IIT Bombay Technical Report (December 2025)
https://dspace.library.iitb.ac.in/jspui/handle/123456789/43734

Consumer Price Index: Methodological Aspects of Measuring Housing Services

Praggya Das
Former Adviser-in-Charge
Monetary Policy Department
Reserve Bank of India
Mumbai

Ashish Das
Professor
Department of Mathematics
IIT Bombay
Mumbai

Indian Institute of Technology Bombay
Powai, Mumbai-400 076, India

Let My Country Awake
Where the mind is without fear and the head is held high;
Where knowledge is free;
Where the world has not been broken up into fragments by narrow domestic walls;
Where words come out from the depth of truth;
Where tireless striving stretches its arms towards perfection;
Where the clear stream of reason has not lost its way into the dreary desert sand of dead habit;
Where the mind is led forward by thee into ever-widening thought and action;
Into that heaven of freedom, my Father, let my country awake.

Rabindranath Tagore
Original Bengali Composition, 1901

CONTENTS

Disclaimer	ii
Acknowledgments	iii
Authors' note	iv
Foreword	v
The quote	vi
Executive Summary	1
I. Introduction	5
II. Housing Index in CPI – a Special Case	6
III. Current Approach of Housing Index Compilation in CPI	7
IV. Major Challenges in the Current Method of Housing Index Computation	12
V. Changes Proposed by MoSPI for Housing Index Compilation	20
VI. Other Aspects to CPI House Rent Index	26
VII. Concluding Remarks	26
References	28
Annex 1: Equivalence of the chain-based and fixed-base housing index	29
Annex 2: Summary of Observations on the Proposals in the Discussion Paper	41
Annex 3: Census of India 2011: Houselisting and Housing Census Schedule	43
Annex 4: MoSPI's Discussion Paper on Housing Index	45

***Disclaimer**:*

The technical opinion expressed in the Report by the authors is based on her/his expertise in the particular area of research and NOT the views of IIT Bombay. The contents of this Report are purely technical/scientific and non-legal in nature and based on the information/facts available with the authors.

***Acknowledgments*:**

The authors acknowledge the valuable discussions with Dr. R. B. Barman, Former Executive Director, Reserve Bank of India, and Former Chairman, National Statistical Commission; Dr. Ajit Joshi, Executive Director, Reserve Bank of India; Dr. G. M. Boopathy, Former Additional Director General, Central Statistics Office; and Shri Asish Thomas George, Director, Department of Economic and Policy Research, Reserve Bank of India. Comments on the Report were also received from Dr. Mridul Saggar, Former Executive Director, Reserve Bank of India and Professor of Practice, Indian Institute of Management, Kozhikode. Their encouragement and support have helped us in bringing the Report to its present shape.

The authors are also thankful to Dr. K. V. Palanichamy, Former Director - Biostatistics and Statistical Programming, PRA Health Sciences Private Limited, to meticulously go through an earlier draft and offer significant comments.

A major part of the study was carried out by Praggya Das and Ashish Das during the latter's academic visit to the Institute of Statistical Science, Academia Sinica, Taipei.

The authors are thankful to IIT Bombay for supporting this collaborative study as an IIT Bombay's R&D project.

From reflection to direction

***Authors' note*:**

In order to stimulate discussions and receive valued comments, the paper is being put in the public domain in form of a Technical Report.

The methodology adopted in the Report has been the authors' prerogative and researchers may like to improvise on it.

The Ministry of Statistics and Programme Implementation (MoSPI), Government of India, is undertaking the CPI Base revision and had brought out a Discussion Paper (DP) on housing services for comments and suggestions. Authors' broad comments on the DP were sent to MoSPI on November 20, 2025, and the information about the supporting detailed Report under preparation was also given. An earlier draft of the Report was shared with MoSPI on December 5, 2025, for discussions.

In this Technical Report, all possible care has been taken to project the correct picture using statistical rigour. Deviations, if any, are inadvertent.

This is a zero-budget R&D project of IIT Bombay, under Project Code RD/0525-IRCC000-001.

Foreword

The Consumer Price Index (CPI) is not merely a statistic; it is a foundational pillar of our national economic architecture, guiding the monetary policy of the Reserve Bank of India and shaping fiscal planning. The Ministry of Statistics and Programme Implementation (MoS&PI) has embarked on the commendable and necessary task of revising the CPI Base from 2012 to 2024.

This timely and rigorous Technical Report of IIT Bombay, authored by Praggya Das and Ashish Das, arrives at a crucial moment in that process. It addresses one of the most complex and heavily weighted components of the index: housing. While MoS&PI has proposed a significant overhaul of the housing index methodology based on perceived defects in the current system, this Report provides a powerful, scientifically grounded counter-argument.

The Report's central achievement is its methodical and theoretical proof that the current methodology is *transitive* – meaning the chain-based index is equivalent to the fixed-base index – and cannot be the source of the unexplainable periodic movements MoS&PI seeks to correct. Das and Das compellingly argue that the proposed shift to monthly data collection from every dwelling would impose an avoidable burden on the exchequer and respondents alike, without a commensurate increase in informational value. Their analysis champions the continued use of geometric means for elementary index aggregation, a cornerstone of sound index theory.

The Report is an indispensable contribution to the ongoing dialogue on strengthening India's macroeconomic indicators. I am therefore delighted to commend this vital Technical Report to policymakers, statisticians, and economists.



Professor Bimal Roy, Padma Shri Awardee

Former Chairman, National Statistical Commission
Former Director, Indian Statistical Institute

December 17, 2025

***The quote**:*

"We must become experts in data-driven decision-making, so that policy design and implementation become more accurate."

– Prime Minister, Shri Narendra Damodardas Modi
17th Civil Services Day, 2025

Consumer Price Index: Methodological Aspects of Measuring Housing Services*

Praggya Das[1] and Ashish Das[2]

December 18, 2025

Executive Summary

1. Ministry of Statistics and Programme Implementation (MoSPI) produces Consumer Price Index (CPI) at a monthly frequency. CPI provides a measure of inflation that is prescribed under statue to be used by the Reserve Bank of India (RBI) for the conduct of monetary policy.

2. The current CPI series has Base 2012 = 100. MoSPI is in the process of revising the CPI Base to a current period (2024 = 100). MoSPI's approach during the process of revision has been reformative and consultative. It has held a series of consultations and has brought out a Discussion Paper (DP) on the housing index compilation methodology. They also held a pre-release consultative workshop on Base revision of CPI in November 2025.

Several reforms proposed for CPI Base revision by MoSPI are commendable

3. Several of the suggestions by MoSPI for CPI Base revision are in line with the principles guiding the strengthening of the national statistical system. The steps taken by MoSPI for CPI revision will enhance coverage, increase granularity of data dissemination, promote the use of latest technology, and make use of administrative data, which is praiseworthy.

4. Housing service is a major component in CPI. Presently this service is measured by MoSPI only for the urban areas. Housing service carries a significant weight of 10.07 per cent in the overall CPI and a commanding 21.67 per cent in the urban CPI – i.e., more than a fifth of the total expenditure of urban consumer goes for housing.

5. Given the prominence of housing services in CPI, MoSPI brought out a separate DP on its measurement. With respect to housing, some of the changes proposed will

* The views expressed in the Report are those of the authors and not of IIT Bombay. (Updated)

[1] Dr. Praggya Das is Former Adviser-in-Charge, Monetary Policy Department, and Former Secretary to the Monetary Policy Committee, Reserve Bank of India, Mumbai. E-mail: praggyadas@gmail.com

[2] Dr. Ashish Das is Professor, Department of Mathematics, IIT Bombay, Mumbai. E-mail: ashish@math.iitb.ac.in

immensely benefit policy making. These changes include (i) expanding the coverage of housing indices to include rural areas, (ii) using Census 2011 data for deriving weights for categorisation of dwelling types, and (iii) dropping employer-provided residences from the sample of dwellings selected for rent collection.

Scientific evaluation of measurement of housing services in CPI

6. This Technical Report scientifically examines the existing methodology of house rent index compilation and the pros and cons of the changes proposed by MoSPI in their DP. Many of the conclusions drawn by MoSPI regarding the current housing index compilation methodology, while intuitive, lack scientific rigour. Given the importance of CPI and the fact that housing consists of more than a-tenth of the CPI, this Report deep-dives into the extant method of housing index compilation. The Report examines each of the challenges highlighted in the DP and provides theoretical underpinnings to establish that the extant method is robust to measure housing prices in CPI. Importantly the Report scientifically justifies the need to continue with panel sample rent collection approach and continuation of elementary index compilation based on geometric means.

7. The major takeaways of the analysis:

A. The extant method is robust and the panel approach is collectively representative

a) ***The current 6-month moving panel method is robust****:* The current methodology for the house rent index compilation, using a panel-based 6-month moving survey approach, apart from being a standard international practice, is robust and *transitive*.

b) ***Perception on the extant method's drawbacks is not correct****:* The proposed method of collecting rental data from the entire sample every month, as against the six-panel moving survey, is based on MoSPI's incorrect perception about the methodological drawbacks of the extant panel-based approach for the housing index compilation.

c) ***Initial distortions in the housing index are addressable****:* For the current method (Base 2012 series), house rent index was kept at 100 for the first five months of the series. This was done despite the fact that rental data was being incrementally collected each month. Keeping the house rent index as 100 during January to May 2013 was an implementation choice and not a methodological flaw. There is a positive trade-off in using partial data than using no data for the index compilation of the initial months. Using partial data, the January to May 2013 indices would have had more information; May 2013 to June 2013 spike would not have happened; and the January to May 2014 inflation would not have seen a sharp surge. This issue is, therefore, addressable through proper data utilisation, not methodological overhaul.

d) ***The extant method has not caused the rhythmic dips****:* A serious contention set-forth by MoSPI is that the extant house rent index compilation, that is based on a chain-based panel method, has introduced unexplainable periodic movements in the housing index series. This assertion is not supported by statistical theory. As established in the Report's theoretical proof, the property of *transitivity* ensures that the chain-based method is mathematically equivalent to the fixed-base method. Therefore, the transition to a chain-based index could not have *introduced* these dips.

e) ***Limited availability can be solved by three-month moving panel****:* In case there is limited availability of rented dwellings in many markets outside major urban centres, MoSPI could consider splitting the overall sample of dwellings into fewer panels, say, three (in place of six). This will make panel size large and without any significant loss of information, still save cost and reduce respondent / investigator burden. Given that the revised Base is 2024 = 100, and that MoSPI has proposed to collect monthly rental data from all dwellings each month, the Base rental values from all sample dwellings may have already been collected. With rental values for all dwellings available for the Base year, for index compilation starting January 2025, price collection can alternately transit to three-panel survey approach. However, the decision to reduce six-panels to fewer panels should be based **solely** on the non-availability of rented dwellings in the sample when the overall sample is split into six panels.

f) ***Employer-provided accommodation – changes proposed are apposite****:* Employer-provided accommodation – changes proposed are apposite: The current method for the compilation of housing index, uses 'HRA (house rent allowance) foregone plus license fee paid' as rent for employer-provided dwellings. This does not measure rent appropriately and causes distortions in the index computations. Accordingly, MoSPI has proposed to ignore employer-provided dwellings in the housing sample to measure rent. Also, MoSPI will be using results from Census 2011 as the frame. Since rented dwellings include employer-provided dwellings in the census data, the new weights of rented dwellings will include the employer-provided accommodation and implicitly provide rental equivalence for employer-provided dwellings. These are welcome changes for the forthcoming CPI (2024 = 100) series.

B. The proposed method is sub-optimal

g) ***Covering all dwellings each month is not a good idea****:* Given that the house rentals do not change every month, the proposal to collect rent data monthly from the entire sample of over 25,000 dwellings (as against a panel survey covering just about 4000 dwellings per month) will:

- lead to a sharp upsurge in the cost of price collection, putting an avoidable burden on the national exchequer;
- raise respondent burden and fatigue;
- substantially increase the workload of price collectors;
- have no significant gain in information as against a rolling sample of six months; and
- risk compromising the data quality if each sample dwelling is not actually visited every month by the price collectors and instead proxies are used.

h) ***Geometric mean should be used for elementary indices****:* For CPI compilation, it is critical to differentiate between the construction of *elementary* indices and *higher-level* indices. For house rent indices the elementary level aggregation involves more than one step. Aggregating rent relatives across different dwelling categories (e.g., 1-room, 2-room) or across ownership (owner-occupied or rented) are steps in constructing the elementary house rent index. Till such time the rent relatives are being aggregated, geometric mean should be used to arrive at elementary house rent index. Thereafter, for higher level indices, weighted arithmetic mean should be used. For combining rent relatives, taking arithmetic mean instead of geometric mean, sacrifices on the benefits of geometric mean to capture the true overall change in the rent-relative ratios.

Time sensitivity is critical for CPI Base revision

8. We are cognizant of the time sensitivity of the CPI Base revision exercise. Our suggestions and observations on the method of index compilation are implementable within the CPI Base revision timelines and will not cause any delays.

Summing up

9. In summary, our view is that, expanding house rent measurement to rural areas; excluding employer provided dwellings for measuring rent; and using Census 2011 frame, are desirable changes. Contrastingly, method proposed by MoSPI of visiting over 25,000 sample dwellings each month, under the premise that the extant housing index compilation method is defective; doing away with the current and robust panel-based housing index methodology; and bringing in arithmetic mean in elementary index calculations, will be sub-optimal. As it is said, *'if it ain't broke, don't fix it'*.

10. Data-driven decision-making would be accurate not only by collecting the correct data but also by correctly aggregating the same through precise summary statistics and measures. The sample survey-based house rent index compilation is an exercise of national importance as it contributes significantly towards inflation measurement of the country. MoSPI may like to deliberate on the suggestions made in the Report.

I. Introduction

1. Ministry of Statistics and Programme Implementation (MoSPI) produces Consumer Price Index (CPI) at a monthly frequency. CPI provides a measure of inflation that is prescribed under statue to be used by the Reserve Bank of India (RBI) for the conduct of monetary policy. The Base year of the current series is 2012 = 100. Now that the results of the latest rounds of Household Consumer Expenditure Surveys (HCES) for 2022-23 and 2023-24 have been released by the National Sample Survey Organisation (NSSO), MoSPI is in the process of revising the CPI Base to a current period (2024 = 100).

2. CPI covers goods (food items, non-food items) and services consumed by the households. Among services covered in the current CPI, housing services are notably important. With a weight of 10.07 per cent in the overall CPI, housing constitutes more than 43 per cent of CPI services.

3. MoSPI releases CPI data separately for the rural and urban areas. A combination of the CPI-Rural and CPI-Urban indices, called CPI-Combined indices, provide the measurement of all-India CPI. In absence of coverage of rural housing services in the consumption expenditure survey of 2011-12 (which provides the basis for deriving CPI weights), housing services are measured by MoSPI only for the urban areas. For the urban households, housing services account for a much higher share – 21.67 per cent of the total urban CPI, i.e., more than a fifth of their total expenditure. Combining rural and urban households, the weight for housing services in all-India CPI drops to 10.07 per cent.

4. Given its importance and prominence in the index, MoSPI has come out with a "Discussion Paper on the Proposed Changes in the Housing Index Compilation Methodology in the new CPI Series".

5. This Technical Report scientifically examines the existing methodology of house rent index compilation and the pros and cons of the changes proposed by MoSPI in their Discussion Paper (DP) and subsequently in their pre-release consultative workshop on Base revision of CPI, held in Mumbai on November 26, 2025.

6. In Section II of the Report, we discuss that housing index in CPI is a special case. Section III discusses the current approach adopted by MoSPI for housing index computation. Section IV examines the challenges indicated by MoSPI in the current method of housing index compilation and addresses some of the counter intuitive statements made in the DP. Section V discusses the changes proposed by MoSPI in the housing index compilation and examines its pros and cons. Section VI presents some other aspects pertaining to housing index. Finally, Section VII gives the concluding remarks.

II. Housing Index in CPI – a Special Case

7. Housing is one of the relatively more important components of CPI as substantial portion of the income of the household is spent on housing and it is one of the basic requirements of human well-being. Because of housing market structure (there is no 'standard house' as such) and practical measurement issues, it cannot be priced like other goods and services.

8. Due to the non-standard nature of the housing market, it presents unique challenges as it cannot be accurately priced using the same methods applied to other items of CPI – typical goods and services. Housing is also a special case in CPI since rents do not change frequently. Another peculiarity about housing is that the houses in the rural area of the country are predominantly owner-occupied and availability of rented dwelling, from where house rental prices can be collected, is scarce. Housing price in the existing series of CPI (Base 2012 = 100) are being collected only from the urban areas.

9. For the measurement of housing rental prices in CPI, data is collected from a fixed set of rented dwellings from each urban market. This fixed set, or *full-stock*, of selected dwellings in the sample are divided into six panels. To optimise resources, longitudinal surveys are conducted where rents from each panel of dwellings are measured at six-monthly intervals. This method of house rent measurement is unique and unlike the method of price collection adopted for any other item in CPI.

10. Repeat house rent surveys (covering same set of dwellings) are conducted in each of the selected urban market for compilation of index. The main objective of collecting data on house rent, from a fixed sample of dwellings, is to measure pure changes in rents over a period of time. The sample dwellings are selected in such a way that they represent various categories with different number of living rooms. As the six-monthly panel survey approach is adopted, the dwellings visited in the month of January for collection of rental information are covered again in the month of July. Similarly, dwellings visited in February are covered again in August and so on. MoSPI mentions that "this arrangement has been made to reduce the workload of enumerators in collection of information and moreover, **rent does not change very frequently** like prices of cereals, vegetables, fruits, etc." (Report of the Group of Technical Advisory Committee on Statistics of Prices and Cost of Living, 2014).

11. The rental price measurement by MoSPI is also in accordance with the international practice for house rent measurement. The international '*CPI Manual: Concepts and Methods 2020*', recommends that:

A. "If rents change rather infrequently, it may be more efficient to use a relatively large sample that is divided into representative subsamples to collect the rents less frequently than every month from each household. The CPI requires monthly data on

rent. Given the nature of rental contracts and the reality that rent does not change every month, the panel survey approach satisfies the monthly data needs of the CPI and minimizes respondent burden.". [3]

B. *"Spreading price observations by pricing the rent for a particular dwelling less frequently than monthly (that is, pricing a subsample of rents each month) is a strategy used for increasing the sample without necessarily having to allocate more resources to the collection exercise. Ideally, a panel survey is used to collect rent on a monthly basis. Many countries divide the sample into six panels and collect rent from each household twice each year."*.[4]

12. International practice also aligns to staggered rental price collecting methodology. For instance, the US Bureau of Labor Statistics (BLS) collects rental housing data using a panel design. Their approach indicates that:

"Collecting a large sample less frequently is more efficient for the Housing Survey because rent prices are not as volatile as most other consumer prices. This efficiency is accomplished by assigning each selected neighborhood (called a segment) in a pricing area to 1 of 6 panels, each of which represents a subsample of each pricing area and provides sufficient information for the monthly owners' equivalent rent of primary residence and rent indexes. Each month, a panel is priced, with all six panels priced twice a year: panel 1 is collected in January and July, and panel 2 is collected in February and August, and so on. ***Every month, we collect rent prices and other information for one panel and the 6-month price ratio is computed (the current rent divided by the rent 6 months ago) for each unit in the panel.*** *The measures of price change for the two housing components are based on weighted averages of these rent ratios."*.[5]

13. The next Section discusses India's current approach of measuring house rent and compilation of housing index in CPI.

III. Current Approach of Housing Index Compilation in CPI

14. As mentioned earlier, the current CPI housing index coverage is limited to urban areas. Three categories of dwellings are considered – rented dwellings, employer-provided dwellings and owner-occupied dwellings. For the measurement of rental price, in case the dwelling is rented, the rent paid is taken as the house rent. In case of government or subsidized dwellings, the house rent allowance (HRA) foregone plus license fee paid by the occupant is taken as rent payable per month. In case the dwelling is owner-occupied, rental equivalence approach is adopted (Report of the

[3] Para 11.152 of the international *CPI Manual: Concepts and Methods (2020)*

[4] Para 11.155 of the international *CPI Manual: Concepts and Methods (2020)*

[5] See, 'Consumer Price Index: *Design*' (Handbook of Methods) US BLS https://www.bls.gov/opub/hom/cpi/design.htm Last Modified Date: January 30, 2025 (Accessed on Dec. 10, 2025)

Group of Technical Advisory Committee on Statistics of Prices and Cost of Living, 2014).

15. The data collection in the urban areas is undertaken by the National Sample Survey Office. A stock of rented dwellings has been selected across 1114 markets of 310 towns. As per availability, 12 dwellings are selected per market. Thus, a *full-stock* of rented dwellings is about 13,368, and every month the rental prices are collected from about 2228 dwellings. Every year, the sample rented dwellings are visited once in the six months period from January to June, and again visited during the period July to December for canvassing the house rent schedule (Report of the Group of Technical Advisory Committee on Statistics of Prices and Cost of Living, 2014 and MoSPI, 2025).

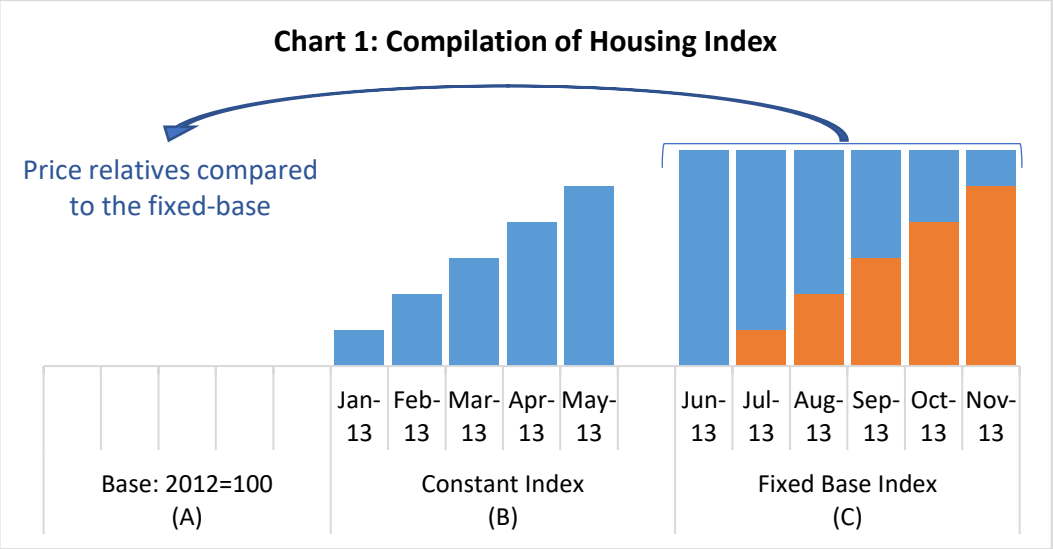
16. The index for CPI (Base 2012 = 100) was released from January 2013 onwards. Since each month only one-sixth of sample dwellings are visited, January 2013 had one-sixth of the rental data available. February 2013 had two-sixth of rental data available, and so on. The full rental data of all sample dwellings was available for the first time in June 2013. Since dwellings are visited once in six months for canvassing house rent schedule, the dwellings covered in the month of January for collection of rental prices are visited again in the month of July. Similarly, dwellings covered in February are covered again in August, and so on.

The Flow of Data Influences Type of Index Computation:

17. Three different methods for construction of house rent index were used for the current CPI series (Base 2012 = 100) as the data availability for the initial months of index computation was staggered.

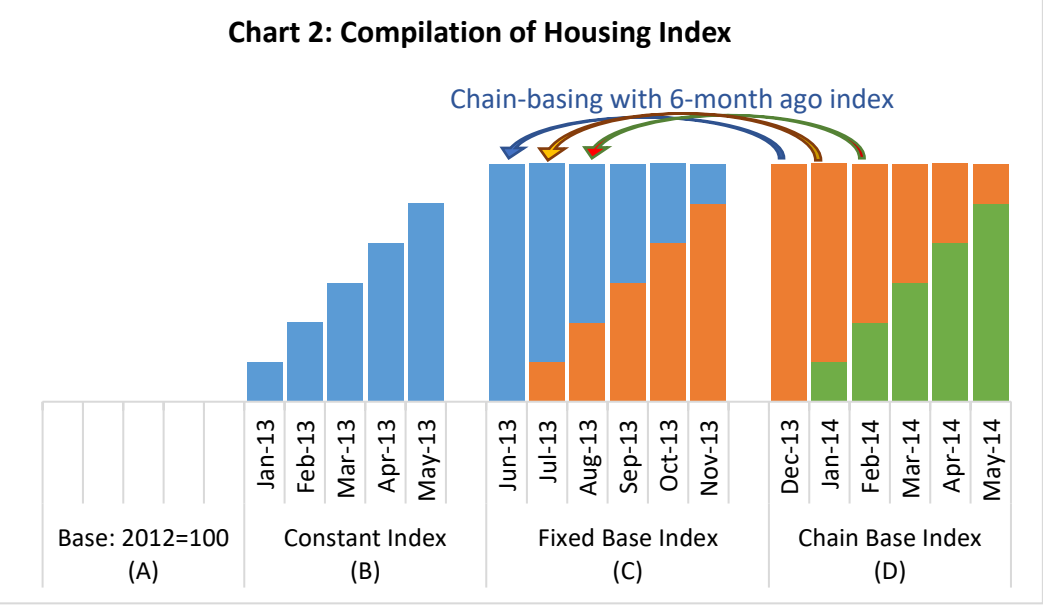
i) Fixed index: For the period January to May 2013, index was kept at 100 as house rent data was not available for the full sample. The availability of rental data was, however, gradually increasing – with data for one-sixth of the dwellings available in January 2013, two-sixth available by February 2013, and so on, five-sixth available by May 2013 (Chart 1). Thus, keeping the house rent index as 100 for the first five months was an implementation choice.

ii) Fixed-base index: For the period June 2013 to November 2013, when data for full sample was available, fixed-base index was compiled (Chart 1).



Note: In the month of January 2013, rent from one-sixth of sample houses was collected (blue bars). In February, rentals of another one-sixth sample houses were measured, and so on. In June 2013, first time rent of entire sample was available. From July 2013, fresh rent from one-sixth sample become available each month (shown by increasing height of orange bars).

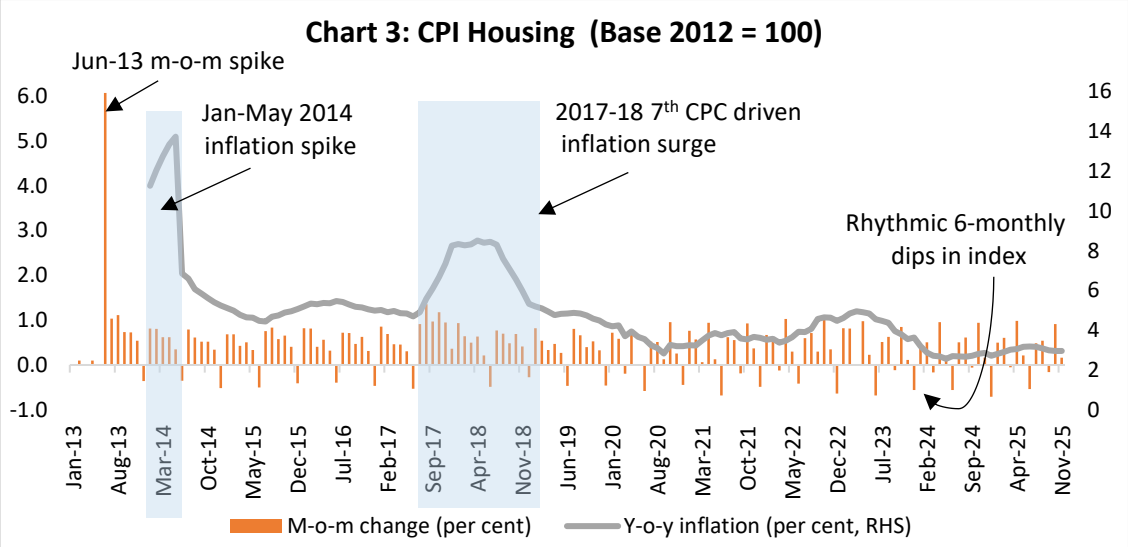
iii) Chain index: From December 2013 onwards, house rent index was compiled using a chain-based method. Under this method, current month rent was compared with the rent six months ago (i.e., block 'D' over 'C' in Chart 2). Thus, December 2013 rent was compared with that of June 2013, January 2014 rent with that of July 2013, and so on.



Note: Bars in different colours indicate arrival of new rentals data for one-sixth of the sample houses – though only one-sixth data is new, the entire bar is used to compile house rent index each month.

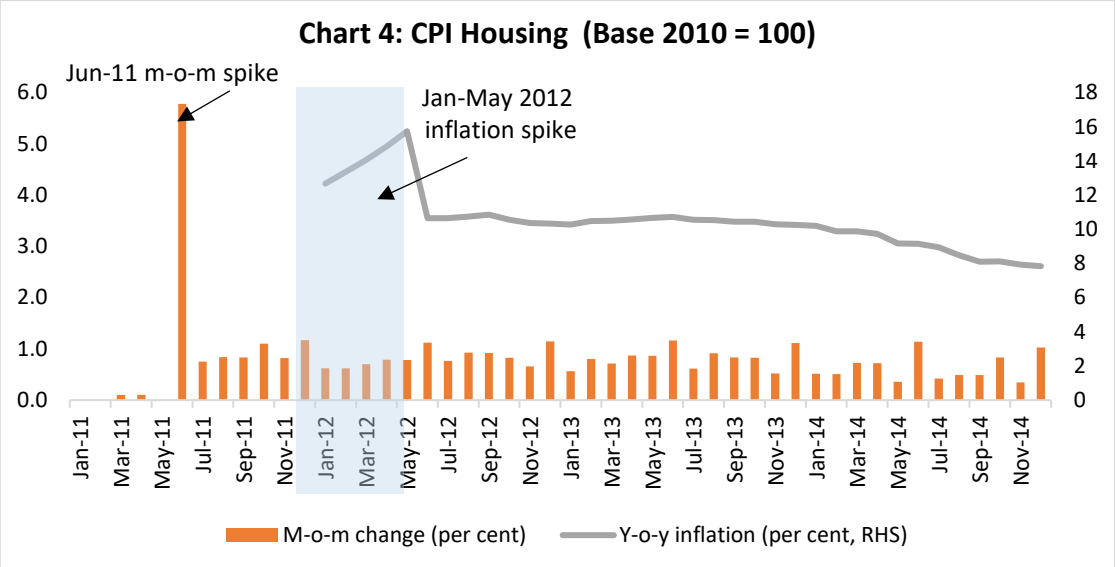
18. The transition from fixed index for January to May 2013 to fixed-base index in June 2013, led to a sharp increase in month-on-month (M-o-m) movement in housing index in June 2013 and a corresponding spike in year-on-year (Y-o-y) inflation during January to May 2014 (Chart 3).

19. The house rent series also displayed peculiar and rhythmic month-on-month dips every six months starting December 2013 and continuing till recent period (Chart 3). Just one exception to the December and June dips was seen in December 2017, when due to the increase in HRA under the 7th Central Pay Commission (CPC), there was a sharp increase in house rent indices.



Source: MoSPI and authors' calculation

20. Interestingly, for the previous CPI series (Base 2010 = 100), that also used (i) fixed index, (ii) fixed-base index and (iii) chain index for house rent compilation, while similar spike was seen in the month-on-month movement in June 2011, and correspondingly in year-on-year inflation for January to May 2012, the subsequent six-monthly dips were not present (Chart 4).



Source: MoSPI and authors' calculation

Computation of Indices:

21. Computation of house rent indices used three methods as discussed above – fixed index, fixed-base index and chain index. Actual computation of indices involves computation of rent relatives. Rent relative is the rental price of a dwelling in the sample in relation to its price for a previous period (Base period in case of fixed-base method and price six months ago in case of chain-based method). While for the fixed index the value is taken as 100, for the fixed-base and chain-based method the index computation is conceptually different.

a) *The fixed-base method rent relatives*: These are the current month rent as compared to Base rent. This requires definition of Base rent. If r_1, r_2, … r_{12} are the rents collected in the Base year 2012 for January, February, …, December, respectively, then the Base rent for the year 2012, as explained in the DP, will be
   - for January and July, $(r_1 + r_7)/2$;
   - for February and August, $(r_2 + r_8)/2$; and so on; and
   - for June and December, it will be $(r_6 + r_{12})/2$.

   The rent relatives are then calculated as:
   (Current month rent) / (Corresponding Base rent).

   Index for the months June 2013 to November 2013 on fixed-base method will be:
   (Current month rent) / (Corresponding Base rent) x 100.

b) *The chain-based method rent relatives*: For the chain-based method, the rent relatives are computed as under:
   (Current month rent) / (Rent 6-month ago).

Index for the months December 2013 onwards on chain-based method will be:
(Current month rent) / (Rent 6-month ago) x Index 6-month ago.

22. Since there are many other dimensions of a dwelling in a sample, the actual computation of house rent index is very nuanced. Actual House rent index computation involves the following steps:

- First, the category of dwellings (1-room, 2-room, 3-room and ≥ 4-room) needs to be accounted for. For each State and Union Territory (UT) and each category, geometric mean of rent relatives is separately worked out using the full set of dwellings in the rolling sample of six months.

- Second, the shares (weights) of each category of dwellings within owner-occupied and rented houses (as per the results of Housing Condition Survey NSS 69th Round) are taken. Then weighted geometric mean of the rent relatives are separately worked out for owner-occupied and rented dwellings for each state. Since the rents of owner-occupied dwellings are taken by rental equivalence approach, the rent relative of rented accommodation is applied to the respective category of owner-occupied dwellings also.

- Third, the overall rent relative for a State/UT is worked out using weighted geometric mean of owner-occupied and rented dwelling. The weights of owner-occupied and rented dwellings are computed from the result of HCES 2011-12.

- Fourth, State/UT wise house rent index is arrived at by multiplying the above rent relative to (i) 100 (in case of fixed-base index), and (ii) house rent index 6-month ago (in case of chain-based index).

- Lastly, the State level house rent indices are aggregated using state-wise housing weights from the HCES. At this stage weighted arithmetic mean is used.

23. Algebraic details of CPI house rent index computation are given in the DP of MoSPI (NSO, 2025). Also, Annex 1 provides details on the computation-routine.

IV. Major Challenges in the Current Method of Housing Index Computation

24. In the DP, MoSPI mentions a few challenges in using the housing indices in CPI. Our analytical observations on these challenges are presented below.

IV.1 The issue of fixed index of 100 for the initial five months

The DP mentions that "There are three different methods used to calculate the index:

- *From January to May 2013, the index was set to 100.*
- *From June to November 2013, a fixed base method was used.*
- *From December 2013 onwards, a chain index method was applied.*

It was observed that a sharp rise in both the index and inflation occurred following May 2013, resulting in a sudden upward shift. This escalation was due to the assumption of index as 100 till May 2013."

25. In Section III, we discussed that the transition from fixed index for January to May 2013 to fixed-base index in June 2013, led to a sharp increase in month-on-month movement in housing index in June 2013 since the previous five months' house rent indices were kept artificially suppressed, even though data was incrementally getting collected each month. The supressed index for January to May 2013 also resulted in a corresponding spike in inflation during January to May 2014 (Chart 3).

26. Keeping the house rent index as 100 for the first five months was an implementation choice and not a methodological flaw. This issue could have been addressed by taking the sequential data availability into index compilation. Starting January 2013, additional data of one-sixth rented dwellings become available each month. Though such data was available, it was not being used for index compilation. There is a positive trade-off in using partial data than using no data for the index compilation of the initial months. Using partial data, the January to May 2013 indices would have had more information; May 2013 to June 2013 spike would not have happened; and the January to May 2014 inflation would not have seen a sharp surge. **Therefore, instead of fixed index method, we should have used fixed-base index method, with partial (but incrementing) data for the first five months of the series.** The fixed-base index for the next six months should stand as is. For details, see Annex 1 (A-V).

IV.2 Attributing the unexplainable six-monthly movement to the chain-based approach

The DP mentions that "from December 2013, the chain index was based on six months prior data which introduced an unexplainable movement in the monthly housing inflation rates."

27. The CPI housing index (Base 2012 = 100) has undergone peculiar and rhythmic six-monthly declines since December 2013. The DP, even after 13 years of index compilation, calls these dips unexplainable and attributes them to the transition of housing index compilation method from fixed-base to chain-based starting December 2013.

28. The DP mentions that the chain-based formula is equivalent to the fixed-base formula, i.e.,

Fixed-base Index for December
= Rent December / Base rent x 100
= (Rent December / Rent June) x (Rent June / Base rent) x 100
= Rent Relative of December x Index 6-month ago
= Chain-based Index for December

So, it appears that *transition to chain index should not introduce the unexplainable recurrent dips*. However, the computation of house rent index involves a series of intermediate stages as discussed in Section III.

29. To bring in more rigour to the above contention, based on all the stages of housing index computation, we theoretically establish the following:

> ***Theorem:*** *In CPI (Base 2012 = 100), for every full sample of house rentals collected over a moving window of six months, starting from December 2013, the chain-based housing index for a month is equal to the housing index computed by the fixed-base method.*

For further nuances and a proof of the above Theorem, we refer to Annex 1. The theorem establishes that *transition to chain index cannot introduce the unexplainable recurrent dips*.

30. An important property of the indices is that of it being *transitive*.[6] *Transitivity* means that the chained monthly indices are identical to the corresponding direct indices. This property is important in practice, because only then elementary price indices can be calculated as chained indices that link together the month-on-month indices.[7]

31. The Theorem shows that the extant housing index is *transitive*, i.e., both chain-based and fixed-base indices are equal. Thus, the reason provided by MoSPI **that the chain-based index methodology for housing index compilation has 'introduced an unexplainable movement', is not correct**.

32. The scientific re-evaluation of MoSPI's concerns has shown that under the extant housing index compilation methodology, statistically and theoretically it is not possible

[6] Para 8.25 of the international *CPI Manual: Concepts and Methods (2020)*

[7] The elementary house rent indices are computed using the Jevons index. Jevons index is defined as the unweighted geometric mean of the price relatives, which is identical to the ratio of the unweighted geometric mean prices, for the two periods, 0 and t, to be compared. The Jevons price index is calculated by directly comparing the prices of the two periods, 0 and t. Indices that are calculated by comparing the price of the reference period and the current period directly are referred to as direct indices. The Jevons index is *transitive*.

to have a dip that rhythmically repeats. So, what can explain the regular dips? To get an answer, the data and computations used to arrive at the December 2013 housing index, when the method first transitioned from fixed-base to chain-based method, need to be relooked. The monthly data on CPI house rent is not too voluminous (just about 2200 data points every month). Therefore, it should not be difficult to unravel the source of the December 2013 dip.[8] All the subsequent six-monthly dips are easy to understand as they are chained to the December 2013 index.

33. The chain-based index is only an alternative way to compute the fixed-base index. The advantage of chain-based index over fixed-base index is the ease in quality adjustment of commodities during the course of the CPI series (like feature phone getting replaced by smart phone).[9] However, in the chain-based index computation, if there is any error in calculation of the index for a month, then the error gets transmitted to all the subsequent months where the incorrect index is chained.

34. Theoretically, the current panel-based housing index methodology has a lot of merits. It appears that MoSPI is discarding the same because of the six-monthly dips, and is attributing such dips to a possible defect in the method. However, such dips cannot be attributed to the method. We may, therefore, continue with the current chain-based house rent index compilation methodology.

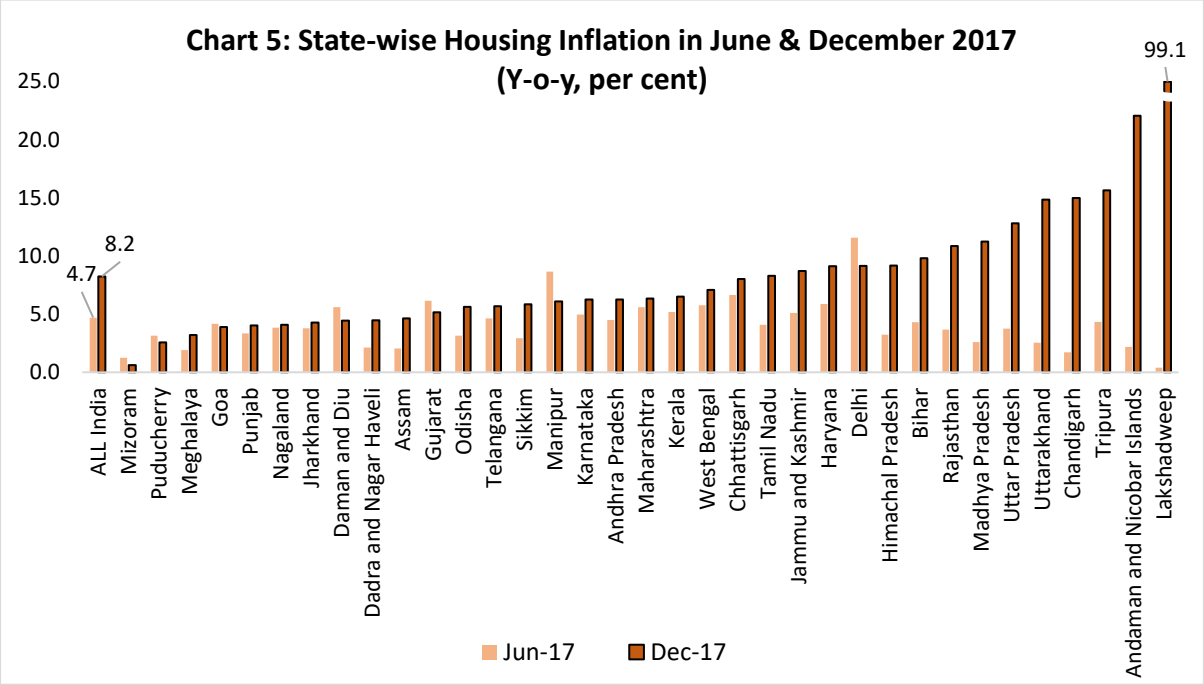
IV.3 Distortions in CPI due to employer-provided dwellings

The DP mentions about the distortions (in housing inflation) in some months due to concessional or employer-provided dwellings. The DP explains that the way rent is measured for government dwellings in CPI (by collecting information on House Rent Allowance and any other license fees paid by the employee to retain the dwelling), it does not capture actual change in housing rental prices and causes distortions.

[8] The computational source of the dip in the December 2013 index compilation could possibly emanate from either dwelling mismatch while computing rent relatives, or in the computer-programmed output of the index compilation, or in the data cleaning process, or some other source that only a data re-examination can reveal. An easy way to detect the cause of the December 2013 dip would be to work out the fixed-base index for December 2013.

[9] For Base 2012 = 100, consider that from September 2018 it is decided to move to 'smart phone' from the existing item 'feature phone' as the consumption of 'feature phone' has depleted significantly. Till August 2018, index was worked out for 'feature phone'. However, prices were collected in August 2018, for both 'feature phone' and 'smart phone'. In order to work out the chain-based September 2018 index for the item 'smart phone', its price relative is obtained by computing the ratio of the September 2018 to August 2018 price, and then multiplying the result by the August 2018 index of the 'feature phone'. This facilitates ease of replacing obsolete products with new ones without going back to the Base price. (It is noted that starting September 2018, the chain-based index for the 'smart phone' will still remain equivalent to the fixed-base index for the 'smart phone'. This equivalence can be established by arriving at the Base price of the 'smart phone'. The Base price of the 'smart phone' will be the Base price of 'feature phone' multiplied by an *adjustment factor* – the *adjustment factor* being the ratio of the August 2018 price of 'smart phone' to the August 2018 price of 'feature phone'. However, the beauty of the chain-based approach is that we don't have to go back to the derived Base price of 'smart phone'.)

35. Employer-provided dwelling in India are primarily by the government or the public sector entities. Inclusion of government dwellings in CPI housing sample led to sharp increase in housing inflation during the period of the 7th Central Pay Commission (CPC), 2017-18 (Chart 3). Geographically, this increase was very pronounced in certain States/UTs such as Andaman and Nicobar Islands, and Lakshadweep, due to a high share of employer-provided dwellings in these states (Chart 5).



Source: Das, P. (2018a), Mint Street Memo, RBI.

36. The fact that the measurement of rent for employer-provided dwelling, as HRA surrendered plus nominal licence fee charged, does not measure rent appropriately was earlier pointed out in Das (2018b). Given the large presence of employer-provided dwellings in several states, it was suggested in Das (2018b) that for government dwellings, rental equivalence approach, i.e., market rent of similar dwellings in the neighbouring area, as is used for owner-occupied housing, could be used.

37. However, it is noted that there may be constraints in some places to get similar dwellings in the neighbouring localities where there is prominence of government provided accommodation. Thus, the rental equivalence approach for government/ employer-provided dwellings may not always be feasible.

IV.4 Use of individual panel *vis-à-vis* moving panels approach

As per the DP, consultations with IMF under a Technical Assistance Mission suggested, inter alia, to use an individual panel approach rather than carrying forward prices of other panels, provided each panel is broadly representative of the whole.

IMF's view was that carrying forward the prices of the other panels may create a downward bias in the rent index.

38. Housing prices do not change frequently. Often, the rental agreements are annual, and they keep the rental values constant for about a year. Thus, a rolling sample of six months, as in the current method, broadly captures the latest rental values of each sample household (of the *full-stock*).

39. In this regard, the US BLS mentions the following:

> "*The CPI program collects rent data from each sampled unit every 6 months. Many rents change infrequently, being locked in place for a given lease term, and collecting rent data less frequently allows for a larger sample. Most rents included in the sample are continuing rents, and only a minority of observations are rents which have changed since the previous observation period.*"[10]

40. The methodology envisages that every panel shows rent change of each sample dwelling compared to its rent six months back. For the sake of efficiency, the full sample stock is split into six panels and data collection process covers one panel in each month. The *full-stock* of all the six panels taken together makes one representative sample. A 6-month moving panel gives one full sample of latest rental measurement each month. This method, in construct, eliminates any possible bias.[11]

IV.5 The case of the 6th root

It is indicated in the DP that the IMF team made the following remark:
"the price change is based on a comparison of like with like, meaning that panel 1 in M7 is compared with the prices collected in M1. This results in a six-month change. To convert the 6 months, change into a one-month change, the 6th root of the change may be calculated. This is then multiplied by the previous period index. Prices for the other panels are not imputed or used."

[10] See, 'Price Change and Quality Adjustment' (Measuring Price Change in the CPI: Rent and Rental Equivalence) US BLS https://www.bls.gov/cpi/factsheets/owners-equivalent-rent-and-rent.htm Last Modified Date: April 9, 2025 (Accessed on Dec. 10, 2025)

[11] Let us visualize the extant housing index compilation method as the fixed-base method. In that scenario, when calculating the rent relatives every month based on the full-stock (i.e., all the six panels), data from only one panel provides new rent relatives (with respect to Base) whereas the rent relatives of the remaining five panels are borrowed from the earlier obtained data. Given that house rents do not change frequently, possible downward bias, as suggested by IMF, is a trade-off *vis-à-vis* individual six-monthly representative panel approach that **may** create an upward bias. Such an upward bias **may** creep-in because of ignoring many dwellings, among the other five panels (of the full-stock), for which the housing price did not change. Thus, given the trade-off between carrying forward prices of other panels (downward bias) *vis-à-vis* using individual panels, by ignoring pertinent and realistic information of no change in housing prices for majority of the dwellings in the other five panels (upward bias), IMF's view appears one-sided.

41. The method of taking the 6th root, proposed by IMF, appears to be based on the approach suggested by the US BLS. It is noted that in their 'Estimation of price change for shelter – Six-month chained estimator', the US BLS uses the 6th root method. They mention that "*for the rent index, the current month's index is derived by applying the sixth root of the 6-month rent change to the index for the previous month*". However, their approach for deriving the 6-month rent change is different from the rent relatives obtained through geometric mean.[12]

42. Furthermore, the international 'CPI Manual: Concepts and Methods 2020', also discusses adopting a 6th root method. They indicate that:
Where rent changes are not obtained monthly for the full sample of dwellings, the monthly rent index from months t-1 to t can be derived from a subsample of rental units for that month. To obtain the full estimates of rent change over longer periods, the values from the different monthly subsamples are chained together in succession. To calculate the monthly rent index with a subsample of units, the same set of rental units is priced at intervals 6 months apart. The monthly change obtained at time t is the 6th root of the geometric mean of the sample rents in period t to the geometric mean of the rents for the same dwellings in period t-6.[13]

43. The method of taking the 6th root appears intuitive, but is not well justified. The basic fundamentals of finding an index for a month is to take a ratio of the rental for the month to the corresponding month's Base rent. However, if one tries to first take the 6th root of the ratio of the rents of October 2015 (say, M10) and April 2015 (M4) and then multiply the result by the index of September 2015 (M9), it will fundamentally not provide the fixed-base index of October 2015 (M10) (i.e., it will not be comparing the rent of October 2015 (M10) with that of the October 2012 Base (say, B10)). In other words, taking a 6th root will not lead the October 2015 (M10) index to be *transitive*. We show this in the illustration that follows, by computing the index of July 2013 (M7).

44. On the other hand, if we try to compute the same index by a chain-based method without incorporating a 6th root, rent of October 2015 (M10) is first divided by the April 2015 (M4) rent. The result is then multiplied by the index of April 2015 (M4). This does not mean that there is a real comparison of the rent of October 2015 (M10) to the rent of 6-month back April 2015 (M4) (that being just an intermediate step), since such a comparison gets multiplied by the index of April 2015 (M4). Such a methodical process leads to ultimately comparing the rent of October 2015 (M10) with that of the October 2012 Base (B10). This retains the *transitivity* property of the index. The illustration below explains this further.

[12] See, 'Consumer Price Index: Calculation' (Handbook of Methods) US BLS https://www.bls.gov/opub/hom/cpi/calculation.htm Last Modified Date: January 30, 2025 (Accessed on Dec. 10, 2025)

[13] Paras 11.156 and 11.157 of the international *CPI Manual: Concepts and Methods (2020)*

Illustration

45. Consider the construction of housing index for CPI (Base 2012 = 100). Under the panel approach, up to June 2013, fixed-base index will have to be taken. The first chain-based index can be constructed for July 2013 when the second reading for a panel will be available for the first time. Moreover, under the approach the Base rent for January 2012 and July 2012 will be the same as they are the average of these two rents. Similarly, the Base rents for February 2012 and August 2012 will be same, and so on.

The correct approach without introducing the 6th root

46. Without the 6th root, the chain-based index establishes the correct relation with the Base year, as seen below:

Chain-based index for October 2015

= (R_Oct15 / R_Apr15) x Index_Apr15

= (R_Oct15 / R_Apr15) x (R_Apr15 / R_Oct14) x Index_Oct14

= (R_Oct15 / R_Oct14) x (R_Oct14 / R_Apr14) x Index_Apr14

= (R_Oct15 / R_Apr14) x (R_Apr14 / R_Oct13) x Index_Oct13

= (R_Oct15 / R_Oct13) x (R_Oct13 / R_Apr13) x Index_Apr13

= (R_Oct15 / R_Apr13) x (R_Apr13 / R_Apr12Base) x 100

= (R_Oct15 / R_Oct12Base) x 100

= Fixed-base index for October 2015

Here, *R_mmmyy* denotes the geometric mean of the rent relative for the month *mmm* in year *20yy*. Also, note that *Apr12Base* and *Oct12Base* are the same as they are the average of these two rents as discussed above.

The defect in the 6th root Approach

47. With the 6th root, the chain-based index cannot establish the correct relation with the Base year, and the *transitivity* property does not hold, as seen below:

The Chain-based index for July 2013

$$= \sqrt[6]{\frac{R_Jul13}{R_Jan13}} \times Index_Jun13$$

$$= \frac{\sqrt[6]{R_Jul13}}{\sqrt[6]{R_Jan13}} \times \frac{R_Jun13}{R_Jun12Base} \times 100$$

≠ Fixed-base index for July 2013

V. Changes Proposed by MoSPI for Housing Index Compilation

48. MoSPI has proposed a comprehensive revamp of methodology for compilation of housing index. The changes proposed are largely to address the issues it flagged on the current methodology, on which we have provided our rebuttals in Section IV. Our specific observations on the proposed changes envisaged by MoSPI are presented in this Section. A summary of these observations is presented in Annex 2.

V.1 Monthly rentals from the entire set of sampled dwellings as against the panel approach

MoSPI will measure the rental prices from the entire set of sampled dwellings every month, instead of visiting these households once every six months. The DP mentions: "***Monthly Rent Collection****: Rent data will be collected monthly, replacing the current practice of collecting rent every six months.*
Expanded Sample Coverage*: Instead of limiting rent collection to one-sixth of the sample, the new approach proposes collecting rent data from all selected dwellings each month*.".

49. The proposal to **collect rent data monthly from the entire sample of over 25,000 dwellings**[14] (as against the current panel-based approach that would require only one-sixth sample, i.e., just over 4000 dwellings) has **several significant drawbacks**:

- It will lead to **a sharp upsurge in the cost of price collection.**
- This will **put an avoidable burden on the national exchequer**, especially given that the house rentals do not change every month.
- It will **raise respondent burden and fatigue**, as price collectors will visit each sample dwelling every month.
- This will **substantially increase the workload of price collectors**.
- There is **no empirical evidence that there will be a significant gain in information** in the full sample collected every month over a rolling sample of six months, given the nature of infrequent housing price changes.
- It may risk compromising the data quality. If the intent of the proposed approach is to collect rent data from all selected dwellings each month, it will have to be ensured that each dwelling is actually visited each month for data collection. The price collector should not ask questions like "when is the next increase in rent scheduled" and take it as a rental information for next couple of months

[14] The new CPI housing series (Base 2024 = 100) will include 12 dwellings from each of the 1395 urban markets (as per availability); and 6 dwellings per rural market from 1465 villages (as per availability). This leads to over 25,000 sample dwellings from the combined urban and rural sector (12x1395 + 6x1465 = 25530).
(Source: *Booklet on Base Revision of Consumer Price Index (CPI), Gross Domestic Product (GDP), and Index of Industrial Production (IIP)*. November 25, 2025.)
https://www.mospi.gov.in/uploads/publications_reports/publications_reports1764067885229_df54c5fb-cc26-4038-bfd6-8c455b4c7018_Booklet_Mumbai_Workshop_25112025.pdf)

without actually visiting the dwelling. In case such proxies are adopted and **if each sample dwelling is not visited every month, it could compromise the data sanctity**.

The extant method of 6-month moving panels is a statistically sound approach

50. As discussed earlier, the current panel survey approach of CPI housing index compilation splits the sample of dwellings into six panels and visits each panel once in six months. Then, six-monthly *Moving Rent Relative Method* is used for monthly updation of house rent index. Since housing prices do not change frequently, the six-monthly moving panel represents the actual change in the *full-stock* of housing sample appropriately.

51. **The panel survey approach satisfies the monthly data needs of the CPI and minimizes respondent burden**. Given the reality that rent does not change every month, the panel survey approach for house rent measurement is also the norm the international '*CPI Manual: Concepts and Methods 2020*' and the US BLS recommends.

If availability of rented dwellings is limited, consider three-month moving panel

52. In case there is limited availability of rented dwellings in many markets outside major urban centres, MoSPI could consider splitting the overall sample of dwellings into fewer panels, say, three (in place of six) and visit each panel of dwellings every three months (in place of six months). This will make panel size large and without any significant loss of information, this approach will save substantial cost and reduce respondent / investigator burden.

53. Given that the revised Base is 2024 = 100, and that MoSPI has proposed to collect monthly rental data from all dwellings each month, the Base rental values from all sample dwellings may have already been collected through physically visiting the dwellings for all rural and urban markets; and for all months of the Base year. With rental values for all dwellings available for the Base year, for index compilation starting January 2025, price collection can alternately transit to three-panel survey approach. However, the decision to reduce the current six-panels to fewer panels should be based **solely** on the non-availability of rented dwellings in the sample when the overall sample is split into six panels. In case rented dwellings are available, the six-panel approach may continue.

54. In case rental values from all sample dwellings have not been collected through physical visits for the Base year 2024, the extant six-panel based survey approach needs to continue.

V.2 Use of weighted arithmetic mean as against the extant weighted geometric mean

For higher level indices (arrived by aggregation of elementary indices), MoSPI in the DP suggests use of weighted arithmetic mean for house rent (in line with other items in CPI) in place of weighted geometric mean.

55. Bringing in uniformity for arriving at higher level indices across commodities is a well-meaning proposal. However, house rental is a special commodity as it has significant weight in CPI and has multiple dimensions – it has different categories (based on number of rooms in the dwellings), and different status of dwelling (self-owned or rented).

56. In this context, it will be pertinent to run through some of the fundamental concepts behind compilation of elementary indices and higher level indices (See, Box).

Box: Elementary Indices and Higher Level Indices

Consumer Price Indices (CPIs) measure the movement in prices of an aggregate basket of goods and services consumed by a typical household in a country. The goods and services items that are included for construction of a CPI are aggregated using their expenditure share obtained from the household consumption expenditure surveys (HCES).

Calculation of CPI is usually done in two stages – it starts with compilation of elementary index for each item and then the elementary indices are aggregated to higher level indices using the item's expenditure weights in HCES.

Elementary Price Indices

Elementary index is called elementary since it is the lowest level price index and corresponds to a **weighted item** in CPI. Weighted items are all the items that get weight in CPI and for which indices are released by National Statistics Offices. Expenditure weights are usually not available below the elementary aggregate level. In case of India, the current CPI (Base 2012 = 100) series consists of 299 weighted items and all India indices for these items are released every month by National Statistics Office (NSO).

To compile the 299 item indices, NSO collects prices for many more items than the 299 items. These are called **priced items**. Priced items reflect different varieties of a weighted item (e.g., 'rice' may include priced items such as basmati, parmal, ponni), or different types of a weighted item (e.g., 'other vegetables' may include raw papaya, sweet potato, etc.) or different categories of a weighted item (e.g. 'house rent' includes, 1-room, 2-room, 3-room or ≥ 4-room dwellings; or owner-occupied and rented dwellings).

...Continued

The priced items are aggregated to elementary item indices and the aggregation may involve more than one step. As an example, we take the case of rice and consider that it has three varieties. To work out the elementary index of rice, first the geometric mean of price relatives for each variety of rice (priced items) from different markets is worked out. The geometric means of these three varieties of rice are then aggregated as a weighted mean, if weights are available; or as a simple mean, if weights are not available. The computation of elementary index of rice is, thus, a two-step process. The same analogy of elementary index compilation for different varieties of priced items can be extended to different types and different categories of priced items.

For a weighted item of CPI, which has different varieties, if the expenditure weights of each of these varieties are not available, the choice of the averaging method can be very important. The larger the variation in the individual prices, the larger the difference among the standard averaging methods. Though both arithmetic and geometric averaging can be used, the international *'CPI Manual: Concepts and Methods 2020'* recommends the use of geometric average formulas.[15]

All the steps of aggregation of price relatives to arrive at the elementary index of weighted items are part of elementary index compilation and should not be construed as preparation of a higher-level index. Also, till the elementary index is prepared, the aggregation deals with price relatives only and the method of aggregation should remain the same – geometric mean, as recommended by the international '*CPI Manual: Concepts and Methods 2020'*.

Higher Level Indices

Elementary indices provide the basic building block for higher level indices and are the starting point for calculating CPI. Working upward from the elementary price indices, **all indices above the elementary aggregate level are higher-level indices** that can be calculated from the elementary price indices using the elementary aggregate expenditure as weights.[16]

The higher level aggregates include grouping the elementary item indices to sub-group/group indices (vertical aggregation); or to regional indices (horizontal aggregation).

Higher level indices are calculated from the elementary price indices using the household expenditure as weights and using weighted arithmetic mean for aggregation. Usually, for higher level indices, Laspeyres Index or Young Index formula of weighing the elementary indices is used.

57. For CPI compilation, it is critical to differentiate between the construction of *elementary* indices and *higher-level* indices. Elementary index is the lowest level price index in CPI. It is arrived at by aggregating price relatives of priced items. The aggregation may involve more than one step – first price relatives are aggregated separately for each of the varieties/types/categories within an item. Next these aggregate price relatives are further combined using weights (for their varieties/types/categories) to the final elementary index. These steps of aggregation of price relatives across varieties/types/categories is still a step towards construction

[15] Para 1.145 of the international *CPI Manual: Concepts and Methods (2020)*

[16] Para 8.10 of the international *CPI Manual: Concepts and Methods (2020)*

of elementary index only and should not be construed as preparation of a high-level index. The higher-level indices include grouping the elementary item indices to sub-group/group indices and further to headline indices; or grouping them to regional indices (state-wise aggregation) and further to national indices.

58. In case of house rent index, the elementary level aggregation involves multiple steps. Aggregating rent relatives across different dwelling categories (e.g., 1-room, 2-room) or across ownership (owner-occupied or rented) are steps in constructing the elementary house rent index. Till such time the rent relatives are being aggregated, geometric mean should be used to arrive at elementary house rent index. Thereafter, for higher level indices (housing index by aggregating house rent index, watchman charge index, water charge index, etc., or for combining state house rent indices to arrive at all-India house rent index), weighted arithmetic mean should be used. For combining rent relatives, taking arithmetic mean instead of geometric mean, sacrifices on the benefits of geometric mean to capture the true overall change in the rent-relative ratios.

59. For combining the four types of rent relatives, **taking arithmetic mean**, instead of geometric mean, **sacrifices on the benefits of geometric mean to capture the true overall change in the house rentals**, measured through the rent relatives.[17] Moreover, the Report of the Group of Technical Advisory Committee on Statistics of Prices and Cost of Living (2014) also recommends that for compilation of elementary indices,

> "*Consistent with the international practices, Geometric Mean may be used to compile elementary indices because of the following reasons:*
>
> - *geometric mean is stable and is robust against extreme values; and*
> - *average of the Price Relatives with respect to Base Prices and Ratio of the Averages of Prices with respect to Base Prices coincide in the geometric mean.*"

60. Therefore, rather than treating house rent like any other item in CPI, a separate treatment of house rent index compilation, as is scientifically done in the existing series, may continue. Bringing in arithmetic mean in elementary index calculation, will be sub-optimal. After arriving at the elementary house rent indices aggregated across categories and ownership, higher level indices may be compiled through arithmetic mean as proposed.

[17] For example, consider 1-room house rents increase by 5 per cent, while in a small part of the market, high end 3-room house-rents increase by 50 per cent. Arithmetic mean will be heavily skewed by that 50 per cent jump. It is a subtle but really a vital point. The arithmetic mean gives too much weight to items that have had extreme percentage increases. It would make the overall change in house rent seem much higher than the average consumer is truly feeling. Arithmetic mean can distort the perception of the real change. It sacrifices the accuracy and stability that the geometric mean provides.

V.3 Exclusion of employer-provided dwellings

Given that the rent paid for subsidized dwellings provided by employers do not reflect actual rental transaction, the DP is proposing to exclude employer-provided dwellings.

61. The proposal has merit as the current series faced challenges due to sharp increase in rental prices of government dwellings following the 7th CPC pay revision.

62. Also, MoSPI will be using results from Census 2011 as the frame to assign weights to dwelling categories within owner-occupied and rented houses (See, Census 2011 Houselisting Schedule in Annex 3). Census 2011 classified ownership status of dwellings into three types – owned, rented and others. Since employer-provided accommodation is implicitly rented by the employee from the employer, it is classified as rented house in the census data. Thus, usage of the Census 2011 frame for CPI housing index compilation will help in including employer-provided dwellings in the share of rented dwellings itself. That is, the new weights of rented dwellings will represent (i) the privately rented accommodation, as also (ii) the employer-provided ones. This will implicitly provide rental equivalence for employer-provided dwellings, as discussed in sub-Section IV.3. This is a welcome change for the forthcoming CPI (2024 = 100) series.

V.4 Inclusion of rural sector in addition to urban sector

In the DP, MoSPI proposes to include rural sector in addition to urban sector in the existing series. The new series will include 6 dwellings from the rural markets to collect rent data.

63. **This is a welcome change**. It will fill in a major data gap that existed in the earlier series which was due to the non-availability of rental data from the rural markets in HCES 2011-12 on which the CPI (2012 = 100) is based. Also, rural market sample size of 6 dwellings looks appropriate, given that the rural dwellings must be primarily owner-occupied.

V.5 Use of Census 2011 data to get weights for the dwelling types

The DP proposes to use Census 2011 data to get weights for the dwelling types.

64. The existing series uses NSSO 69th survey data (2012) since the results of Census 2011 were not available at the time of the previous CPI series revision. Using **Census data will provide a better population frame.**

VI. Other Aspects to CPI House Rent Index

65. There are a few other suggestions relating to housing price index compilation that need to be delved into:

a) Dwellings included in the sample should have detailed identifier / product classification in the database so as to facilitate understanding the source of price shocks, if any, i.e., which type of houses are the drivers of housing inflation. This will also be a very important input for checking data quality by MoSPI. Needless to say, if shared by MoSPI, even internally for policy purposes, this may be an important input for policy makers to understand the price dynamics in the housing market.

b) Given that significant changes are proposed in the new series, a method to connect the current house rent index with the one in the revised series should be devised by MoSPI. The same back series linking was also provided by MoSPI in the first CPI Base revision when the Base moved from 2010 to 2012. This proved to be very crucial and valuable for analysts and policy makers.

c) NSSO should do more frequent housing condition surveys. The existing Housing conditions survey of 2012 and even the Census 2011 data is too dated. Housing sector has undergone significant changes in the last 15 years, with high rises and gated communities mushrooming, even outside major urban centres. Also, the share of apartments according to dwelling size may have changed during this period with further increase in nuclear families, migration to urban areas, and space constrains in cities giving preference to smaller apartments.

d) The housing group in the current CPI consists of items other than house rent – such as, residential building & land (cost of repairs only), water charges, and watch man charges (other cons taxes) – that are released along with CPI item indices. In case these items are included in the revised CPI, MoSPI may provide information on measurement of their prices in the revised CPI manual.

VII. Concluding Remarks

66. It is our constitutional fundamental duty *to develop the scientific temper, and the spirit of inquiry and reform*. MoSPI's approach has been reformative and consultative during the process of updating the CPI to a new Base (2024 = 100). It has held a series of consultations, has brought out two Discussion Papers – on treatment of public distribution system items in CPI, and on the housing index compilation methodology. MoSPI also organised a pre-release consultative workshop on revision of major macro indicators, including CPI.

67. Several of the suggestions by MoSPI for CPI Base revision are in line with the principles guiding the strengthening of the national statistical system. The steps taken by MoSPI for CPI revision will enhance coverage, increase granularity of data dissemination, promote the use of latest technology, and make use of administrative data, which is praiseworthy. With respect to housing services in CPI, some of the changes proposed will immensely benefit policy making. These changes include (i) expanding the coverage of housing indices to include rural areas, (ii) using Census 2011 data for deriving weights for categorisation of dwelling types, and (iii) dropping employer-provided residences from the sample of dwellings selected for rent collection.

68. We have focussed in this Report on the changes MoSPI has proposed in the DP on housing index compilation methodology. Many of the conclusions drawn by MoSPI regarding the current housing index compilation, while intuitive, lack scientific rigour. Given the importance of CPI and the fact that housing consists of more than a-tenth of the CPI, this Report deep-dives into the extant method of housing index compilation. The Report examines each of the challenges highlighted in the DP and provides theoretical underpinnings to establish that the extant method is robust to measure housing prices in CPI. Importantly the Report scientifically justifies the need to continue with panel sample rent collection approach and continuation of elementary index compilation based on geometric means.

69. We are cognizant of the time sensitivity of the CPI Base revision exercise. Our suggestions and observations on the method of index compilation are implementable within the CPI revision timelines and will not cause any delays.

70. In summary, our view is that, expanding house rent measurement to rural areas; excluding employer provided dwellings for measuring rent; and using Census 2011 frame, are desirable changes. Contrastingly, the new and significantly different method proposed by MoSPI of visiting over 25,000 sample dwellings each month, under the premise that the extant housing index compilation method is defective; doing away with the current and robust panel-based housing index methodology; and bringing in arithmetic mean in elementary index calculations, will be sub-optimal in various aspects. As it is said, ‘if it ain’t broke, don’t fix it’.

71. Data-driven decision-making would be accurate not only by collecting the correct data but also by correctly aggregating the same through precise summary statistics and measures. The sample survey-based house rent index compilation is an exercise of national importance as it contributes significantly towards inflation measurement of the country. MoSPI may like to deliberate on the suggestions made in the Report.

References

1. Consumer Price Index Manual: Concepts and Methods (2020), International Monetary Fund, International Labour Organization, Statistical Office of the European Union (Eurostat), United Nations Economic Commission for Europe, Organisation for Economic Co-operation and Development, The World Bank. https://www.ilo.org/sites/default/files/wcmsp5/groups/public/@dgreports/@stat/documents/publication/wcms_761444.pdf

2. Das, P. (2018a), Impact of Increase in House Rent Allowance on CPI Inflation, Mint Street Memo No. 11, Reserve Bank of India, April 23, 2018. https://www.rbi.org.in/Scripts/MSM_Mintstreetmemos11.aspx

3. Das, P. (2018b), Housing Services in CPI – Measurement Issues, Mint Street Memo No. 15, Reserve Bank of India, November 5, 2018. https://www.rbi.org.in/Scripts/MSM_Mintstreetmemos15.aspx

4. Monetary Policy Report (April 2018), Reserve Bank of India, April 5,2018. https://www.rbi.org.in/Scripts/PublicationsView.aspx?id=18110

5. Ministry of Statistics and Programme Implementation (2025), Proposed Changes in New CPI Series, Government of India, November 26. https://docs.google.com/presentation/d/1DCXdzC2_hymsqs5BppGPPgBWlCnREWx_/mobilepresent?slide=id.p1

6. National Statistics Office (2024), Report No.591, Survey on Household Consumption Expenditure 2022-23, Ministry of Statistics and Programme Implementation, Government of India, June. https://www.mospi.gov.in/sites/default/files/publication_reports/Report_591_HCES_2022-23New.pdf

7. National Statistics Office (NSO) (2025), Report No.592, Survey on Household Consumption Expenditure 2023-24, Ministry of Statistics and Programme Implementation, Government of India, January. https://nccd.gov.in/uploads/Household_Consumption_Expenditure2023_24_d9fcc28952.pdf

8. National Statistics Office (2025), Discussion paper on the proposed changes in the Housing index compilation methodology in the new CPI series, Ministry of Statistics and Programme Implementation, Government of India, October 31. (**See, Annex 4**) https://new.mospi.gov.in/uploads/announcements/announcements_1761816278170_89e91cb4-018c-44b1-87f7-17a8e45db702_Discussion_paper_on_the_proposed_changes_in_the_Housing_index_compilation_methodology_in_the_new_CPI_series.pdf

9. Report of the Group of Technical Advisory Committee on Statistics of Prices and Cost of Living (2014), Prices & Cost of Living Unit, National Accounts Division, Central Statistics Office, Ministry of Statistics and Programme Implementation, Government of India. https://cpi.mospi.gov.in/PDFile/Report_of_the_Group_of_TAC_on_SPCL_on_Base_Revision_of_CPI.pdf

Annex 1

Equivalence of the chain-based and fixed-base housing index

A-I. Introduction

For compiling the housing index in consumer price index (CPI) a certain sample survey framework is setup. For compilation of this index, two categories of dwellings are considered:

- Rented dwellings; and
- Self-owned dwellings

Rental equivalence approach is adopted for compilation of house rent for self-owned dwellings. Only rented dwellings are selected in the sample for collection of rent data.

Selected dwellings are classified into four types depending on the number of rooms in the dwellings. The four categories of dwellings depending on the number of rooms being 1, 2, 3, or ≥4, are represented as i=1,2,3,4, respectively.

Actual rent paid by the occupant is collected from the houses. For Government accommodations, house rent is equal to the HRA foregone plus license fee paid by the occupant.

Rented dwellings have been selected using appropriate sampling procedure, considering the proportional representation of these types of dwellings. Selected dwellings are classified as per States. Consider S States. The States are represented as j=1,2, …, S.

At the all-India level, a *full-stock* of N=13,368 rented dwellings are selected across 1114 markets of 310 towns. Each market is allocated 12 rented dwellings.

The *full-stock* of N rented dwellings is covered in a period of six months, by surveying one-sixth of the *full-stock* in a month. For compilation of house rent index, the full sample stock of dwellings is considered. Thus, for compilation of house rent index for March 2024, N rent-observations from the selected dwellings covered in the six consecutive months October 2023 through March 2024 are considered.

The sample sizes for the six consecutive months, say for months 1 through 6, are $N_1, N_2, N_3, N_4, N_5, N_6$, respectively. These sample sizes are expected to be equal but for the sake of generality, they can be unequal. However, they add up to the total sample size of N.

State-wise house rent indices are obtained first. Then these State indices are aggregated to obtain the all-India house rent index.

A-II. Preliminaries

Let, N_{ij}^{t} be the number of dwellings in category *i* dwellings of State *j* in the sample for month *t*. Also, since the same sample dwellings are visited after every six months, we have, $N_{ij}^{t} = N_{ij}^{t+6} = N_{ij}^{t+12} = \cdots$. Therefore, the number of dwellings selected in month *t* is

$$\sum_{i=1}^{4}\sum_{j=1}^{S} N_{ij}^{t} = N_t = N_{t+6} = N_{t+12} = \cdots.$$

The complete sample (*full-stock*) at month *t* is of size $N = \sum_{t'=t-5}^{t} N_{t'}$, and is the sum of the sample sizes $N_{t-5}, N_{t-4}, N_{t-3}, N_{t-2}, N_{t-1}, N_t$, of the six consecutive months till month *t*.

Let, x_{ijk}^{t} be the *k*-th rental observation collected from the category *i* dwelling in State *j* at month *t*. Here, *k*=1,2, …, N_{ij}^{t}.

For the Base year, let the months January, February, …, December be represented by *t*=1, *t*=2, …, *t*=12. Let, Base year be 2012. Base rent for each dwelling is the arithmetic mean of the rent collected for the dwellings during 2012. The dwellings allotted to January 2012 is visited again in July 2012; the dwelling assigned for the month February 2012 is visited again in August 2012; and so on. In the end, against each dwelling in the Base year, there will be two rent values. Arithmetic mean of these two rents is the revised Base rent for that dwelling.

Rental data x_{ijk}^{t} are collected for the twelve months in the Base year. A revised Base rent for month *t* of the Base year (*t*=1,2, …, 12), denoted by $x'^{(t)}_{ikj}$, is now defined as,

$$x'^{(t)}_{ijk} = \frac{x_{ijk}^{t} + x_{ijk}^{t+6}}{2} = x'^{(t+6)}_{ijk},\ t=1,2,\ldots,6.$$

Thus, $x'^{(1)}_{ijk} = x'^{(7)}_{ijk}$, $x'^{(2)}_{ijk} = x'^{(8)}_{ijk}$, $x'^{(3)}_{ijk} = x'^{(9)}_{ijk}$, $x'^{(4)}_{ijk} = x'^{(10)}_{ijk}$, $x'^{(5)}_{ijk} = x'^{(11)}_{ijk}$, $x'^{(6)}_{ijk} = x'^{(12)}_{ijk}$. By taking such revised Base rents, it is clear that the Base rents of January 2012 (*t*=1) and July 2012 (*t*=7) are made same. Similarly, Base rents are made same for February 2012 (*t*=2) and August 2012 (*t*=8), and so on, for June 2012 (*t*=6) and December 2012 (*t*=12).

A-III. Fixed-base Housing Index

First, we define the modulo operation *mod*. Let, *p* and *q* be positive integers. For *p* the dividend (the number being divided) and *q* the divisor (the number you are dividing by), the result of *p mod q* is the unique integer *s* (remainder) such that $0 \leq s < q$. **For our workout, if *s*=0, it shall be replaced by *q*.**

It is noted that since $x'^{(t)}_{ijk} = x'^{(t+6)}_{ijk}$ for *t*=1,2, …, 6, therefore for *t*=13,14, …, $x'^{(t\ mod\ 12)}_{ijk} = x'^{((t+6)\ mod\ 12)}_{ijk}$.

The fixed-base rent relative for month *t* (*t*=13,14, …) with respect to the Base month is defined as

$$r'^{(t)}_{ijk} = \frac{x^t_{ijk}}{x'^{(t\ mod\ 12)}_{ijk}}.$$

Then, for the month *t*, the geometric mean of the rent relatives with respect to the Base month, over the N^t_{ij} observations, is

$$g'^{(t)}_{ij} = \left(\prod_{k=1}^{N^t_{ij}} r'^{(t)}_{ijk}\right)^{\frac{1}{N^t_{ij}}}.$$

At the month *t* (*t*=18,19, …), the geometric mean of the rent relatives for the full sample stock of size *N* is based on the rent relatives for the six months *t-5,t-4, …, t*. For example, for *t*=19, at the month July 2013, the geometric mean of the rent relatives for the 6-month period February-July 2013 is taken. Such a geometric mean for the *full-stock* (called the 6-monthly *moving rent relative*) at the month *t* (*t*=18,19, …) is

$$G'^{(t)}_{ij} = \left(\prod_{t'=1}^{6}\left(g'^{(t-6+t')}_{ij}\right)^{N^{t-6+t'}_{ij}}\right)^{\frac{1}{\sum_{t'=1}^{6} N^{t-6+t'}_{ij}}} = \left(\prod_{t'=1}^{6}\prod_{k=1}^{N^{t-6+t'}_{ij}} r'^{(t-6+t')}_{ijk}\right)^{\frac{1}{\sum_{t'=1}^{6} N^{t-6+t'}_{ij}}},$$

At the month January 2014 (t=25), the geometric mean of the rent relatives for the 6-month period August-December 2013 and January 2014 is taken with respect to Base months August-December 2012 and January 2012, respectively.

Let, weights of the *i*-th category of dwellings in State *j*, within rented and owner-occupied houses be $w^{(r)}_{ij}$ and $w^{(o)}_{ij}$, respectively, such that $\sum_{i=1}^{4} w^{(r)}_{ij} = \sum_{i=1}^{4} w^{(o)}_{ij} = 1$.

For State *j*, the weighted geometric mean of the rent relatives of rented dwellings, over the four categories, for the full sample stock of size *N* at the month *t* is

$$G'^{(t)}_{j(r)} = \prod_{i=1}^{4}\left(G'^{(t)}_{ij}\right)^{w^{(r)}_{ij}}.$$

Similarly, for State *j*, the weighted geometric mean of the rent relatives of owner-occupied dwellings, over the four categories, for the full sample stock of size *N* at the month *t* is

$$G'^{(t)}_{j(o)} = \prod_{i=1}^{4}\left(G'^{(t)}_{ij}\right)^{w^{(o)}_{ij}}.$$

Finally, let the weights of rented and owner-occupied dwellings in State *j* be $w_{j(r)}$ and $w_{j(o)}$, respectively, such that $w_{j(r)} + w_{j(o)} = 1$. Then, for State *j*, the weighted geometric mean of the rent relatives of the dwellings, over rented and owner-occupied houses, for the full sample stock of size *N* at the month *t* is

$$G'^{(t)}_{j} = \left(G'^{(t)}_{j(r)}\right)^{w_{j(r)}}\left(G'^{(t)}_{j(o)}\right)^{w_{j(o)}}.$$

The fixed-base housing index for State *j* at the month *t* (*t*=18,19, …) is

$$\boldsymbol{HCPI'^{(t)}_{j} = G'^{(t)}_{j} \times 100.}$$

A-IV. Chain-based Housing Index

Let, $r^{(t)}_{ijk} = \frac{x^{t}_{ijk}}{x^{t-6}_{ijk}}$ denote the chain-based rent relative for month *t*, which is the ratio of rents at month *t* to that of month *t*-6 (*t*=19,20, …). For *t*=19, such a rent relative for the month July 2013 is the ratio of rents in July 2013 to that of January 2013. Then, for the month *t* (*t*=19,20, …), the geometric mean of the rent relatives, over the N^{t}_{ij} observations, is

$$g^{(t)}_{ij} = \left(\prod_{k=1}^{N^{t}_{ij}} r^{(t)}_{ijk}\right)^{\frac{1}{N^{t}_{ij}}}.$$

For t=24,25, …, at the month *t*, the geometric mean of the rent relatives for the full sample stock of size *N* is based on the rent relatives for the six months *t-5,t-4, …, t*. For example, for *t*=25, at the month January 2014, the geometric mean of the rent relatives at *t*=20 through *t*=25, i.e., the 6-month period August 2013 - January 2014 is taken. Such a geometric mean for the *full-stock* at the month *t* is

$$G^{(t)}_{ij} = \left(\prod_{t'=1}^{6}\left(g^{(t-6+t')}_{ij}\right)^{N^{t-6+t'}_{ij}}\right)^{\frac{1}{\sum_{t'=1}^{6} N^{t-6+t'}_{ij}}} = \left(\prod_{t'=1}^{6}\prod_{k=1}^{N^{t-6+t'}_{ij}} r^{(t-6+t')}_{ijk}\right)^{\frac{1}{\sum_{t'=1}^{6} N^{t-6+t'}_{ij}}}.$$

Let, weights of the *i*-th category of dwellings in State *j*, within rented and owner-occupied houses be $w^{(r)}_{ij}$ and $w^{(o)}_{ij}$, respectively, such that $\sum_{i=1}^{4} w^{(r)}_{ij} = \sum_{i=1}^{4} w^{(o)}_{ij} = 1$.

For State *j*, the weighted geometric mean of the rent relatives of rented dwellings, over the four categories, for the full sample stock of size *N* at the month *t* is

$$G_{j(r)}^{(t)} = \prod_{i=1}^{4}\left(G_{ij}^{(t)}\right)^{w_{ij}^{(r)}}.$$

Similarly, for State *j*, the weighted geometric mean of the rent relatives of owner-occupied dwellings, over the four categories, for the full sample stock of size *N* at the month *t* is

$$G_{j(o)}^{(t)} = \prod_{i=1}^{4}\left(G_{ij}^{(t)}\right)^{w_{ij}^{(o)}}.$$

Finally, let the weights of rented and owner-occupied dwellings in State *j* be $w_{j(r)}$ and $w_{j(o)}$, respectively, such that $w_{j(r)} + w_{j(o)} = 1$. Then, for State *j*, the weighted geometric mean of the rent relatives of the dwellings, over rented and owner-occupied houses, for the full sample stock of size *N* at the month *t* is

$$G_{j}^{(t)} = \left(G_{j(r)}^{(t)}\right)^{w_{j(r)}}\left(G_{j(o)}^{(t)}\right)^{w_{j(o)}}.$$

The chain-based housing index for State *j* at the month *t* (*t*=24,25, …) is

$$\boldsymbol{HCPI_j^{(t)} = G_j^{(t)} \times HCPI_j^{(t-6)}.}$$

Note that for *t*=18,19, …, 23, only fixed-base housing indices are derived. Thus, for *t*=18,19, …, 23, we take $HCPI_j^{(t)} = HCPI'^{(t)}_j$.

A-V. Construction of Indices for January-November 2013

The months t=1,2, …, 12 are the Base months, say, January 2012, February 2012, …, December 2012, respectively. For months corresponding to t=13 through t=23 fixed-base housing index is only feasible. **What we now describe for *t*=13,14, …, 17, is a new proposal.**

1. For State *j*, the **fixed-base** housing index for January 2013 corresponds to t=13 and is based on one-sixth of the *full-stock*, and is defined as, $\boldsymbol{HCPI'^{(13)}_j = g'^{(13)}_j \times 100,}$ where,

$$g'^{(13)}_j = \left(g'^{(13)}_{j(r)}\right)^{w_{j(r)}}\left(g'^{(13)}_{j(o)}\right)^{w_{j(o)}},$$

$$g'^{(13)}_{j(r)} = \prod_{i=1}^{4}\left(g_{ij}^{*(13)}\right)^{w_{ij}^{(r)}},$$

$$g'^{(13)}_{j(o)} = \prod_{i=1}^{4}\left(g^{*(13)}_{ij}\right)^{w^{(o)}_{ij}},$$

$$g^{*(13)}_{ij} = \left(\prod_{k=1}^{N^{13}_{ij}} r'^{(13)}_{ijk}\right)^{\frac{1}{N^{13}_{ij}}}.$$

2. For State *j*, the **fixed-base** housing index for February 2013 corresponds to t=14 and is based on two-sixth of the *full-stock*, and is defined as, $\boldsymbol{HCPI'^{(14)}_{j} = g'^{(14)}_{j} \times 100,}$ where,

$$g'^{(14)}_{j} = \left(g'^{(14)}_{j(r)}\right)^{w_{j(r)}}\left(g'^{(14)}_{j(o)}\right)^{w_{j(o)}},$$

$$g'^{(14)}_{j(r)} = \prod_{i=1}^{4}\left(g^{*(14)}_{ij}\right)^{w^{(r)}_{ij}},$$

$$g'^{(14)}_{j(o)} = \prod_{i=1}^{4}\left(g^{*(14)}_{ij}\right)^{w^{(o)}_{ij}},$$

$$g^{*(14)}_{ij} = \left(\prod_{t\prime=13}^{14}\prod_{k=1}^{N^{t\prime}_{ij}} r'^{(t\prime)}_{ijk}\right)^{\frac{1}{\sum_{t\prime=13}^{14} N^{t\prime}_{ij}}}.$$

3. For State *j*, the **fixed-base** housing indices for March-May 2013 corresponds to t=15,16,17 and is based on three-sixth, four-sixth, five-sixth of the *full-stock*, respectively, and is defined as, $\boldsymbol{HCPI'^{(t)}_{j} = g'^{(t)}_{j} \times 100; t = 15,16,17,}$
where,

$$g'^{(t)}_{j} = \left(g'^{(t)}_{j(r)}\right)^{w_{j(r)}}\left(g'^{(t)}_{j(o)}\right)^{w_{j(o)}},$$

$$g'^{(t)}_{j(r)} = \prod_{i=1}^{4}\left(g^{*(t)}_{ij}\right)^{w^{(r)}_{ij}},$$

$$g'^{(t)}_{j(o)} = \prod_{i=1}^{4}\left(g^{*(t)}_{ij}\right)^{w^{(o)}_{ij}},$$

$$g^{*(t)}_{ij} = \left(\prod_{t\prime=13}^{t}\prod_{k=1}^{N^{t\prime}_{ij}} r'^{(t\prime)}_{ijk}\right)^{\frac{1}{\sum_{t\prime=13}^{t} N^{t\prime}_{ij}}}.$$

4. For State *j*, the **fixed-base** housing indices for June-November 2013 corresponds to t=18,19,20,21,22,23 and is based on the *full-stock*, and is defined as, $\boldsymbol{HCPI'^{(t)}_{j} = G'^{(t)}_{j} \times 100.}$

A-VI. December 2013 Index through fixed-base and chain-based approaches

1a. For State *j*, the **fixed-base** housing index for December 2013 corresponds to t=24, and is defined as, $\boldsymbol{HCPI'^{(24)}_j = G'^{(24)}_j \times 100.}$

1b. For State *j*, the **chain-based** housing index for December 2013 corresponds to t=24, and is defined as, $\boldsymbol{HCPI^{(24)}_j = G^{(24)}_j \times HCPI^{(18)}_j.}$

Now, since by definition, $HCPI^{(18)}_j = HCPI'^{(18)}_j = G'^{(18)}_j \times 100$, therefore,

$$\boldsymbol{HCPI^{(24)}_j = G^{(24)}_j \times G'^{(18)}_j \times 100.}$$

We now show that $HCPI^{(24)}_j = HCPI'^{(24)}_j$.

From points 1a and 1b above, it follows that $HCPI^{(24)}_j = HCPI'^{(24)}_j$, i.e., chain-based and fixed-base housing index for December 2013 are the same,

$$\textbf{if } \boldsymbol{G^{(24)}_j \times G'^{(18)}_j = G'^{(24)}_j.} \quad \textbf{(A)}$$

LHS = $G^{(24)}_j \times G'^{(18)}_j$

$= \left(G^{(24)}_{j(r)}\right)^{w_{j(r)}} \left(G^{(24)}_{j(o)}\right)^{w_{j(o)}} \times \left(G'^{(18)}_{j(r)}\right)^{w_{j(r)}} \left(G'^{(18)}_{j(o)}\right)^{w_{j(o)}}$

$= \left(G^{(24)}_{j(r)} G'^{(18)}_{j(r)}\right)^{w_{j(r)}} \left(G^{(24)}_{j(o)} G'^{(18)}_{j(o)}\right)^{w_{j(o)}}$

$= \left(\prod_{i=1}^{4}\left(G^{(24)}_{ij}\right)^{w^{(r)}_{ij}} \prod_{i=1}^{4}\left(G'^{(18)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G^{(24)}_{ij}\right)^{w^{(o)}_{ij}} \prod_{i=1}^{4}\left(G'^{(18)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

$= \left(\prod_{i=1}^{4}\left(G^{(24)}_{ij} G'^{(18)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G^{(24)}_{ij} G'^{(18)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

RHS = $G'^{(24)}_j = \left(G'^{(24)}_{j(r)}\right)^{w_{j(r)}} \left(G'^{(24)}_{j(o)}\right)^{w_{j(o)}} = \left(\prod_{i=1}^{4}\left(G'^{(24)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G'^{(24)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

Looking as the expressions of LHS and RHS above, it follows that $G^{(24)}_j \times G'^{(18)}_j = G'^{(24)}_j$,

$$\textbf{if } \boldsymbol{G^{(24)}_{ij} G'^{(18)}_{ij} = G'^{(24)}_{ij}.} \quad \textbf{(B)}$$

LHS = $G_{ij}^{(24)} G'^{(18)}_{ij}$

$= \left(\prod_{t'=1}^{6} \left(g_{ij}^{(18+t')} \right)^{N_{ij}^{18+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{18+t'}}} \left(\prod_{t'=1}^{6} \left(g'^{(12+t')}_{ij} \right)^{N_{ij}^{12+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{12+t'}}}$

$= \left(\prod_{t'=1}^{6} \left(g_{ij}^{(18+t')} g'^{(12+t')}_{ij} \right)^{N_{ij}^{18+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{18+t'}}}$, since $N_{ij}^{12+t'} = N_{ij}^{18+t'}$

RHS = $G'^{(24)}_{ij} = \left(\prod_{t'=1}^{6} \left(g'^{(18+t')}_{ij} \right)^{N_{ij}^{18+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{18+t'}}}$

Looking as the expressions of LHS and RHS above, it follows that $G_{ij}^{(24)} G'^{(18)}_{ij} = G'^{(24)}_{ij}$,

$$\textbf{if } g_{ij}^{(18+t')} g'^{(12+t')}_{ij} = g'^{(18+t')}_{ij} \textbf{, for } t' = 1, 2, \dots, 6. \textbf{ (C)}$$

LHS = $g_{ij}^{(18+t')} g'^{(12+t')}_{ij}$

$= \left(\prod_{k=1}^{N_{ij}^{18+t'}} r_{ijk}^{(18+t')} \right)^{\frac{1}{N_{ij}^{18+t'}}} \left(\prod_{k=1}^{N_{ij}^{12+t'}} r'^{(12+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{12+t'}}}$

$= \left(\prod_{k=1}^{N_{ij}^{18+t'}} r_{ijk}^{(18+t')} r'^{(12+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{18+t'}}}$, since $N_{ij}^{12+t'} = N_{ij}^{18+t'}$

RHS = $g'^{(18+t')}_{ij} = \left(\prod_{k=1}^{N_{ij}^{18+t'}} r'^{(18+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{18+t'}}}$

Looking as the expressions of LHS and RHS above, it follows that $g_{ij}^{(18+t')} g'^{(12+t')}_{ij} = g'^{(18+t')}_{ij}$,

$$\textbf{if } r_{ijk}^{(18+t')} r'^{(12+t')}_{ijk} = r'^{(18+t')}_{ijk} \textbf{, for } t' = 1, 2, \dots, 6. \quad \textbf{(D)}$$

But,

$$r_{ijk}^{(18+t')} r'^{(12+t')}_{ijk} = \frac{x_{ijk}^{18+t'}}{x_{ijk}^{12+t'}} \frac{x_{ijk}^{12+t'}}{x'_{ijk}^{((12+t') \, mod \, 12)}} = \frac{x_{ijk}^{18+t'}}{x'_{ijk}^{((12+t') \, mod \, 12)}} = \frac{x_{ijk}^{18+t'}}{x'_{ijk}^{((18+t') mod \, 12)}} = r'^{(18+t')}_{ijk}. \qquad \text{(E)}$$

Therefore, from (A), (B), (C), (D), and (E), it follows that $HCPI_j^{(24)} = HCPI'^{(24)}_j$.

Lemma 1: For a State, the chain-based housing index and the fixed-base housing index, for December 2013, are the same.

A-VII. January-May 2014 Indices through fixed-base and chain-based approaches

1a. For State *j*, **fixed-base** housing index for January-May 2014 corresponds to t=25,26, …, 29, respectively, and is defined as, $\boldsymbol{HCPI'^{(t)}_j = G'^{(t)}_j \times 100}$**, *t*=25,26, …, 29.**

1b. For State *j*, **chain-based** housing index for January-May 2014 corresponds to t=25,26, …, 29, respectively, and is defined as, $\boldsymbol{HCPI^{(t)}_j = G^{(t)}_j \times HCPI^{(t-6)}_j}$**.**

Now, since by definition, $HCPI^{(t-6)}_j = HCPI'^{(t-6)}_j = G'^{(t-6)}_j \times 100$, therefore,

$$\boldsymbol{HCPI^{(t)}_j = G^{(t)}_j \times G'^{(t-6)}_j \times 100}\text{, }\boldsymbol{t}\text{=25,26, …, 29.}$$

We first consider the housing index for January 2014. From points 1a and 1b above, it follows that $HCPI^{(25)}_j = HCPI'^{(25)}_j$, i.e., chain-based and fixed-base housing index for January 2014 are the same,

$$\text{if } G^{(25)}_j \times G'^{(19)}_j = G'^{(25)}_j. \qquad \text{(A)}$$

LHS = $G^{(25)}_j \times G'^{(19)}_j$

$= \left(G^{(25)}_{j(r)}\right)^{w_{j(r)}} \left(G^{(25)}_{j(o)}\right)^{w_{j(o)}} \times \left(G'^{(19)}_{j(r)}\right)^{w_{j(r)}} \left(G'^{(19)}_{j(o)}\right)^{w_{j(o)}}$

$= \left(G^{(25)}_{j(r)} G'^{(19)}_{j(r)}\right)^{w_{j(r)}} \left(G^{(25)}_{j(o)} G'^{(19)}_{j(o)}\right)^{w_{j(o)}}$

$= \left(\prod_{i=1}^{4}\left(G^{(25)}_{ij}\right)^{w^{(r)}_{ij}} \prod_{i=1}^{4}\left(G'^{(19)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G^{(25)}_{ij}\right)^{w^{(o)}_{ij}} \prod_{i=1}^{4}\left(G'^{(19)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

$= \left(\prod_{i=1}^{4}\left(G^{(25)}_{ij} G'^{(19)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G^{(25)}_{ij} G'^{(19)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

RHS = $G'^{(25)}_j = \left(G'^{(25)}_{j(r)}\right)^{w_{j(r)}} \left(G'^{(25)}_{j(o)}\right)^{w_{j(o)}} = \left(\prod_{i=1}^{4}\left(G'^{(25)}_{ij}\right)^{w^{(r)}_{ij}}\right)^{w_{j(r)}} \left(\prod_{i=1}^{4}\left(G'^{(25)}_{ij}\right)^{w^{(o)}_{ij}}\right)^{w_{j(o)}}$

Looking as the expressions of LHS and RHS above, it follows that $G_j^{(25)} \times G'^{(19)}_j = G'^{(25)}_j$,

$$\text{if } G_{ij}^{(25)} G'^{(19)}_{ij} = G'^{(25)}_{ij}. \qquad \text{(B)}$$

LHS = $G_{ij}^{(25)} G'^{(19)}_{ij}$

$$= \left(\prod_{t'=1}^{6} \left(g_{ij}^{(19+t')} \right)^{N_{ij}^{19+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{19+t'}}} \left(\prod_{t'=1}^{6} \left(g'^{(13+t')}_{ij} \right)^{N_{ij}^{13+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{13+t'}}}$$

$$= \left(\prod_{t'=1}^{6} \left(g_{ij}^{(19+t')} g'^{(13+t')}_{ij} \right)^{N_{ij}^{19+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{19+t'}}}, \text{ since } N_{ij}^{13+t'} = N_{ij}^{19+t'}$$

RHS = $G'^{(25)}_{ij} = \left(\prod_{t'=1}^{6} \left(g'^{(19+t')}_{ij} \right)^{N_{ij}^{19+t'}} \right)^{\frac{1}{\sum_{t'=1}^{6} N_{ij}^{19+t'}}}$

Looking as the expressions of LHS and RHS above, it follows that $G_{ij}^{(25)} G'^{(19)}_{ij} = G'^{(25)}_{ij}$,

$$\text{if } g_{ij}^{(19+t')} g'^{(13+t')}_{ij} = g'^{(19+t')}_{ij}, \text{ for } t' = 1,2,\dots,6. \qquad \text{(C)}$$

LHS = $g_{ij}^{(19+t')} g'^{(13+t')}_{ij}$

$$= \left(\prod_{k=1}^{N_{ij}^{19+t'}} r_{ijk}^{(19+t')} \right)^{\frac{1}{N_{ij}^{19+t'}}} \left(\prod_{k=1}^{N_{ij}^{13+t'}} r'^{(13+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{13+t'}}}$$

$$= \left(\prod_{k=1}^{N_{ij}^{19+t'}} r_{ijk}^{(19+t')} r'^{(13+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{19+t'}}}, \text{ since } N_{ij}^{13+t'} = N_{ij}^{19+t'}$$

RHS = $g'^{(19+t')}_{ij} = \left(\prod_{k=1}^{N_{ij}^{19+t'}} r'^{(19+t')}_{ijk} \right)^{\frac{1}{N_{ij}^{19+t'}}}$

Looking as the expressions of LHS and RHS above, it follows that $g_{ij}^{(19+t')} g'^{(13+t')}_{ij} = g'^{(19+t')}_{ij}$,

$$\text{if } r_{ijk}^{(19+t')} r'^{(13+t')}_{ijk} = r'^{(19+t')}_{ijk}, \text{ for } t' = 1,2,\dots,6. \qquad \text{(D)}$$

But,

$$r_{ijk}^{(19+t')} r'^{(13+t')}_{ijk} = \frac{x_{ijk}^{19+t'}}{x_{ijk}^{13+t'}} \frac{x_{ijk}^{13+t'}}{x'^{((13+t') \bmod 12)}_{ijk}} = \frac{x_{ijk}^{19+t'}}{x'^{((13+t') \bmod 12)}_{ijk}} = \frac{x_{ijk}^{19+t'}}{x'^{((19+t') \bmod 12)}_{ijk}} = r'^{(19+t')}_{ijk}. \qquad \text{(E)}$$

Therefore, from (A), (B), (C), (D), and (E), it follows that $HCPI_j^{(25)} = HCPI'^{(25)}_j$.

On similar lines, February-May 2014 corresponds to *t*=26,27,28,29, respectively, and to show that $HCPI_j^{(t)} = HCPI'^{(t)}_j$, it suffices to show that $G_j^{(t)} \times G'^{(t-6)}_j = G'^{(t)}_j$. Furthermore, to show that $G_j^{(t)} \times G'^{(t-6)}_j = G'^{(t)}_j$, if suffices to show that

$$r_{ijk}^{(t-6+t')} r'^{(t-12+t')}_{ijk} = r'^{(t-6+t')}_{ijk},\ t' = 1,2,\dots,6.$$

But,

$$r_{ijk}^{(t-6+t')} r'^{(t-12+t')}_{ijk} = \frac{x_{ijk}^{t-6+t'}}{x_{ijk}^{t-12+t'}} \frac{x_{ijk}^{t-12+t'}}{x'^{((t-12+t')\,mod\,12)}_{ijk}} = \frac{x_{ijk}^{t-6+t'}}{x'^{((t-12+t')\,mod\,12)}_{ijk}} = \frac{x_{ijk}^{t-6+t'}}{x'^{((t-6+t')mod\,12)}_{ijk}} = r'^{(t-6+t')}_{ijk}.$$

Therefore, $HCPI_j^{(t)} = HCPI'^{(t)}_j$, for *t*=26,27,28,29.

Lemma 2: For a State, the chain-based housing index and the fixed-base housing index, for each of the months in January-May 2014, are the same.

A-VIII. June 2014 onward Indices through fixed-base and chain-based approaches

1a. For State *j*, **fixed-base** housing index for June 2014 onwards corresponds to t=30,31, …, respectively, and is defined as, $\boldsymbol{HCPI'^{(t)}_j = G'^{(t)}_j \times 100}$**, *t*=30,31, … .**

1b. For State *j*, **chain-based** housing index for June 2014 onwards corresponds to t=30,31, …, respectively, and is defined as, $\boldsymbol{HCPI_j^{(t)} = G_j^{(t)} \times HCPI_j^{(t-6)}}$**.**

We now show that if $HCPI_j^{(t-6)} = HCPI'^{(t-6)}_j$, then $HCPI_j^{(t)} = HCPI'^{(t)}_j$.

Let, $HCPI_j^{(t-6)} = HCPI'^{(t-6)}_j$.

Then, $\boldsymbol{HCPI_j^{(t)} = G_j^{(t)} \times HCPI_j^{(t-6)} = G_j^{(t)} \times HCPI'^{(t-6)}_j = G_j^{(t)} \times G'^{(t-6)}_j \times 100.}$

Thus, to show that $HCPI_j^{(t)} = HCPI'^{(t)}_j$, it suffices to show that $G_j^{(t)} \times G'^{(t-6)}_j = G'^{(t)}_j$.

Furthermore, to show that $G_j^{(t)} \times G'^{(t-6)}_j = G'^{(t)}_j$, if suffices to show that

$$r_{ijk}^{(t-6+t')} r'^{(t-12+t')}_{ijk} = r'^{(t-6+t')}_{ijk},\ t' = 1,2,\ldots,6.$$

But,

$$r_{ijk}^{(t-6+t')} r'^{(t-12+t')}_{ijk} = \frac{x_{ijk}^{t-6+t'}}{x_{ijk}^{t-12+t'}} \frac{x_{ijk}^{t-12+t'}}{x'^{((t-12+t')\ mod\ 12)}_{ijk}} = \frac{x_{ijk}^{t-6+t'}}{x'^{((t-12+t')\ mod\ 12)}_{ijk}} = \frac{x_{ijk}^{t-6+t'}}{x'^{((t-6+t')mod\ 12)}_{ijk}} = r'^{(t-6+t')}_{ijk}.$$

Therefore, if $HCPI_j^{(t-6)} = HCPI'^{(t-6)}_j$, then $HCPI_j^{(t)} = HCPI'^{(t)}_j$.

For *t*=30, it is already established that $HCPI_j^{(24)} = HCPI'^{(24)}_j$. Therefore, $HCPI_j^{(30)} = HCPI'^{(30)}_j$. Similarly, for *t*=31,32, …, 35, it is already established that $HCPI_j^{(t-6)} = HCPI'^{(t-6)}_j$. Therefore, $HCPI_j^{(t)} = HCPI'^{(t)}_j$, for *t*=31,32, …, 35.

In this recursive way, using the Principle of Mathematical Induction,

$HCPI_j^{(t)} = HCPI'^{(t)}_j$, for *t*=36,37, … .

Lemma 3: For a State, the chain-based housing index and the fixed-base housing index, for each of the months in June 2014 onwards, are the same.

Based on Lemmas 1, 2 and 3, we have,

Theorem: In CPI (Base 2012 = 100), for every full sample of house rentals collected over a moving window of six months, starting from December 2013, the chain-based housing index for a month is equal to the housing index computed by the fixed-base method.

Remark: For Base 2012 = 100, consider that from September 2018 (i.e., panel number 3), because of non-availability, a 1-room dwelling (D_o) captured in March 2018 is to be replaced by a new 1-room dwelling (D_n) in the same locality. Till March 2018, index was worked out on the basis of the rent from D_o. In September 2018, D_n's rental data is captured for both March and September 2018. To work out the chain-based September 2018 index, using the new dwelling D_n, its rent relative is obtained by computing the ratio of the September 2018 to March 2018 rent, and then multiplied to the March 2018 index (that was based on the rental data from D_o). This facilitates ease of replacing an unavailable dwelling with a new dwelling without going back to the Base rent. It is noted that starting September 2018, the chain-based index (on the basis of the rental data from D_n) will still remain equivalent to the fixed-base index that is based on the rental data from D_n. This equivalence can be established by arriving at the Base rent of D_n. The Base rent of D_n will be the Base rent of D_o multiplied by an *adjustment factor* – the *adjustment factor* being the ratio of the March 2018 rent of D_n to the March 2018 rent of D_o. However, the beauty of the chain-based approach is that we don't have to go back to the derived Base rent of D_n.

Annex 2

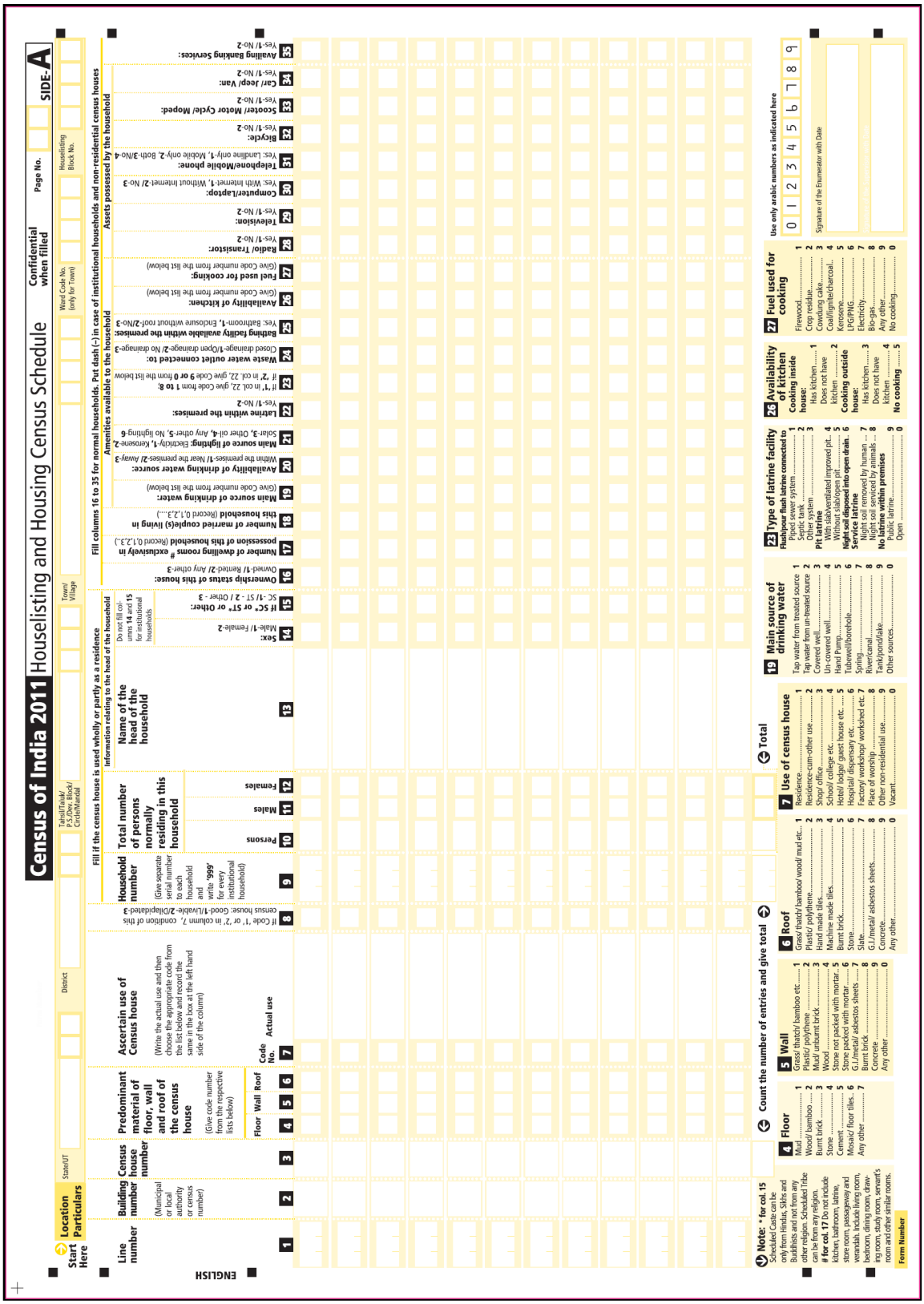
Summary of Observations on the Proposals in the Discussion Paper

Parameters	Existing Series	Proposed in the new series	Observations
1. Coverage	Only urban areas	Urban & rural both	Welcome improvement in coverage.
	12 dwellings per market (as per availability)	Urban – 12 dwellings per market (as per availability) Rural - 6 dwellings per market (as per availability)	Rural: sample size looks appropriate, given that rural dwellings are predominantly owner-occupied.
	Panel approach for capturing rents from all dwellings in 6 months	Rent data will be captured from all dwellings for every month	Panel approach may continue as housing prices change infrequently. It will save substantial cost, reduce respondent and investigator burden without compromising on information content.
	Employer provided accommodation included	Employer provided accommodation not included	Since the presence of government houses in several States/UTs is substantial, MoSPI may ensure that in the weights of rented dwellings, the share of government accommodation is included.
2. Methodology	3 methods are used to compile the index for different periods.	Only one method will be used from the beginning as done for other items in the basket, which is short index or chain index method	Housing is different as rental prices change infrequently. Existing method may continue for multiple reasons as discussed in the Report, using only the fixed-base and chain-based approaches (which are mathematically equivalent).

Parameters	**Existing Series**	**Proposed in the new series**	**Observations**
3. Higher level indices	Weighted Geometric mean of elementary indices	Weighted Arithmetic mean of elementary indices (in line with other items in CPI)	Elementary indices should be constructed using geometric mean only.
4. Source for dwelling type weights	Housing Condition Survey - NSS 69th round, 2012	Census 2011	Using Census 2011 data will provide a better population frame.
5. Release of Housing index	All India and urban	All India, urban and rural	Excellent move
6. Other observations	A method to connect the current house rent index with the one in the revised series may be devised. The back series was also provided by MoSPI in the first CPI Base revision (Base changed from 2010 to 2012).		

Annex 3

Census of India 2011: Houselisting and Housing Census Schedule



Census of India 2011 Houselisting and Housing Census Schedule

Confidential when filled

Page No. ____

SIDE-B

ENGLISH

Fill if the census house is used wholly or partly as a residence

Fill columns 16 to 35 for normal households. Put dash (–) in case of institutional households and non-residential census houses

1 Line number	2 Building number (Municipal or local authority or census number)	3 Census house number	4 Predominant material of floor, wall and roof of the census house (Give code number from the respective lists below) Floor	5 Wall	6 Roof	7 Ascertain use of Census house (Write the actual use and then choose the appropriate code from the list below and record the same in the box at the left hand side of the column) Code No.	Actual use	8 If Code '1' or '2' in column 7, condition of this census house: Good-1/Livable-2/Dilapidated-3	9 Household number (Give separate serial number to each household and write '999' for every institutional household)	10 Total number of persons normally residing in this household Persons	11 Males	12 Females	13 Name of the head of the household	Information relating to the head of the household: Do not fill columns 14 and 15 for institutional households 14 Sex: Male-1/ Female-2	15 If SC* or ST* or Other: SC -1/ ST - 2 / Other - 3	16 Ownership status of this house: Owned-1/ Rented-2/ Any other-3	17 Number of dwelling rooms # exclusively in possession of this household (Record 0,1,2,3...)	18 Number of married couple(s) living in this household (Record 0,1,2,3....)	Amenities available to the household: 19 Main source of drinking water: (Give Code number from the list below)	20 Availability of drinking water source: Within the premises-1/ Near the premises-2/ Away-3	21 Main source of lighting: Electricity-1, Kerosene-2 Solar-3, Other oil-4, Any other-5, No lighting-6	22 Latrine within the premises: Yes-1/ No-2	23 If '1' in col. 22, give Code from 1 to 8; if '2' in col. 22, give Code 9 or 0 from the list below	24 Waste water outlet connected to: Closed drainage-1/Open drainage-2/ No drainage-3	25 Bathing facility available within the premises: Yes: Bathroom-1, Enclosure without roof-2/No-3	26 Availability of kitchen: (Give Code number from the list below)	27 Fuel used for cooking: (Give Code number from the list below)	Assets possessed by the household: 28 Radio/ Transistor: Yes-1/ No-2	29 Television: Yes-1/ No-2	30 Computer/Laptop: Yes: With Internet-1, Without Internet-2/ No-3	31 Telephone/Mobile phone: Yes: Landline only-1, Mobile only-2, Both-3/No-4	32 Bicycle: Yes-1/ No-2	33 Scooter/ Motor Cycle/ Moped: Yes-1/ No-2	34 Car/ Jeep/ Van: Yes-1/ No-2	35 Availing Banking Services: Yes-1/ No-2

Count the number of entries and give total ____ Total ____

Note: * for col. 15 Scheduled Caste can be only from Hindus, Sikhs and Buddhists and not from any other religion. Scheduled Tribe can be from any religion.
 # for col. 17 Do not include kitchen, bathroom, latrine, store room, passageway and verandah. Include living room, bedroom, dining room, drawing room, study room, servant's room and other similar rooms.

4 Floor
- Mud 1
- Wood/ bamboo 2
- Burnt brick 3
- Stone 4
- Cement 5
- Mosaic/ floor tiles.. 6
- Any other 7

5 Wall
- Grass/ thatch/ bamboo etc 1
- Plastic/ polythene 2
- Mud/ unburnt brick 3
- Wood 4
- Stone not packed with mortar.. 5
- Stone packed with mortar 6
- G.I./metal/ asbestos sheets 7
- Burnt brick 8
- Concrete 9
- Any other 0

6 Roof
- Grass/ thatch/ bamboo/ wood/ mud etc... 1
- Plastic/ polythene 2
- Hand made tiles 3
- Machine made tiles 4
- Burnt brick 5
- Stone 6
- Slate 7
- G.I./metal/ asbestos sheets 8
- Concrete 9
- Any other 0

7 Use of census house
- Residence 1
- Residence-cum-other use 2
- Shop/ office 3
- School/ college etc. 4
- Hotel/ lodge/ guest house etc. 5
- Hospital/ dispensary etc. 6
- Factory/ workshop/ workshed etc. 7
- Place of worship 8
- Other non-residential use 9
- Vacant 0

19 Main source of drinking water
- Tap water from treated source 1
- Tap water from un-treated source 2
- Covered well 3
- Un-covered well 4
- Hand Pump 5
- Tubewell/borehole 6
- Spring 7
- River/canal 8
- Tank/pond/lake 9
- Other sources 0

23 Type of latrine facility
- **Flush/pour flush latrine connected to**
  - Piped sewer system 1
  - Septic tank 2
  - Other system 3
- **Pit latrine**
  - With slab/ventilated improved pit.. 4
  - Without slab/open pit 5
- **Night soil disposed into open drain.. 6**
- **Service latrine**
  - Night soil removed by human ... 7
  - Night soil serviced by animals ... 8
- **No latrine within premises**
  - Public latrine 9
  - Open 0

26 Availability of kitchen
- **Cooking inside house:**
  - Has kitchen 1
  - Does not have kitchen 2
- **Cooking outside house:**
  - Has kitchen 3
  - Does not have kitchen 4
- **No cooking 5**

27 Fuel used for cooking
- Firewood 1
- Crop residue 2
- Cowdung cake 3
- Coal/lignite/charcoal.. 4
- Kerosene 5
- LPG/PNG 6
- Electricity 7
- Bio-gas 8
- Any other 9
- No cooking 0

Use only arabic numbers as indicated here: 0 1 2 3 4 5 6 7 8 9

Signature of the Enumerator with Date

Signature of the Supervisor with Date

Continued to another sheet
Write 'C' if continued to another sheet ____

Write last three digits of the form number of the continued sheet ____

Annex 4

MoSPI's Discussion Paper on Housing Index

Discussion paper on the proposed changes in the Housing index compilation methodology in the new CPI series

Importance of Housing in Indian CPI

The Consumer Price Index (CPI) is a key macro-economic indicator for measuring price changes of goods and services consumed by the households over time. Inflation based on CPI is the year on year change in the CPI. The Housing is a crucial indicator of the overall well-being of the households not only in India but across the world as a significant amount of their income is spent either on house rent or maintaining an owned house. It is considered an important factor for the economy as it affects household budgets and influences the construction and real estate sectors. High house rents can strain household finances which may in turn reduce the spending on other requisite goods and services. Therefore, inflation based on house rent index is an important tool not only for the policy and decision makers but also for the households.

In India, one of the key components of the existing CPI series is housing as it has 21.67% expenditure share for urban areas and 10.07% expenditure share at All India level in the existing CPI series. Currently, the housing index is not compiled in the rural sector mainly because Household Consumption Expenditure Survey (HCES) 2011-12 did not provide the estimates of the imputed rent for owner occupied houses for this sector. Further, as per HCES (2011-12), the actual house rent expenditure accounted for only 0.44% of the total rural consumption expenditure. Further, the rental equivalent approach also could not be adopted due to non-availability of rent market.

2.Housing Index compilation Methodology for the existing CPI series

2.1 In the existing series of CPI, the owner-occupied dwellings are also taken into account in the computation of housing index besides rented dwellings. The "Rental Equivalent Approach" was adopted to impute the rent of owner-occupied houses. The rent data are collected from the sample rented dwellings in each of the selected towns. For each quotation, twelve rented dwelling units were selected. These were selected in such a way that they represented various categories of dwellings with different number of living rooms. Dwellings are visited once in six months for canvassing house rent schedule which means the dwellings covered in the month of January for collection of information are visited in the month of July again. Similarly, dwellings covered in

February are covered again in August and so on. This arrangement was made to reduce the workload of enumerators in collection of information. Moreover, rent does not change very frequently like prices of cereals, vegetables, fruits etc. In case of concessional or subsidized dwellings like dwellings provided by the employer, the rent actually paid by the family for the dwelling along with any allowance foregone in lieu of the accommodation given to the owner is taken as rent payable per month. The selected dwellings are substituted during the course of the series. Substitution generally occurs when a dwelling is no longer available for rent, its category changes due to reconstruction or other structural modifications and in a few cases due to non-cooperation of the respondents. 7%-10% of dwellings are substituted in a year.

2.2 For compilation of housing index, rent data for six months' period were required as each sample dwelling was visited once in six months for data collection. Therefore, for the period January 2013 to May 2013, housing indices were kept at 100. First Housing Index on Base 2012=100 was compiled for the month of June 2013, for which, house rent data from January 2013 to June 2013 was used. February 2013 to July 2013-house rent data was used for July 2013 house rent index and so on. For computing House Rent Index, Rent Relatives were calculated as (current month rent)/ (Base rent) and then GM of the Rent Relatives was worked out by classifying the dwellings by number of living rooms (i.e. one room, two rooms, three rooms and four or more rooms). Weighted geometric mean (GM) of the aforementioned average rent relatives was taken to get the Housing Index. Here weights for each category of dwellings was obtained from the NSS 69th round survey on Housing Conditions (July-December 2012). This fixed base method was Continued up to November 2013. Subsequently, the Housing Indices were computed using Chain Base Method where Rent Relatives (RR) were computed as (current month rent)/ (rent six months ago) and then GM of Rent Relatives was worked out by classifying the dwellings by number of living rooms (one room, two rooms, three rooms and four or more rooms). Weighted GM of the aforementioned average rent relatives was taken to get a combined rent relative. Housing index was obtained by multiplying the combined rent relative with the corresponding House Rent Index six months ago.

2.3 Base Rent computation for the existing CPI series

Let $\mathbf{x_1}$, $\mathbf{x_2}$…, **and** $\mathbf{x_6}$ were the rent collected for dwellings allocated to January to June of the Base year and $\mathbf{x_7}$, **…..** **and** $\mathbf{x_{12}}$ represented the rent collected for July to December during a

second visit. So the Base rent were computed as **$(x_1+ x_7)/2$, $(x_2+ x_8)/2$, ... and $(x_6+ x_{12})/2$ for January, February ……and June respectively.**

2.4 Index Compilation -Current Year (2013 onwards)

It may be noted that the complete set of rent values was unavailable until May of the initial year, as rent was collected for only **1/6th** of the total dwellings each month. Therefore, a full set of **Current Year Rent** was available for compilation after June of the initial year.

This means that for January, the current year's rent will be available for **1/6th** of the total dwellings.

During February, rent data for **2/6th** of the dwellings (1/6th from January and 1/6th from February) will be available.

Similarly, by May, rent data for **5/6th** of the dwellings (1/6th from each month from January to May) will be collected.

However, only after June of the initial year, the complete set of current rent values for all dwellings will be available.

Therefore, **Index for January, February, ….and May** was taken as **100.**

For June, rent for 2013 for all the dwellings was available for the first time.

Index for June = Rent June/Base rent *100.

Where rent June 2013 contained all the data from January to June (Complete set).

Index for July = Rent July/Base rent *100.

Where rent July contains all the data from February to July.

This was followed till Nov, wherein

Index for Nov= Rent Nov/Base rent *100.

Where rent November contains all the data from June to November.

The chain index for Housing was started from December (2013) onwards:

Index for December = Rent December/Base rent *100.

$$= \frac{\text{Rent December}}{\text{Rent June}} * \frac{\text{Rent June}}{\text{Base rent}} *100$$

= Rent Relative*Index six month ago

2.5 Rent relative calculation for the existing series

Let us suppose, there are five States in the country. As per current index compilation procedure, all elementary indices, including Housing index, are compiled State-wise and then aggregated to arrive at all India level index.

2.5.1 Rent data are collected from rented accommodations only. Therefore, the sample contains only rented accommodations. Dwellings, in the sample, have been divided into -four categories, using the criteria of number of living rooms:

I - one living room set
II - two living rooms set
III - three living rooms set
IV - four or more living rooms set

2.5.2. Let N_{ij} is the number of dwellings in category *i* of dwellings in State *j* in the sample. Further, assume that R^C is current rent, R^{-6} is rent six months ago and RR (Rent Relative) is ratio of R^C and R^{-6}. Then RR_{ij} represents geometric mean of the rent relatives of the rented dwellings in category *i* of dwellings in State j, which are depicted in the matrix below:

States	Category I	Category II	Category III	Category IV
States 1	RR_{I1}	RR_{II1}	RR_{III1}	RR_{IV1}
States 2	RR_{I2}	RR_{II2}	RR_{III2}	RR_{IV2}
States 3	RR_{I3}	RR_{II3}	RR_{III3}	RR_{IV3}
States 4	RR_{I4}	RR_{II4}	RR_{III4}	RR_{IV4}
States 5	RR_{I5}	RR_{II5}	RR_{III5}	RR_{IV5}

2.5.3 Weights/shares of these categories of dwellings within owner-occupied and rented houses (as per the results of Housing Condition Survey NSS 69th Round) were supposed as follows:

State	Rented accommodations				Owner-occupied accommodations			
	Cat- I	**Cat- II**	**Cat- III**	**Cat- IV**	**Cat- I**	**Cat- II**	**Cat- III**	**Cat- IV**
States 1	A_{I1}	A_{II1}	A_{III1}	A_{IV1}	B_{I1}	B_{II1}	B_{III1}	B_{IV1}
States 2	A_{I2}	A_{II2}	A_{III2}	A_{IV2}	B_{I2}	B_{II2}	B_{III2}	B_{IV2}
States 3	A_{I3}	A_{II3}	A_{III3}	A_{IV3}	B_{I3}	B_{II3}	B_{III3}	B_{IV3}
States 4	A_{I4}	A_{II4}	A_{III4}	A_{IV4}	B_{I4}	B_{II4}	B_{III4}	B_{IV4}
States 5	A_{I5}	A_{II5}	A_{III5}	A_{IV5}	B_{I5}	B_{II5}	B_{III5}	B_{IV5}

Where $\sum^{IV}_{i=i} Aij = 100$ and $\sum^{IV}_{i=i} B_{ij} = 100$, for state j.

2.5.4. Thus, weighted average of the category-wise rent relatives for rented and owner-occupied accommodations is as follows:

State	Rented	Owner-occupied

States 1	R_1= weighted GM of RR_{i1}, where weight A_{i1}	O_1= weighted GM of RR_{i1}, where weight B_{i1}
States 2	R_2= weighted GM of RR_{i2}, where weight A_{i2}	O_1= weighted GM of RR_{i2}, where weight B_{i2}
States 3	R_3= weighted GM of RR_{i3}, where weight A_{i3}	O_1= weighted GM of RR_{i3}, where weight B_{i3}
States 4	R_4= weighted GM of RR_{i4}, where weight A_{i4}	O_1= weighted GM of RR_{i4}, where weight B_{i4}
States 5	R_5= weighted GM of RR_{i5}, where weight A_{i5}	O_1= weighted GM of RR_{i5}, where weight B_{i5}

It may be noted that the Rent Relative of rented accommodation is applied to the respective category of owner-occupied dwellings also, using rental equivalence approach, to compute weighted average of the category-wise rent relatives for owner-occupied accommodations.

2.5.6. Now the overall rent relative is computed as follows:

State	Overall Rent Relative
States 1	Y_1= weighted GM of R_1 & O_1, where weight are w_1 & $(1-w_1)$
States 2	Y_2= weighted GM of R_2 & O_2, where weight are w_2 & $(1-w_2)$
States 3	Y_3= weighted GM of R_3 & O_3, where weight are w_3 & $(1-w_3)$
States 4	Y_4= weighted GM of R_4 & O_4, where weight are w_4 & $(1-w_4)$
States 5	Y_5= weighted GM of R_5 & O_5, where weight are w_5 & $(1-w_5)$

where w_j was computed from the result of HCES 2011-12. Here, w_j represents the share of expenditure.

2.6. **Compilation of State wise and All India Housing index**

2.6.1 Using methodology mentioned above, the State-wise Housing Index (HRI) is computed, following chain base method, as follows:

State	House Rent Index
States 1	$HRI_1 = HRI^{-6}{}_1 . Y_1$
States 2	$HRI_2 = HRI^{-6}{}_2 . Y_2$
States 3	$HRI_3 = HRI^{-6}{}_3 . Y_3$
States 4	$HRI_4 = HRI^{-6}{}_4 . Y_4$
States 5	$HRI_5 = HRI^{-6}{}_5 . Y_5$

Where $HRI^{-6}{}_j$ is the Housing Index of six months ago of State *j*.

2.6.2 Following this procedure, State-wise House Rent Indices are compiled, which were further aggregated to arrive at all India Housing Index. For compilation of All India Housing index, the corresponding housing weights of the respective States are used.

3. Limitations identified by the users and experts in the existing housing index compilation methodology

The stakeholders and users of CPI data highlighted some anomalies in the existing Housing index compilation methodology which are as under;

3.1 **There are three different methods used to calculate the index:**

- From January to May 2013, the index was set to 100.
- From June to November 2013, a fixed base method was used.
- From December 2013 onwards, a chain index method was applied.

It was observed that **a sharp rise in both the index and inflation occurred following May 2013**, resulting in a **sudden upward shift**. This escalation was due to the assumption of index as 100 till May 2013.

3.2 From December 2013, the chain index was based on six months prior data which introduced an unexplainable movement in the monthly housing inflation rates.

3.3 The issue of some distortions in some months, introduced due to concessional or employer provided dwellings, was also highlighted by the users including the Reserve Bank of India. In the case of employer-provided accommodation, information is collected on House Rent Allowance (HRA) and any other license fees paid by the employee to retain the dwelling. When an employee's salary increases, the corresponding rise in HRA is reflected in the recorded house rent, thereby capturing an increase. However, when the employee vacates the accommodation and it is allotted to a junior employee with a lower HRA, it results in a lower recorded rent, which may incorrectly appear as a decline in rent or negative inflation. This, however, does not represent an actual decrease in rent prices.

3.4 During a Technical Assistance Mission on base revision of CPI with IMF Experts, it was advised that since India uses the panel survey approach for the collection of rents, when calculating price change, the price change is based on a comparison of like with like, meaning that panel 1 in M7 is compared with the prices collected in M1. This results in a six-month change. To convert the 6 months, change into a one-month change, the 6^{th} root of the change may be calculated. This is then multiplied by the previous period index. Prices for the other panels are not imputed or used. Only the prices of the individual panels are used subject to the condition that each panel is broadly representative of the whole. Carrying forward the prices of the other panels may create a downward bias in the rent index.

4. Proposed Changes and Methodology for Compilation of the House Rent Index in the New Series

In the ongoing base revision exercise, all aspects of index compilation methodology are revisited to prepare a more robust and resilient CPI series. To address issues highlighted by the users and experts as mentioned in para 3 above, the housing index compilation methodology is proposed

to be revised significantly. The methodology is reviewed under the guidance of the "Expert Group on the Base Revision of CPI". Proposed changes in the housing index compilation methodology are as follows:

4.1 Frequency and Coverage of Rent Collection

- **Monthly Rent Collection**: Rent data will be collected **monthly**, replacing the current practice of collecting rent every six months.
- **Expanded Sample Coverage**: Instead of limiting rent collection to **one-sixth of the sample**, the new approach proposes collecting rent data from **all selected dwellings** each month. It is being proposed to address the issue of panel approach highlighted by the IMF expert at para 3.4 above, since the panel approach necessitates a larger sample size to ensure representativeness at the aggregate level, which is not feasible due to the limited availability of rented dwellings in many markets outside major urban centres

4.2 Inclusion of Rural Sector: In addition to urban expenditure on housing, the HCES 2023–24 has also captured house rent data for rural areas, including imputed rent for owner-occupied dwellings. Consequently, the new series will compile the Housing Index for both rural and urban sectors. This marks a departure from the current series, which includes only the urban sector, due to the absence of imputed rent data for rural areas in the HCES 2011–12.

4.3 Sampling Framework

- **Urban Sector**: Rent data will be collected from 12 dwellings per urban market, subject to the availability of rented units.
- **Rural Sector**: In selected villages, data will be collected from 6 dwellings, based on availability.

4.4. Exclusion of employer provided dwellings.

To eliminate distortions introduced sometimes due to concessional or employer provided dwellings as mentioned in para 3.3 above, in the proposed CPI series, government accommodations and other employer-provided dwellings will be excluded from the compilation of the Housing Index, as these do not reflect transactions in the actual rental market.

4.5. Classification and Weighting of Dwellings

As in the existing series, dwellings will be categorized by the number of living rooms:

- Category 1- Dwellings with 1 living room
- Category 2- Dwellings with 2 living rooms
- Category 3- Dwellings with 3 living rooms
- Category 4- Dwellings with 4 or more living rooms

The weights assigned to each dwelling category will be based on the proportions obtained from the Census 2011 data.

4.6 Compilation Methodology

4.6.1 In the new CPI series, it is proposed to compile the Housing Index by treating the Categories as a priced item and compile index category wise in a state * sector wise. Then compile the weighted average will be the index.

4.6.2. Let N_{ij} is the number of dwellings in category *i* of dwellings in State *j* in the sample. Further, assume that R^C is current rent, R^{-1} is rent six months ago and RR (Rent Relative) is ratio of R^C and R^{-1}. Then RR_{ij} represents geometric mean of the rent relatives of the rented dwellings in category *i* of dwellings in State j, which are depicted in the matrix below:

States	Category I	Category II	Category III	Category IV
States 1	RR_{I1}	RR_{II1}	RR_{III1}	RR_{IV1}
States 2	RR_{I2}	RR_{II2}	RR_{III2}	RR_{IV2}
States 3	RR_{I3}	RR_{II3}	RR_{III3}	RR_{IV3}
States 4	RR_{I4}	RR_{II4}	RR_{III4}	RR_{IV4}
States 5	RR_{I5}	RR_{II5}	RR_{III5}	RR_{IV5}

4.6.3. P_{ij} represents Priced item Index of the of the rented dwellings in category *i* of dwellings in State j, which is the **product** of **Geometric mean of rent relative** and **Priced item index of previous month** in category *i* of dwellings in State j(formula for the short term formula or Chain index).

i.e., $P_{ij}^c = RR_{ij} * Pij^{-1}$

States	Category I	Category II	Category III	Category IV
States 1	P_{I1}	P_{II1}	P_{III1}	P_{IV1}
States 2	P_{I2}	P_{II2}	P_{III2}	P_{IV2}
States 3	P_{I3}	P_{II3}	P_{III3}	P_{IV3}
States 4	P_{I4}	P_{II4}	P_{III4}	P_{IV4}
States 5	P_{I5}	P_{II5}	P_{III5}	P_{IV5}

4.6.4. Let us suppose weights/shares of these categories of dwellings within owner-occupied and rented houses (as per the Census 2011 data) are as follows:

State	Rented accommodations				Owner-occupied accommodations			
	Cat- I	**Cat- II**	**Cat- III**	**Cat- IV**	**Cat- I**	**Cat- II**	**Cat- III**	**Cat- IV**
States 1	A_{I1}	A_{II1}	A_{III1}	A_{IV1}	B_{I1}	B_{II1}	B_{III1}	B_{IV1}
States 2	A_{I2}	A_{II2}	A_{III2}	A_{IV2}	B_{I2}	B_{II2}	B_{III2}	B_{IV2}
States 3	A_{I3}	A_{II3}	A_{III3}	A_{IV3}	B_{I3}	B_{II3}	B_{III3}	B_{IV3}
States 4	A_{I4}	A_{II4}	A_{III4}	A_{IV4}	B_{I4}	B_{II4}	B_{III4}	B_{IV4}
States 5	A_{I5}	A_{II5}	A_{III5}	A_{IV5}	B_{I5}	B_{II5}	B_{III5}	B_{IV5}

Where $\sum^{IV}_{i=i} Aij = 100$ and $\sum^{IV}_{i=i} B_{ij} = 100$, for state j.

4.6.5. Thus, the Index for Rented dwellings and Owner-occupied dwellings are the weighted average of the category-wise priced index for rented and owner-occupied accommodations which is as follows:

State	Rented	Owner-occupied
States 1	R_1= weighted AM of P_{i1}, where weight A_{i1}	O_1= weighted AM of P_{i1}, where weight B_{i1}
States 2	R_2= weighted AM of P_{i2}, where weight A_{i2}	O_2= weighted AM of P_{i2}, where weight B_{i2}
States 3	R_3= weighted AM of P_{i3}, where weight A_{i3}	O_3= weighted AM of P_{i3}, where weight B_{i3}
States 4	R_4= weighted AM of P_{i4}, where weight A_{i4}	O_4= weighted AM of P_{i4}, where weight B_{i4}
States 5	R_5= weighted AM of P_{i5}, where weight A_{i5}	O_5= weighted AM of P_{i5}, where weight B_{i5}

Note: Price index of rented accommodation (Pij) is applied respective category of owner-occupied dwellings also, using rental equivalence approach, to compute weighted average of the category-wise rent relatives for owner-occupied accommodations. It may be noted that Rent or rates are not collected independently from households that occupy their own dwellings.

4.6.7. Now the overall House rent Index for the state is computed as follows:

State	Overall House rent
States 1	HR_1= weighted AM of R_1 & O_1, where weight are w_1 & w_{1^*}
States 2	HR_2= weighted AM of R_2 & O_2, where weight are w_2 & w_{2^*}
States 3	HR_3= weighted AM of R_3 & O_3, where weight are w_3 & w_{3^*}
States 4	HR_4= weighted AM of R_4 & O_4, where weight are w_4 & w_{4^*}
States 5	HR_5= weighted AM of R_5 & O_5, where weight are w_5 & w_{5^*}

where w_j has been computed from the result of HCES round. Here, wj and wj* represents the share of expenditure for rented dwelling and owner-occupied dwellings respectively for state j.

5. Following is the summary of changes proposed in the housing index compilation in the new CPI series;

Parameters	**Existing series**	**Proposed in the new series**
Coverage	Only urban areas	Urban & rural both

	12 dwellings per market (as per availability)	Urban – 12 dwellings per market(as per availability)Rural - 6 dwellings per market (as per availability)
	Panel approach for capturing rents from all dwellings in 6 months	Rent data will be captured from all dwellings for every month
	Employer provided accommodation included	Employer provided accommodation not included
Methodology	3 methods are used to compile the index for different different periods.	Only one method will be used from the beginning as done for other items in the basket, which is short index or chain index method
Higher level indices	Weighted Geometric mean of elementary indices	Weighted Arithmetic mean of elementary indices (in line with other items in CPI)
Source for dwelling type weights	Housing Condition Survey -NSS 69th round	Census 2011
Release of Housing index	All India and urban	All India, urban and rural

The proposed changes in the methodology are being done with the objective of making housing index more robust and representative. **Feedback/comments are invited** on the proposed changes in housing index compilation methodology. Comments and suggestions may be sent to **psd-nso2020@mospi.gov.in by 20th November, 2025**

*****