are looked into, we observe that the BSE Sensex outperformed the other indices, returning 12.27% annualized compared to other indices. The Power and Auto sectors were highly volatile. Power exhibited the highest risk (25.62% volatility) but yielded the lowest annualized return (10.2%). This suggests that investing in the Power index during this timeframe was highly inefficient. The FMCG sector had the lowest volatility (13.56%), making it less risky than the broader Sensex while still delivering an 11.29% return. The same is witnessed when we calculate the Sharpe ratio. FMCG leads with a Sharpe ratio of 0.83. While it did not generate the absolute highest returns, Health and Sensex have Sharpe ratios of 0.60 and 0.74. Auto has a value of 0.48 and Power has the lowest Sharpe ratio of 0.40.

An analysis of average monthly per capita consumption expenditure (MPCE) (Annexure 1) shows significant regional and sectoral variance in growth across Indian states. When the average expenditure growth, along with the corresponding standard deviations, is analyzed, wide differences between rural (R) and urban (U) sectors, as well as essential versus discretionary spending categories, are observed.

Mean growth rates for food were found to be consistently low and tightly bounded across both rural and urban sectors, highlighting its role as a basic necessity with limited consumption scalability.

In the case of trans (transport) and health sectors, huge volatility and higher average spikes were observed. Spending in these categories is relatively more elastic, discretionary, or event-driven, which varies significantly depending on state-level infrastructure and levels of urbanization.

The data also brought out key structural disparities when comparing the rural (R) and urban (U) segments across states.

Rural sectors exhibited stable but lower average expenditure growth in non-food items, showing a heavy household reliance on baseline subsistence.

Significantly higher standard deviations and average expenditure were observed in the case of urban centers in categories such as transport and healthcare. This trend emphasizes greater economic financialization, diverse market dependencies, and a higher vulnerability to price shocks within urban spaces.

An analysis of the simple CCAPM estimates (Annexure 2) provides insights into the relationship between asset returns and regional consumption growth.

Combined TotExp has a negative slope (–0.0498). This is a contradiction to the basic CCAPM prediction, where asset returns should be positively related to consumption growth (positive consumption beta). When we analyze other slope

coefficients, we observed that food and electricity had small positive slopes (0.037, 0.050). Transport slope was very close to zero (0.012) and health slope was strongly negative (–0.135), which can be interpreted as higher health consumption growth is associated with *lower* asset returns.

Across all sectors (combined, rural, urban) and most states, the slope for health was negative. India aggregate: –0.135 (combined), –0.119 (rural), –0.152 (urban). Health expenditure often rises during economic downturns (illness, stress) when asset returns are low, which would have a negative correlation. Alternatively, health spending may be a 'necessity' that crowds out investment in risky assets.

The rural slope was positive (+0.043) and the urban slope was found to be (–0.002). Rural consumption growth is more aligned with asset returns—perhaps because rural incomes are tied to agricultural cycles that also drive corporate earnings.

In the case of food, the rural slope (+0.315) has an order of magnitude larger than the urban slope (+0.042). In rural areas, food consumption is a dominant part of the basket and highly sensitive to income shocks, making it a strong pricing factor.

In the case of health, the urban negative slope is more pronounced than the rural slope, suggesting that urban health spending is even more counter-cyclical or measured with more error.

When Total Expenditure versus Disaggregated Categories was compared, the negative or near-zero slope for TotExp (for combined and urban) can be interpreted to mean that aggregate consumption growth is a poor pricing kernel in India. In the case of the analysis at the disaggregated categories, food and electricity sometimes yielded positive slopes, indicating that specific components of consumption may better capture marginal utility growth.

For states such as Andhra Pradesh, Bihar, Chandigarh, Maharashtra, and Uttar Pradesh, we observed consistently positive slopes for food and TotExp (especially rural), implying stronger CCAPM validation there.

In the case of states such as Karnataka, Jammu and Kashmir, Rajasthan, and Tamil Nadu, we observed negative TotExp slopes across sectors.

Standard theory predicts $b > 0 b > 0$ for assets that are positively correlated with consumption growth (most risky assets). The negative b for TotExp at the India level negates the basic CCAPM with aggregate consumption.

Even in the case of disaggregated categories such as food give positive but often unstable estimates across states. Only rural food comes close to a plausible risk aversion interpretation ($b = 0.3$ would imply a coefficient of relative risk aversion of around 3–5, which is reasonable).

When we transition from the unconstrained linear model to the canonical log-linearized CCAPM, we change the fundamental question we are asking the data.

The simple CCAPM measured how raw, discrete changes in spending correlated with asset returns. The canonical CCAPM measures how households smooth their proportional consumption over time, accounting for the coefficient of relative risk aversion.

Canonical CCAPM analysis covers 24 Indian states (including UTs) for combined, rural, and urban sectors, across five consumption categories (Annexure 3).

All coefficients except those for Chandigarh (CH) are statistically significant at conventional levels (presumably 5% or 1%). This high degree of significance is justifiable because typical CCAPM regressions often suffer from large standard errors due to weak correlation between consumption growth and asset returns (Cochrane, 2005). This significance can be interpreted as either low measurement error, high consumption volatility, or a well-specified model for Indian data.

Chandigarh's insignificance may be due to its small size, unique consumption patterns as a UT, or data quality issues.

All point estimates were found to be negative, satisfying the theoretical sign restriction. The implied risk aversion coefficients were found to be around 1.0, which is at the lower bound of the possible range but consistent with the habit formation literature (Campbell & Cochrane, 1999), where effective risk aversion can be time-varying but average near 1.

In the case of health consumption, we observed the highest risk aversion ($\eta = 1.14$). This can be explained as health expenditures are often inelastic and rise during economic downturns (due to illness, stress, or public health crises), creating a negative covariance with asset returns. Assets that perform poorly when health spending spikes require a higher risk premium, manifesting as a larger value.

Electricity showed relatively lower risk aversion in rural areas ($\eta = 0.529$) compared to urban ($\eta = 0.868$) and combined ($\eta = 0.926$). This rural–urban gap is economically and statistically significant. A likely explanation is that rural electricity consumption is subsidized, irregular, or driven by non-economic factors (e.g., government rationing), decoupling it from the marginal utility of consumption. Urban electricity usage is more closely linked with income changes and discretionary spending.

For 23 out of 24 states (excluding Andhra Pradesh combined), all categories except electricity in a few states exhibited negative slope coefficients. This consistency with regard to the canonical CCAPM is remarkable and suggests that consumption-based pricing is a robust cross-state phenomenon in India, with an exception in the case of Andhra Pradesh combined.

The positive slope coefficients for combined Andhra Pradesh in cases of TotExp, food, and electricity violate the fundamental risk aversion restriction. Since the rural and urban subsamples separately conform to theory, the anomaly likely arises from aggregation bias: when pooling rural and urban consumption data, the constructed consumption growth series may be contaminated by composition effects (e.g., changes in rural–urban population shares, differential price indices, or measurement errors in aggregate consumption). This is a classic Simpson's paradox: the sign of the correlation reverses when disaggregating. Researchers must therefore exercise caution when using aggregate state-level consumption data; sectoral disaggregation is essential.

Total consumption and food consumption have similar marginal utility dynamics. This is plausible because food constitutes a large fraction of the consumption basket in India (especially in rural areas). The CCAPM is robust to the choice of consumption aggregate.

The transport coefficient was found to be consistent across states and sectors, with very little variation.

In the case of electricity, the rural–urban difference in the coefficient was observed across states.

With the exception of Chandigarh (insignificant) and the combined Andhra Pradesh aggregation anomaly (positive slopes), the canonical CCAPM with log consumption growth is strongly supported across 23 Indian states and both rural and urban sectors. The estimated relative risk-aversion coefficients are remarkably close to 1 for total expenditure, food, and transport, slightly higher for health (–1.14), and lower for electricity in rural areas (–0.53). These results provide credible, significant evidence that consumption risk is priced in Indian asset markets, aligning with the theoretical predictions of power utility. The rural–urban divergence for electricity calls for separate pricing kernels or for inclusion of sector-specific consumption measures in empirical asset pricing.

Conclusion

The canonical model's coefficients were found to be more stable, interpretable, and significant—a strong indicator that the log specification is the correct functional form for testing the CCAPM for the dataset used in this study.

The results of the canonical model observed near-complete significance of the coefficients, suggesting that log consumption growth is a much stronger predictor of asset returns than simple growth rates. This was expected because log differences are able to better approximate the continuous-time diffusion processes assumed in theory and reduce heteroskedasticity.

The observed results of the canonical CCAPM were theory-consistent and statistically significant across nearly all Indian states and sectors, establishing that consumption risk is priced with a risk aversion coefficient of approximately 1. The simple CCAPM suffers from functional form misspecification and yielded misleading slope coefficients for important consumption categories such as food. For the dataset used, the log-specified CCAPM was more appropriate in terms of its results and interpretation as compared to simple consumption-based asset-pricing tests.

Declaration of Conflicting Interests

The author declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author received no financial support for the research, authorship, and/or publication of this article.

ORCID iD

M. Mallikarjun https://orcid.org/0000-0002-1295-8481

References

Breeden, D. T. (1979). An intertemporal asset pricing model with stochastic consumption and investment opportunities. *Journal of Financial Economics*, *7*(3), 265–296.

Breeden, D. T., & Litzenberger, R. H. (1978). Prices of state contingent claims implicit in option prices. *Journal of Business*, *51*(4), 621–651.

Campbell, J. Y., & Cochrane, J. H. (1999). By force of habit: A consumption based explanation of aggregate stock market behavior. *Journal of Political Economy*, *107*(2), 205–251.

Cochrane, J. H. (2005). *Asset Pricing. Princeton*, NJ: Princeton University Press.

Grossman, S. J., Melino, A., & Shiller, R. J. (1987). Estimating the continuous-time consumption-based asset-pricing model. *Journal of Business and Economic Statistics*, *5*(3), 315–327.

Hall, R. E. (1978). Stochastic implications of the life cycle-permanent income hypothesis: Theory and evidence. *Journal of Political Economy*, *86*(6), 971–987.

Hansen, L. P., & Singleton, K. J. (1982). Generalized instrumental variables estimation of nonlinear rational expectations models. *Econometrica*, *50*(5), 269–286.

Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics*, *47*(1), 13–37.

Marsh, T. A. (1980). *Intertemporal capital asset pricing and the term structure of interest rates* [Unpublished PhD dissertation, Graduate School of Business, University of Chicago].

Rubinstein, M. (1976). The valuation of uncertain income streams and the pricing of options. *Bell Journal of Economics and Management Science*, *7*(2), 407–425.

Sharpe, W. F. (1964). Capital asset prices: A theory of asset pricing under conditions of risk. *The Journal of Finance*, *19*(3), 425–442.

Tiao, G. C. (1972). Asymptotic behaviour of temporal aggregates of time series. *Biometrika*, *59*(3), 525–531.

Working, H. (1960). Note on the correlation of first differences of averages in a random chain. *Econometrica: Journal of the Econometric Society*, *28*(4), 916–918.

Annexure 1: Average Monthly Consumption Expenditure Growth

State	CTOTEXP	CFOOD	CELECTRI	CTRANS	CHEALTH	RTOTEXP	RFOOD	RELECTRI	RTRANS	RHEALTH	UTOTEXP	UFOOD	UELECTRI	UTRANS	UHEALTH
AP	0.006343	0.000953	–0.00079	0.391498	0.013239	0.006908	0.001609	0.000381	0.364297	0.015136	0.006079	0.00056	–0.00126	0.401986	0.013923
AS	0.002201	0.000724	0.001402	0.08717	0.018139	0.005115	0.001902	0.006324	0.080673	0.044445	0.001897	0.00044	0.001312	0.111598	0.018883
BH	0.001883	1.17E–05	0.000887	0.146738	0.016153	0.002646	0.00075	0.00363	0.097123	0.028789	0.002366	0.000238	1.25E–05	0.192153	0.015636
CD	0.006981	–0.00011	0.184267	0.700294	0.033907	0.006464	–7.00E–05	0.184222	0.698981	0.03321	0.006562	0.002653	–0.00257	0.161947	0.012035
CH	0.006562	0.002653	–0.00257	0.161947	0.012035	0.007238	0.004072	0.000518	2.190329	0.019804	0.006305	0.001924	–0.00319	0.141657	0.014776
DL	0.00501	0.000943	0.047943	1.036409	0.021039	0.003123	0.000421	0.112008	0.632846	0.022737	0.00533	0.001221	0.040648	1.78533	0.028028
Goa	–0.00847	–0.01119	–0.00529	0.059829	–0.00261	–0.00755	–0.00942	–0.00054	0.133232	0.001635	–0.00812	–0.01157	–0.00698	0.072376	0.000365
GJ	0.002603	0.001151	0.010593	0.0305	0.016551	0.00227	0.001545	0.022355	0.026799	0.034773	0.002425	0.001112	0.012241	0.036352	0.01867
HR	0.002856	0.000398	0.012698	0.045063	0.017789	0.002585	–0.00088	0.042768	0.058396	0.021901	0.003099	0.00093	0.025155	0.046775	0.018809
HP	0.006038	–0.00013	0.023622	0.13956	0.022601	0.005008	–0.00205	0.055455	0.397818	0.034317	0.006317	–5.91E–05	0.028979	0.126429	0.03086
JK	0.020074	0.045428	0.003567	0.011729	0.014269	0.004607	0.002355	0.003556	0.042338	0.015983	0.044433	0.101732	0.008454	0.007016	0.062485
JH	0.002142	0.000607	0.001821	0.021101	0.016304	0.0016	0.000252	0.002932	0.11754	0.021222	0.002144	0.000544	0.001182	0.018087	0.026208
KA	0.003783	–0.00053	–0.00936	0.039614	0.017923	0.00332	0.000674	–0.00393	0.070307	0.017834	0.003882	–0.00078	–0.01108	0.040517	0.019382
KE	0.002068	–0.00057	0.032732	0.106016	0.002696	0.002386	–0.00071	0.044352	0.092083	0.004129	0.002516	–0.00033	0.041609	0.114833	0.003298
MP	0.005531	0.001397	–0.00437	0.106827	0.014348	0.007285	0.0029	–0.00275	0.099756	0.014891	0.004859	0.000738	–0.00536	0.121607	0.016732
MH	0.000306	–0.00242	0.000888	0.040146	0.007994	0.001714	–0.00161	0.00315	0.04052	0.008982	0.000276	–0.00234	0.001519	0.042793	0.00951
OD	0.077568	0.203728	0.003984	0.018525	0.012568	0.007711	0.003593	0.009882	0.017676	0.023033	0.109604	0.307154	0.003023	0.02395	0.013062
PB	0.004351	0.000107	0.019987	0.087152	0.015173	0.00678	0.001959	0.039679	3.124995	0.0288	0.003507	–0.00049	0.047632	0.10233	0.018332
RJ	0.004423	0.001378	0.003596	0.099958	0.01424	0.004588	0.000953	0.009112	0.044121	0.016626	0.004027	0.001234	0.004052	0.148882	0.015394

(Annexure 1 continued)

(Annexure 1 continued)

State	CTOTEXP	CFOOD	CELECTRI	CTRANS	CHEALTH	RTOTEXP	RFOOD	RELECTRI	RTRANS	RHEALTH	UTOTEXP	UFOOD	UELECTRI	UTRANS	UHEALTH
TN	0.002376	–0.00028	0.008301	0.283108	0.016104	0.004535	0.001463	0.024546	1.69267	0.021946	0.001858	–0.00074	0.009869	0.334409	0.015319
TL	0.007601	0.015311	–0.00047	0.365435	0.006281	0.00439	0.001772	0.002596	1.690959	0.012825	0.009072	0.01966	–0.00102	0.305544	0.008099
UP	0.000244	–0.00243	0.000715	0.033145	0.011998	0.001323	–0.00148	0.004286	0.058267	0.017028	–0.00019	–0.00259	0.000305	0.029121	0.012052
UK	0.008039	–0.00052	0.014716	2.07452	0.029748	0.008135	–0.00024	0.098777	0.493202	0.064874	0.007938	–0.00077	0.020417	2.559095	0.027544
WB	0.004857	0.000687	0.001595	0.073105	0.011106	0.005267	0.000873	0.013552	0.118409	0.015196	0.005142	0.000683	0.001734	0.064742	0.011928
India	0.002951	0.003041	–0.00161	0.039677	0.007745	0.002656	0.000124	0.001087	0.036407	0.007912	0.003398	0.004811	–0.00195	0.041595	0.008062
State	LNTOTEXP	LNFOOD	LNELECTRI	LNTRANS	LNHEALTH	LNRTOTEXP	LNRFOOD	LNRELECTRI	LNRTRANS	LNRHEALTH	LNUTOTEXP	LNUFOOD	LNUELECTRI	LNUTRANS	LNUHEALTH
AP	0.00344	0.000625	–0.00142	0.005534	0.009077	0.003832	0.00116	–0.00073	0.004054	0.008266	0.002873	0.00018	–0.00202	0.006538	0.009448
AS	–0.00053	–0.00117	–0.0026	–0.00662	0.000415	0.000804	–0.00118	0.003161	–0.00301	0.006633	–0.00113	–0.00152	–0.00483	–0.00799	–0.00173
BH	0.000757	–0.00033	0.000349	0.000584	0.008022	0.001563	0.000311	0.00288	0.001392	0.008452	0.000837	–0.00015	–0.00088	0.001252	0.00905
CD	0.00159	–0.0012	0.001511	0.025879	0.0117	0.001012	–0.00116	0.001401	0.025302	0.011122	0.002677	0.001626	–0.00409	0.000352	0.001507
CH	0.002677	0.001626	–0.00409	0.000352	0.001507	0.003746	0.003069	–0.00231	0.000507	0.000135	0.001785	0.00062	–0.00461	0.000104	0.002483
DL	0.001164	0.000156	0.003842	–0.00869	0.00824	–0.0005	–0.00086	0.003063	–0.00819	–0.00023	0.000993	0.000465	0.003614	–0.00858	0.009717
Goa	–0.00295	–0.00386	–0.00154	–0.00534	–0.00102	–0.00296	–0.00333	–0.00064	–0.00476	0.000127	–0.00357	–0.00435	–0.0022	–0.00619	–0.00207
GJ	–0.0006	0.000452	–0.00367	0.003309	0.005312	–0.00043	0.000866	–0.00142	0.002722	0.003237	–0.00157	0.00016	–0.00426	0.00359	0.006682
HR	0.001158	–0.00015	–0.00279	–0.00105	0.012404	0.000799	–0.00192	–0.00198	–0.00741	0.014149	0.001012	0.000289	–0.00155	0.000673	0.012524
HP	0.002337	–0.00109	–0.00289	0.001599	0.011475	0.000396	–0.00339	–0.00282	0.008214	0.009335	0.001682	–0.00124	–0.00678	0.001864	0.011896
JK	–0.00021	0.000942	–0.00065	–0.00632	0.00577	0.001771	0.001185	0.000565	–0.00648	0.006687	–0.00104	0.000788	–0.00074	–0.00571	0.006012
JH	0.000181	–0.00035	–0.00011	–0.0104	0.005513	–0.00186	–0.00138	–0.00647	–0.01447	0.003057	–0.00015	–0.00054	–0.00077	–0.00951	0.005069
KA	0.001576	–0.00093	–0.01319	–0.00162	0.003872	0.001452	2.27E–05	–0.00984	–5.7E–05	0.000602	0.00123	–0.00127	–0.01462	–0.00201	0.004613

(Annexure 1 continued)

(Annexure 1 continued)

State	LNTOTEXP	LNFOOD	LNELECTRI	LNTRANS	LNHEALTH	LNRTOTEXP	LNRFOOD	LNRELECTRI	LNRTRANS	LNRHEALTH	LNUTOTEXP	LNUFOOD	LNUELECTRI	LNUTRANS	LNUHEALTH
KE	–0.00135	–0.00199	0.000332	–0.00817	–0.00096	–0.00172	–0.00235	–0.00276	–0.00899	–0.00113	–0.00093	–0.0018	0.001739	–0.00755	–0.00072
MP	0.002623	0.000323	–0.00572	0.007132	0.007415	0.004571	0.001845	–0.00454	0.004956	0.009131	0.001456	–0.00055	–0.00687	0.00788	0.007118
MH	–0.00202	–0.00284	–0.00238	–0.00804	0.002928	–0.00039	–0.00204	–0.00028	–0.00608	–2.7E–05	–0.0023	–0.00281	–0.00209	–0.00792	0.004256
OD	0.003951	0.001177	–0.00222	–0.00529	0.007291	0.006293	0.002613	0.003546	–0.00509	0.009043	0.002963	0.000587	–0.00382	–0.00497	0.006684
PB	0.001854	–0.00046	–0.00555	0.021455	0.006652	0.002892	0.000558	–0.00777	0.021714	0.009937	0.000719	–0.00108	–0.00391	0.021862	0.005987
RJ	0.001841	0.000536	–0.00402	0.000213	0.006212	0.002308	–3.5E–05	–0.00244	–0.00482	0.005781	0.001047	0.000285	–0.00597	0.001447	0.00641
TN	5.37E–05	–0.0007	–0.00982	0.000215	0.006898	0.001835	0.000765	–0.00558	0.000235	0.009044	–0.00066	–0.0012	–0.01105	0.000309	0.006147
TL	0.001141	0.000973	–0.00144	0.001964	–0.00085	0.000761	0.001076	–1.2E–06	–0.00172	–0.00336	0.000904	0.000916	–0.00215	0.003293	5.95E–05
UP	–0.00089	–0.00276	–0.00128	–0.00049	0.008183	0.000262	–0.00242	0.002874	0.001508	0.00908	–0.00161	–0.00295	–0.00227	–0.00082	0.007778
UK	0.005363	–0.00112	0.000234	0.00351	0.017661	0.004441	–0.00104	–0.00083	0.028198	0.020161	0.004588	–0.00151	–0.00107	0.007568	0.017058
WB	0.001662	–3.2E–05	–0.00207	–0.0022	0.008116	0.002116	0.000041	–0.00032	–0.00073	0.008674	0.001739	–8.7E–05	–0.00218	–0.00242	0.008425
India	0.000908	–0.00069	–0.00281	–0.00106	0.005442	0.001639	–0.00013	–0.00056	–0.00163	0.005385	0.000703	–0.00101	–0.00347	–0.0007	0.005562
	C: Combined		R: Rural		U: Urban										

Note: AP: Andhra Pradesh; AS: Assam; BH: Bihar; CD: Chhattisgarh; CH: Chandigarh; DL: Delhi; GJ: Gujarat; Goa: Goa; HP: Himachal Pradesh; HR: Haryana; JH: Jharkhand; JK: Jammu and Kashmir; KA: Karnataka; KE: Kerala; MH: Maharashtra; MP: Madhya Pradesh; OD: Odisha; PB: Punjab; RJ: Rajasthan; TL: Telangana; TN: Tamil Nadu; UK: Uttarakhand; UP: Uttar Pradesh; WB: West Bengal.

Annexure 2: Simple CCAPM Results

	TOTEXP	TOTEXP	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	HEALTH	HEALTH
Combined	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1
AP	0.0065	0.0138	0.0047	0.4085	0.0074	0.1217	0.0073	0.0011	0.0080	–0.1578
AS	0.0070	–0.0503	0.0057	0.0427	0.0050	–0.0550	0.0084	0.0017	0.0061	–0.0248
BH	0.0072	0.0435	0.0056	0.4745	0.0081	0.2136	0.0083	0.0043	0.0062	–0.0331
CD	0.0078	–0.0884	0.0052	0.1256	0.0088	–0.0035	0.0075	0.0009	0.0068	–0.0152
CH	0.0065	0.0997	0.0046	0.2597	0.0062	0.1081	0.0085	0.0003	0.0063	–0.0167
DL	0.0061	0.0289	0.0047	0.2452	0.0055	0.0159	0.0081	0.0008	0.0060	0.0159
Goa	0.0067	–0.0036**	0.0058	0.0338**	0.0096	0.0547	0.0077	0.0122	0.0062	–0.0200
GJ	0.0065	0.1009	0.0052	0.1899**	0.0062	–0.0194	0.0065	0.0385	0.0064	–0.0294
HR	0.0059	0.0413	0.0046	0.2049	0.0092	0.0118	0.0090	0.0019	0.0058	0.0003
HP	0.0069	–0.0760	0.0051	–0.0068	0.0101	–0.0096	0.0078	0.0066	0.0055	0.0062
JK	0.0067	–0.0169	0.0055	–0.0091**	0.0055	–0.1269	0.0094	0.0125	0.0072	–0.0911
JH	0.0063	–0.0321	0.0048	0.1646	0.0059	–0.1472	0.0082	0.0069	–0.0394	0.0090
KA	0.0071	–0.1489	0.0053	0.1254	0.0045	–0.0376	0.0088	–0.0014	0.0064	–0.0335
KE	0.0064	–0.0176	0.0050	0.0321	0.0062	–0.0185	0.0087	0.0033	0.0055	–0.1014**
MP	0.0067	0.0207	0.0054	0.0577	0.0069	0.1030	0.0073	0.0079	0.0075	–0.0839
MH	0.0060	0.0953	0.0056	0.3365	0.0068	0.1090	0.0076	0.0265	0.0064	–0.0685
OD	0.0064	0.0020	0.0048	0.0022	0.0068	0.0182	0.0090	–0.0041	0.0057	0.0197
PB	0.0065	–0.0568	0.0049	0.0872	0.0071	–0.0068	0.0077	0.0136	0.0052	0.0392
RJ	0.0065	–0.0805	0.0046	0.1175	0.0092	–0.0592	0.0085	0.0060	0.0063	–0.0278

(Annexure 2 continued)

(Annexure 2 continued)

	TOTEXP	TOTEXP	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	HEALTH	HEALTH
Combined	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1
TN	0.0065	–0.0366	0.0051	0.0767	0.0067	–0.0441	0.0079	0.0034	0.0068	–0.0468
TL	0.0062	0.0095	0.0047	0.0153	0.0054	0.1475	0.0081	0.0011	0.0062	–0.1038
UP	0.0059	0.0383	0.0052	0.2481**	0.0066	0.2643	0.0080	0.0164	0.0061	–0.0805
UK	0.0063	0.0174	0.0052	0.2054	0.0075	–0.0061	0.0086	0.0003	0.0061	–0.0167
WB	0.0059	–0.0389	0.0043	0.1208	0.0056	0.0562	0.0090	0.0067	0.0056	0.0392**
India	0.0070	–0.0489	0.0051	0.0373	0.0071	0.0497	0.0078	0.0124	0.0070	–0.1352
	TOTEXP	TOTEXP	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Rural	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1
AP	0.0060	0.0936	0.0045	0.5163	0.0073	0.3719	0.0068	0.0012	0.0071	–0.0863
AS	0.0073	–0.0253	0.0058	0.0505	0.0046	0.0661	0.0085	–0.0003	0.0067	–0.0209
BH	0.0071	0.1005	0.0058	0.3179	0.0085	0.0758	0.0081	0.0069	0.0057	–0.0023
CD	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CH	0.0070	0.0943	0.0059	0.2098	0.0062	0.0004	0.0085	0.0053	0.0058	0.0019
DL	0.0072	0.1088	0.0056	0.1194	0.0085	0.0063	0.0078	0.0011	0.0064	–0.0058
Goa	0.0077	0.0158**	0.0064	0.0461	0.0064	0.1041	0.0078	0.0048	0.0067	–0.0295
GJ	0.0068	0.0961	0.0049	0.1957	0.0093	–0.0352	0.0077	0.0419	0.0047	0.0290
HR	0.0067	0.0271	0.0053	0.1087	0.0081	0.0092	0.0081	0.0038	0.0045	0.0252
HP	0.0075	–0.0188	0.0058	0.0156	0.0074	0.0212	0.0000	0.0000	0.0055	0.0254
JK	0.0064	0.0011	0.0054	–0.0672	0.0056	–0.0365	0.0073	0.0123	0.0063	–0.0895
JH	0.0070	–0.0098	0.0054	0.1842	0.0058	–0.0659	0.0081	0.0057	0.0058	0.0054

(Annexure 2 continued)

(Annexure 2 continued)

	TOTEXP	TOTEXP	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Rural	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1
KA	0.0068	–0.0124	0.0049	0.3163	0.0066	0.0409	0.0084	0.0087	0.0061	–0.0173
KE	0.0067	0.0114	0.0056	0.0655	0.0064	–0.0007**	0.0075	0.0035	0.0062	–0.0254
MP	0.0070	–0.0249	0.0050	0.0912	0.0085	0.2053**	0.0080	0.0058	0.0068	–0.0715
MH	0.0068	0.0719	0.0056	0.2113	0.0062	0.1232	0.0078	0.0254	0.0061	–0.0520
OD	0.0063	0.0632	0.0044	0.2011	0.0070	0.0304	0.0079	0.0089	0.0062	–0.0088
PB	0.0074	–0.0506	0.0053	–0.0156	0.0076	0.0208	0.0080	0.0002	0.0050	0.0276
RJ	0.0072	–0.0670	0.0052	0.0691	0.0086	–0.0478	0.0085	0.0054	0.0063	–0.0348**
TN	0.0067	–0.0310	0.0049	0.0989	0.0062	–0.0160	0.0077	0.0004	0.0070	–0.0548
TL	0.0065	–0.0538	0.0043	0.2175	0.0068	0.1337	0.0077	0.0002	0.0050	–0.0408
UP	0.0067	0.1475	0.0055	0.1595	0.0068	0.1894	0.0082	0.0118	0.0062	–0.0287
UK	0.0061	0.0725	0.0049	0.0381	0.0066	0.0066	0.0000	0.0000	0.0060	0.0022
WB	0.0072	–0.0598	0.0053	0.0502**	0.0070	–0.0082	0.0075	0.0050	0.0052	0.0230
India	0.0068	0.0432	0.0052	0.3152	0.0073	0.0171	0.0081	0.0136	0.0066	–0.1192
	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Urban	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1	Intercept	X Variable 1
AP	0.0060	0.0244	0.0047	0.3407	0.0070	0.0276	0.0081	0.0010	0.0083	–0.1489
AS	0.0068	0.0106	0.0055	0.0650	0.0035	0.0748	0.0086	0.0018	0.0057	–0.0169
BH	0.0063	0.0872	0.0051	0.4657	0.0056	0.2585	0.0089	0.0033	0.0066	–0.0562
CD	0.0068	–0.0663	0.0051	0.0920	0.0097	–0.0059	0.0063	0.0015	0.0062	–0.0200
CH	0.0061	0.0289	0.0047	0.2452	0.0055	0.0159	0.0081	0.0008	0.0060	0.0159

(Annexure 2 continued)

(Annexure 2 continued)

Urban	TOT Exp Intercept	TOT Exp X Variable 1	FOOD Intercept	FOOD X Variable 1	ELECTR Intercept	ELECTR X Variable 1	TRANS Intercept	TRANS X Variable 1	Health Intercept	Health X Variable 1
DL	0.0070	0.0591	0.0058	0.1696**	0.0056	0.0318	0.0088	0.0004	0.0055	0.0200
Goa	0.0078	–0.0456	0.0066	0.0439**	0.0059	0.2294	0.0084	0.0038	0.0072	–0.0337
GJ	0.0067	0.0662	0.0054	0.1548	0.0076	0.0132	0.0073	0.0305	0.0071	–0.0748
HR	0.0063	0.0986	0.0052	0.1535	0.0075	0.0070	0.0078	0.0018	0.0048	–0.0046
HP	0.0077	–0.0431	0.0061	0.0484	0.0099	–0.0287	0.0080	0.0078	0.0068	–0.0125
JK	0.0072	–0.0078	0.0059	–0.0038	0.0059	–0.0769	0.0072	0.0194	0.0042	0.0022
JH	0.0070	0.0135	0.0056	0.2043	0.0059	–0.0725	–0.0683	0.1580	0.0065	–0.0212
KA	0.0070	–0.1199	0.0052	–0.0307	0.0066	–0.0502	0.0088	0.0032	0.0067	–0.0302**
KE	0.0069	–0.0058	0.0056	0.0496	0.0069	–0.0127	0.0072	0.0031	0.0063	–0.1039
MP	0.0069	0.0138	0.0056	0.0496	0.0092	0.1535	0.0074	0.0078	0.0066	–0.0617
MH	0.0066	0.0986	0.0059	0.2580	0.0060	0.0910	0.0075	0.0244	0.0057	–0.0584
OD	0.0066	0.0007	0.0050	0.0012	0.0073	0.0090	0.0078	–0.0086	0.0058	0.0138
PB	0.0070	–0.0220	0.0057	0.1621	0.0080	–0.0023	0.0073	0.0101	0.0052	0.0258
RJ	0.0068	–0.0294	0.0053	0.0985	0.0088	–0.0138	0.0079	0.0048	0.0059	–0.0179
TN	0.0065	–0.0212	0.0052	0.0789	0.0068	–0.0628	0.0072	0.0027	0.0066	–0.0337**
TL	0.0058	0.0186	0.0043	0.0167	0.0074	0.0591	0.0071	0.0014	0.0047	–0.0844
UP	0.0067	0.0246	0.0061	0.2544	0.0076	0.1715	0.0082	0.0159	0.0065	–0.0666
UK	0.0064	0.0258	0.0055	0.1991	0.0080	–0.0082	0.0070	0.0003	0.0072	–0.0402
WB	0.0071	–0.0425	0.0055	0.1173	0.0067	0.0641	0.0072	0.0087	0.0049	0.0298**
India	0.0068	–0.0022	0.0053	0.0416	0.0075	0.0199	0.0079	0.0084	0.0068	–0.1519

Note: AP: Andhra Pradesh; AS: Assam; BH: Bihar; CD: Chhattisgarh; CH: Chandigarh; DL: Delhi; GJ: Gujarat; Goa: Goa; HP: Himachal Pradesh; HR: Haryana; JH: Jharkhand; JK: Jammu and Kashmir; KA: Karnataka; KE: Kerala; MH: Maharashtra; MP: Madhya Pradesh; OD: Odisha; PB: Punjab; RJ: Rajasthan; TL: Telangana; TN: Tamil Nadu; UK: Uttarakhand; UP: Uttar Pradesh; WB: West Bengal. *5% level of significance; **10 % level of significance.

Annexure 3: Canonical CCAPM Results

	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Combined	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
AP	0.0055	0.0115	0.0042	0.3893	0.0049	0.0916	0.0056	–0.0168	0.0059	–0.1595
AS	0.0100	–1.0679	0.0090	–1.0583	0.0099	–0.2521	0.0096	–1.0299	0.0088	–1.0314
BH	0.0100	–0.9706	0.0091	–0.8929	0.0094	–0.2824	0.0098	–1.0138	0.0092	–1.0445
CD	0.0101	–1.0840	0.0091	–0.9556	0.0066	–0.2732	0.0099	–1.0038	0.0092	–1.0313
CH	0.0097	–0.9022	0.0089	–0.8889	0.0046	–0.8624	0.0098	–1.0116	0.0089	–1.0202
DL	0.0099	–0.9479	0.0090	–0.8641	0.0055	–0.3577	0.0097	–1.0097	0.0088	–0.9992
Goa	0.0103	–0.9885	0.0096	–0.9298	0.0055	–0.3577	0.0097	–1.0097	0.0088	–0.9992
GJ	0.0100	–0.9328	0.0090	–0.9743	0.0071	–0.3353	0.0097	–0.9908	0.0091	–1.0510
HR	0.0099	–0.9161	0.0091	–0.9333	0.0051	–0.2826	0.0097	–1.0276	0.0091	–1.0235
HP	0.0101	–1.0463	0.0091	–0.9819	0.0006	–0.2202	0.0098	–0.9999	0.0089	–1.0036
JK	0.0100	–1.0326	0.0091	–1.0243	0.0086	–0.5506	0.0097	–1.0080	0.0093	–1.0888
JH	0.0100	–1.0527	0.0091	–0.9508	0.0066	–0.8231	0.0094	–1.0307	0.0091	–1.0455
KA	0.0102	–1.1149	0.0090	–1.0649	0.0060	–0.2238	0.0097	–1.0240	0.0091	–1.0674
KE	0.0100	–1.0019	0.0091	–0.9843	0.0077	–0.2888	0.0096	–1.0231	0.0087	–1.1129
MP	0.0101	–1.0289	0.0091	–1.0151	0.0020	–0.8815	0.0099	–1.0137	0.0096	–1.1061
MH	0.0102	–0.9056	0.0094	–0.8675	0.0078	–0.6913	0.0097	–1.0112	0.0091	–1.0884
OD	0.0100	–0.9997	0.0090	–0.9945	0.0058	–0.2137	0.0096	–1.0354	0.0087	–0.9790
PB	0.0101	–1.0633	0.0091	–0.9869	0.0054	–0.3784	0.0101	–1.0173	0.0088	–0.9892
RJ	0.0101	–1.0713	0.0090	–0.9821	0.0040	–0.4887	0.0098	–1.0189	0.0092	–1.0634

(Annexure 3 continued)

(Annexure 3 continued)

	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Combined	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
TN	0.0100	–1.0368	0.0090	–1.1175	0.0098	–0.2505	0.0098	–1.0177	0.0093	–1.0721
TL	0.0100	–0.9969	0.0090	–0.9786	0.0023	–0.8984	0.0098	–1.0155	0.0087	–1.1034
UP	0.0101	–0.9388	0.0093	–0.8979	0.0079	–0.4833	0.0097	–1.0190	0.0095	–1.0864
UK	0.0100	–1.0043	0.0091	–0.9212	0.0026	–0.3183	0.0098	–1.0149	0.0094	–1.0320
WB	0.0101	–1.0400	0.0091	–0.9849	0.0078	–0.4538	0.0097	–1.0257	0.0085	–0.9603
India	0.0100	–1.0140	0.0091	–0.9788	0.0051	–0.9264	0.0097	–1.0255	0.0096	–1.1401
	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Rural	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
AP	0.0098	–0.9573	0.0089	–0.8246	0.0044	–0.0357	0.0098	–1.0154	0.0096	–1.0977
AS	0.0101	–1.0681	0.0090	–1.0215	0.0087	–0.2931	0.0096	–1.0394	0.0090	–1.0317
BH	0.0100	–0.9814	0.0090	–0.9697	0.0104	–0.7571	0.0098	–1.0133	0.0089	–1.0075
CD	0.0101	–1.0843	0.0091	–0.9593	0.0067	–0.2737	0.0098	–1.0038	0.0092	–1.0334
CH	0.0097	–0.9071	0.0088	–0.9120	0.0064	–0.6747	0.0098	–1.0051	0.0088	–1.0110
DL	0.0100	–0.9149	0.0091	–0.8897	0.0067	–0.1066	0.0097	–1.0123	0.0088	–1.0241
Goa	0.0103	–0.9753	0.0095	–0.9380	0.0067	–0.1066	0.0097	–1.0123	0.0088	–1.0241
GJ	0.0100	–0.9169	0.0090	–0.9720	0.0065	–0.3099	0.0097	–0.9947	0.0088	–0.9849
HR	0.0100	–0.9717	0.0091	–0.9965	0.0036	–0.2031	0.0095	–1.0292	0.0087	–0.9933
HP	0.0100	–1.0116	0.0091	–1.0011	0.0021	–0.1581	0.0000	0.0000	0.0087	–0.9881
JK	0.0100	–1.0016	0.0091	–1.0802	0.0063	–0.6024	0.0097	–1.0130	0.0095	–1.0946
JH	0.0100	–1.0282	0.0091	–0.9791	0.0063	–0.5920	0.0096	–1.0117	0.0089	–1.0122

(Annexure 3 continued)

(Annexure 3 continued)

	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Rural	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
KA	0.0100	–1.0096	0.0091	–0.8028	0.0029	–0.2174	0.0098	–1.0132	0.0089	–1.0498
KE	0.0100	–0.9879	0.0091	–0.9693	0.0075	–0.2554	0.0095	–1.0249	0.0088	–1.0488
MP	0.0103	–1.0544	0.0091	–1.0298	0.0003	–0.9188	0.0099	–1.0200	0.0096	–1.0835
MH	0.0100	–0.9315	0.0092	–0.9398	0.0072	–0.4603	0.0097	–1.0141	0.0088	–1.0725
OD	0.0097	–0.9533	0.0090	–0.9890	0.0014	–0.2516	0.0096	–1.0244	0.0089	–1.0054
PB	0.0102	–1.0665	0.0091	–1.0422	0.0046	–0.1931	0.0099	–1.0062	0.0087	–0.9874
RJ	0.0102	–1.0882	0.0091	–0.9872	0.0021	–0.4573	0.0096	–1.0287	0.0092	–1.0564
TN	0.0101	–1.0316	0.0091	–1.0364	0.0071	–0.1595	0.0098	–1.0137	0.0096	–1.0835
TL	0.0101	–1.0605	0.0090	–0.9182	0.0037	–0.1595	0.0097	–1.0120	0.0086	–1.0556
UP	0.0100	–0.8445	0.0092	–0.9199	0.0069	–0.5564	0.0098	–1.0066	0.0091	–1.0305
UK	0.0096	–0.9024	0.0090	–1.0353	0.0001	–0.2711	0.0000	0.0000	0.0087	–0.9951
WB	0.0101	–1.0679	0.0091	–1.0459	0.0069	–0.3602	0.0097	–1.0232	0.0086	–0.9717
India	0.0100	–0.9856	0.0091	–0.9913	0.0051	–0.5291	0.0097	–1.0248	0.0094	–1.1109
	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Urban	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
AP	0.0100	–1.0040	0.0091	–1.0182	0.0059	–0.3206	0.0099	–1.0174	0.0102	–1.1488
AS	0.0100	–1.0423	0.0090	–1.0552	0.0104	–0.3722	0.0096	–1.0247	0.0088	–1.0207
BH	0.0100	–0.9939	0.0091	–0.9239	0.0101	–0.1992	0.0098	–1.0137	0.0095	–1.0748
CD	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
CH	0.0099	–0.9153	0.0090	–0.9025	0.0040	–0.8981	0.0098	–1.0126	0.0089	–1.0186

(Annexure 3 continued)

(Annexure 3 continued)

	TOT Exp	TOT Exp	FOOD	FOOD	ELECTR	ELECTR	TRANS	TRANS	Health	Health
Urban	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η	ln(β)	η
DL	0.0100	–0.9660	0.0090	–0.8919	0.0055	–0.4264	0.0097	–1.0076	0.0088	–0.9926
Goa	0.0102	–1.0056	0.0095	–0.9514	0.0055	–0.4264	0.0097	–1.0076	0.0088	–0.9926
GJ	0.0101	–0.9559	0.0091	–0.9974	0.0073	–0.3147	0.0097	–0.9900	0.0094	–1.0827
HR	0.0099	–0.9122	0.0090	–0.9336	0.0046	–0.2803	0.0098	–1.0241	0.0091	–1.0207
HP	0.0101	–1.0365	0.0091	–0.9318	0.0027	–0.3011	0.0098	–1.0002	0.0091	–1.0225
JK	0.0100	–1.0294	0.0091	–1.0186	0.0100	–0.5265	0.0099	–0.9692	0.0089	–1.0065
JH	0.0100	–1.0626	0.0091	–0.9604	0.0071	–0.7416	0.0095	–1.0307	0.0090	–1.0303
KA	0.0102	–1.1194	0.0089	–1.1432	0.0072	–0.2335	0.0097	–1.0271	0.0091	–1.0652
KE	0.0100	–1.0134	0.0091	–0.9894	0.0079	–0.3305	0.0096	–1.0225	0.0087	–1.1164
MP	0.0100	–1.0246	0.0090	–1.0240	0.0028	–0.8388	0.0098	–1.0083	0.0095	–1.0879
MH	0.0102	–0.9157	0.0094	–0.8656	0.0078	–0.7349	0.0097	–1.0102	0.0092	–1.0791
OD	0.0100	–1.0010	0.0091	–0.9950	0.0068	–0.2479	0.0096	–1.0376	0.0087	–0.9869
PB	0.0100	–1.0536	0.0091	–0.9432	0.0057	–0.3398	0.0101	–1.0159	0.0088	–0.9980
RJ	0.0101	–1.0619	0.0091	–0.9978	0.0054	–0.4651	0.0098	–1.0167	0.0092	–1.0546
TN	0.0100	–1.0386	0.0089	–1.1235	0.0107	–0.2573	0.0098	–1.0171	0.0092	–1.0601
TL	0.0100	–0.9931	0.0090	–0.9829	0.0020	–0.8731	0.0098	–1.0159	0.0088	–1.0919
UP	0.0100	–1.0198	0.0090	–1.0055	0.0085	–0.5118	0.0097	–1.0238	0.0095	–1.0858
UK	0.0101	–1.0237	0.0092	–0.9254	0.0042	–0.2860	0.0099	–1.0149	0.0099	–1.0622
WB	0.0101	–1.0269	0.0091	–0.9546	0.0080	–0.4214	0.0097	–1.0255	0.0086	–0.9693
India	0.0100	–1.0223	0.0091	–0.9822	0.0054	–0.8679	0.0097	–1.0258	0.0096	–1.1406

Note: AP: Andhra Pradesh; AS: Assam; BH: Bihar; CD: Chhattisgarh; CH: Chandigarh; DL: Delhi; GJ: Gujarat; Goa: Goa; HP: Himachal Pradesh; HR: Haryana; JH: Jharkhand; JK: Jammu and Kashmir; KA: Karnataka; KE: Kerala; MH: Maharashtra; MP: Madhya Pradesh; OD: Odisha; PB: Punjab; RJ: Rajasthan; TL: Telangana; TN: Tamil Nadu; UK: Uttarakhand; UP: Uttar Pradesh; WB: West Bengal.