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BANGLADESH

TECHNICAL ASSISTANCE REPORT—RESIDENTIAL PROPERTY PRICE INDICES MISSION

June 2020

This Technical Assistance Report paper on Bangladesh was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed in December 2019.

Disclaimer:
This document was prepared before COVID-19 became a global pandemic and resulted in unprecedented economic strains. It, therefore, does not reflect the implications of these developments and related policy priorities. We direct you to the **IMF Covid-19 page** that includes staff recommendations with regard to the COVID-19 global outbreak.

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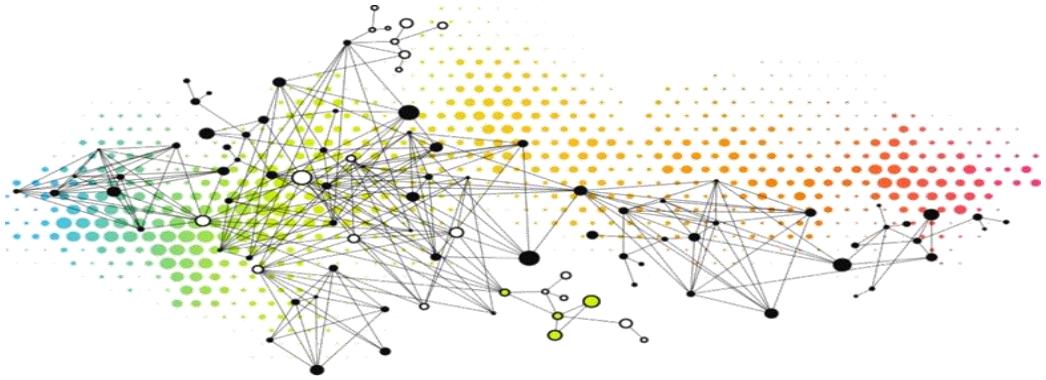


BANGLADESH

JANUARY 2020

REPORT ON RESIDENTIAL PROPERTY PRICE INDICES MISSION (DECEMBER 8–12, 2019)

Prepared by Vanda Guerreiro

CONTENTS

Glossary

BB	Bangladesh Bank
CPI	Consumer Price Index
DBH	Delta Brac Housing Finance Corporation, ltd
EDW	Enterprise Data Warehouse
GDP	Gross Domestic Product
RPPI	Residential Property Price Index
RPPI Guide	RPPI Practical Compilation Guide
TA	Technical Assistance

SUMMARY OF MISSION OUTCOMES AND PRIORITY RECOMMENDATIONS

1. The purpose of the mission was to assist the Bangladesh Bank (BB) in progressing on the compilation of a residential property price index (RPPI). This will be the first technical assistance (TA) mission to Bangladesh on the RPPI to be conducted under the auspices of the *Data for Decisions Fund* (D4D). The aim of the mission is to assist the BB in improving data for RPPI compilation and to compile an experimental RPPI.

2. The Second Phase of the G-20 Data Gaps Initiative and guidance on Financial Soundness Indicators identify RPPI as a critical ingredient of financial stability policy analysis and macroprudential measures. In addition, an RPPI is on its own a macro-economic indicator of growth and a key indicator for understanding financial market conditions. A reliable RPPI is essential for informed economic policy making. The compilation of the RPPI will facilitate the BB in its assessment of developments and risks in property markets and increase the understanding of the link between property asset prices and financial assets. Currently, Bangladesh lacks a reliable official measure of trends in residential property prices.

3. BB is aiming at compiling a quarterly RPPI covering new flats for the capital city, Dhaka. The mission recommended to obtain all data including the secondary market and rest of the country to be stored for future expansion of the index coverage.

4. BB will begin the compilation of the RPPI with the time dummy method with a rolling window of four quarters. The index should be compiled with data from 2007 onwards. The mission adapted the R scripts of the *RPPI Practical Compilation Guide* (*RPPI Guide*) to the BB data. The RPPI Guide can be found at *https://www.imf.org/en/Data/Statistics/RPPI-guide*.

5. BB has plans to set up a new data collection system to improve the current existing data starting from July 2020. The new data collection will expand the geographic coverage and the type of dwellings and mostly will increase the current sample resulting in more accurate results.

Table 1. Priority Recommendations

Target Date	Priority Recommendation	Responsible Institutions
January/2020	*Compile the RPPI with the time dummy with rolling window.*	**BB**
July/2020	*New data collection*	**BB**

Further details on the priority recommendations and the related actions/milestones can be found in the action plan under *Detailed Technical Assessment and Recommendations*.

DETAILED TECHNICAL ASSESSMENT AND RECOMMENDATIONS

A. Governance

6. The BB staff has the required skills, namely on R programming, to compile an RPPI. However, assistance is required on specific methodological issues. Currently, a team of nine staff members from different departments in the BB is compiling the index. Three staff members attended the IMF courses on 2017 and 2019 on RPPI and the lessons learned were implemented to improve the experimental RPPI, for example the use of the size variable as continuous.

7. The mission recommended the use of R instead of other software since it allows to perform all the necessary calculations in one script and single software. The RPPI requires econometric regressions and specific price index calculations. With R all can be made on the same script. Therefore at least six members of the team should have some knowledge in R.

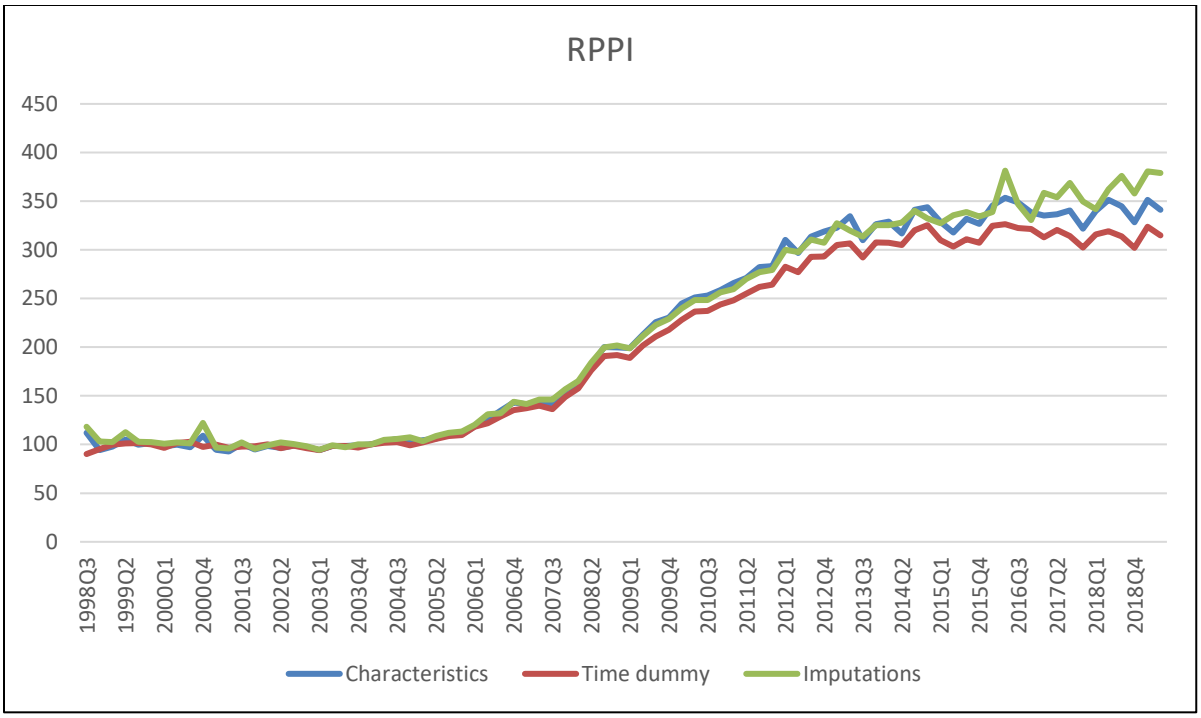
8. BB is aiming at compiling a quarterly RPPI covering new flats for the capital city, Dhaka. There are data for other cities and other types of property but is not sufficient for a robust indicator, therefore for the moment only data on new flats will be used. The mission recommended to continue obtaining all data including the secondary market and rest of the country to be stored for future expansion of the index coverage.

9. The base year of the RPPI should be the same as the Consumer Price Index (CPI) and the Gross Domestic Product (GDP) to facilitate the benchmarking. BBS is aiming at rebasing both, the CPI and the GDP, to the fiscal year that runs from July 2015–June 2016 during 2020.

B. Compilation with the Current Dataset

10. Currently BB receives quarterly data from Delta Brac Housing Finance Corporation, ltd (DBH) on house loans. DBH is a financial institution specialized on housing loans. The DBH dataset contains the valuation price, the size of the dwelling and the location within the city. Data is available since 1998 with over 33,000 observations in total and the work on the index began in 2017. Experimental indices have been compiled by the BB staff with different methods as can be seen in the following figure.

Figure 1. RPPI Compiled by the BB



11. The 21 locations should be clustered in order to have at least around 50 observations per quarter in each location cluster. As shown in the table below the number of observations per location is in many cases much lower than 50, in result the coefficient of the correspondent dummy variable may have a very low significance. The clustering should be made based on some economic criteria as for example income level.

Table 2. Number of Observations per Location for the Period 1Q2017

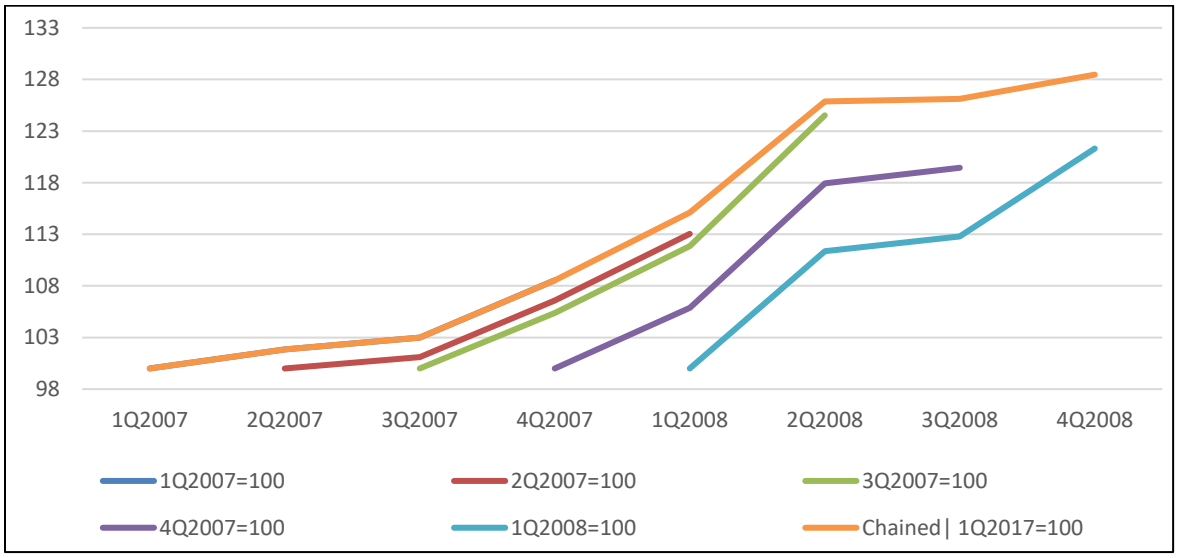
Location	Freq
DHA01	206
DHA02	99
DHA03	98
DHA04	33
DHA05	17
DHA06	25
DHA07	27
DHA08	47
DHA09	17
DHA10	118
DHA11	60
DHA12	14
DHA13	4
DHA14	15
DHA15	11
DHA16	6
DHA17	28
DHA18	19
DHA20	4
DHA21	3

12. The mission provided training particularly on the hedonic methods, chain linking and rebasing. The hedonic methods are the most recommended to address the quality changes on the mix of dwellings transacted when following the price of real estate. The data currently available has few variables but are enough to compile an index with a hedonic method and that is preferred to other methods where the quality mix is not treated at all. The BB staff had the need on TA regarding price indices calculations namely on rebasing and chain linking the indices. The mission made some practical exercises with the BB data and examples can be seen in Table 3 and in Figure 2.

Table 3. Chained and Unchained Indexes

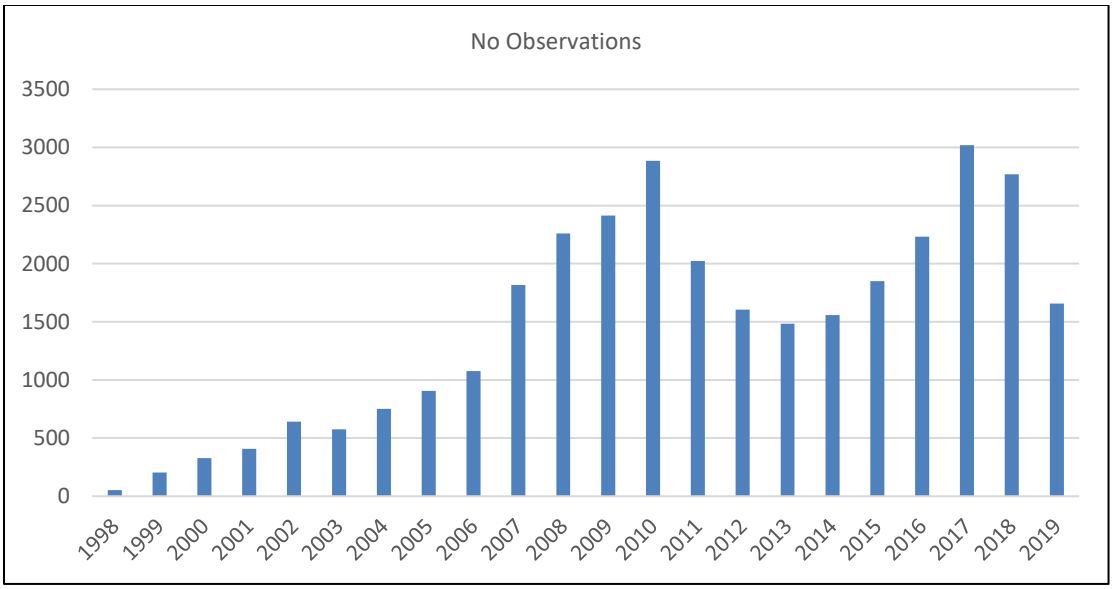
Base	1Q2007=100	2Q2007=100	3Q2007=100	4Q2007=100	1Q2008=100	Chained| 1Q2017=100
1Q2007	100					100
2Q2007	101.834	100				101.834
3Q2007	102.9807	101.1049	100			102.9807
4Q2007	108.5432	106.5797	105.3901	100		108.5432
1Q2008		113.0407	111.8434	105.8695	100	115.1232
2Q2008			124.5275	117.9231	111.358	125.8606
3Q2008				119.4441	112.7894	126.1337
4Q2008					121.3107	128.4682

Figure 2. Chained and Unchained Index



13. The mission recommended the compilation of the RPPI starting from 2007 with the time dummy method with a rolling window of four quarters. The figure below shows the number of observations per year. Each quarter has less than 1,000 observations. Considering the small sample available, to obtain a more robust and less volatile indicator, the time dummy is more appropriate. In addition, data are available since 1998 but until 2007 there are few observations. The index should be compiled with data from 2007 onwards. The mission adapted the R scripts of the *RPPI Guide* to the BB data.

Figure 3. Number of Observations per Year



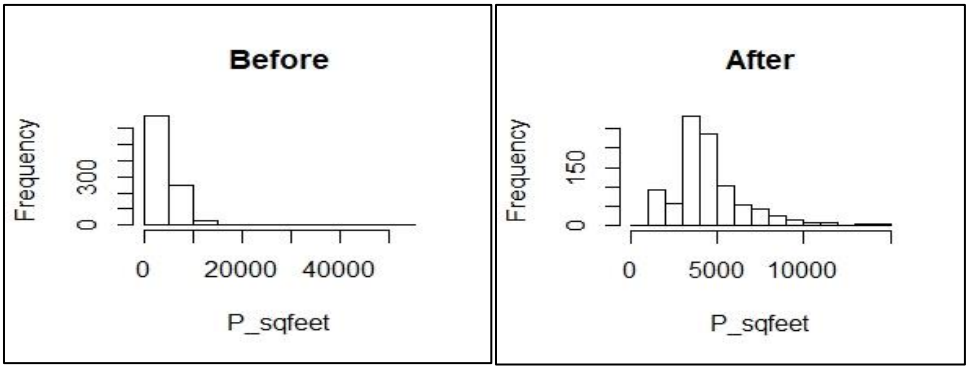
*2019 only two quarters

14. The mission provided guidance on how to analyze and treat the available data. A R script was created for the BB data to perform basic data manipulations namely treating the outliers, missing values and duplicates. Further guidance can be found on the *RPPI Guide* on how to analyze and prepare data for processing. Some results can be seen in the following table and histograms.

Table 4. Descriptive Statistics for the 1Q2017 Before Data Treatment

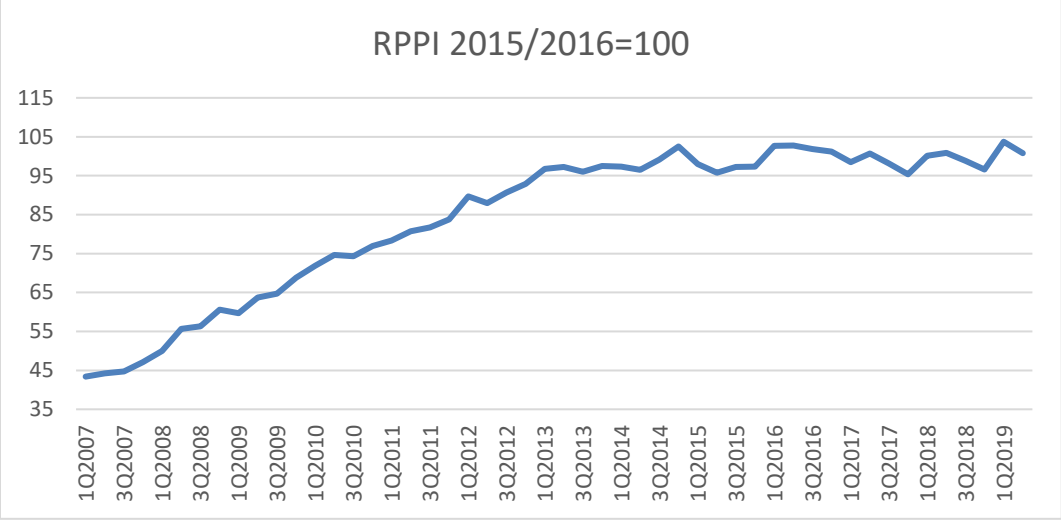
Data Treatment	Minimum	Q1	Median	Mean	Q3	Maximum
Before	555.581	3500	4200	4760.586	5500	55000
After	826.4463	3500	4200	4653.867	5500	14761.9

Figure 4. Histograms Before and After Data Treatment—1Q 2017



15. The mission recompiled the index with BB data from 2007 with the base year July 2015/June 2016. The R script for the time dummy hedonic method calculation prepared for the *RPPI Guide* was adapted for the BB data and the staff was trained to its manipulation. The results are in the figure below:

Figure 5. RPPI Time Dummy with Rolling Window



C. Improving the Data Collection

16. BB staff prepared a template for the survey that was reviewed by the mission and presented to the potential data providers. In general, the mission recommends keeping it as short as possible to avoid respondent burden. A long questionnaire can incur many missing values. The template should not have any open questions. The questions should be objective and mensurable with expected answers to be yes/no or numbers. The use of semantic is highly prone to typing errors and lack of normalization and thus not machine readable.

17. The data structure shown in the table below was built from the feedback obtained during the meeting with the data providers. The data structure will be sent to the data providers for their final assessment and for incorporation in their system.

Table 5. Data Structure

Variable	Description	Type of data
Date	Date of the Approval	Date
Identification number of Dev. Authority Approval	ID number	Not to be used in regression
Address		Categorical
Monthly income	Average monthly income	Numerical
City		Categorical
Thana		Categorical
District		Categorical
Post code		Categorical
Floor level		Categorical
Height of the building	Number of stories	Categorical
Face Direction	South/North/West/East	Categorical
Total size	Square feet	Numerical
Purchase price	Net of costs	Numerical
Valuation price	Net of costs	Numerical
Interest rate	Number	Numerical
No. Bedrooms	Number	Categorical
No. Bathrooms	Number	Categorical
No. lifts	Number	Categorical
Parking	Number	Categorical
Can two cars easily pass at the same time in the street in front of your house?	Y/N	Categorical
Pipeline gas connection	Y/N	Categorical
Park	Within 10 min walking	Categorical
Hospitals	Within 10 min walking	Categorical
Schools	Within 10 min walking	Categorical
Public transports	Within 10 min walking	Categorical
Brand of Developer	Drop down menu with the main developers	Categorical
Construction year	Date	
Resale	Y/N	
Government owned plot	Y/N	

18. BB should send an official data request to the data providers. The data providers mentioned the need of an official request for their internal procedures. This request should be sent with the final data structure and no later than March to allow time for the data providers to adapt their systems.

19. The data will be transmitted and stored using the Enterprise Data Warehouse (EDW) from July 2020. Data providers need some time to adapt their internal systems for the new data collection. After the adjustment period the EDW that is the current system for the automated data transmission by the financial institutions will be used to the real estate data.

D. Dissemination

20. BB may explore the possibility to begin the publication of the RPPI with the new data from July 2021. In the meantime, the regular compilation will continue for the use of internal use. The mission provided recommendations for the dissemination as exemplified on the *RPPI Guide*. In addition, a draft technical note was provided as in Appendix I.

To support progress in the above work areas, the mission recommended a detailed action plan with the following priority recommendations carrying particular weight to make headway in improving the RPPI:

Priority	Action/Milestone	Target Completion Date
Outcome: RPPI is compiled		
M	The 21 locations are clustered.	January 2020
H	The RPPI is compiled with the time dummy method with a rolling window of four quarters	January 2020
M	The provisional data structure will be sent to the data providers	January 2020
M	An official data request is sent by the BB Governor to the data providers.	March 2020
H	New data collection system is implemented	July 2020

E. Officials Met During the Mission

Name	Designation/Institution
Mr. S. M. Moniruzzaman	Deputy Governor, BB
Mr. Ahmed Jamal	Deputy Governor, BB
Mr. Allah Malik Kazemi	Change Manager Adviser, BB
Mr. Asish Kumar Dasgupta	Executive Director (Research), BB
Mr. Md. Abdul Kayum	General Manager, Research Department, BB – RPPI team member
Ms. Mst. Nur Naher Begum	Deputy General Manager, Research Department, BB, RPPI team member Research Department – RPPI team
Mr. Mohammad Shahriar Siddiqui	Deputy General Manager, Banking Regulation and Policy Department, BB – RPPI team member
Md. Sadrul Hasan	Joint Director, Research Department, BB– RPPI team member

Mr. Md. Ahsan Ullah	Joint Director, Monetary Policy Department, BB– RPPI team member
Mrs. Sadia Sultana	Deputy Director, Monetary Policy Department, BB– RPPI team member
Mr. MD. Yousuf	Assistant Director, Chief Economist's Unit, BB– RPPI team member
Mr. Hasan Ahmmed	Assistant Director, Research Department, BB– RPPI team member
Mrs. Saila Sarmin Rapti	Assistant Director, Research Department, BB
Mr. Md. Masudur Rahman	Assistant Director, Research Department, BB
Mrs. Masuka Afrin	Assistant Director, Research Department, BB
Mr. Samim Uddin	Assistant Director, Research Department, BB
Mrs. Nabila Fahria	Assistant Director, Monetary Policy Department, BB
Mrs. Nabila Hasan	Assistant Director, Monetary Policy Department, BB
Mr. Md. Rezwanul Hoque	Joint Director, Governor Secretariat, BB
Mrs. Asma Akter	Deputy Director, Governor Secretariat, BB
Mr. Md. Rashel Hasan	Joint Director, Chief Economist's Unit, BB
Mrs. Nasrin Akther Lubna	Assistant Director, Chief Economist's Unit, BB
Mr. Asif Ahmed Mansur	Joint Director, Statistics Department, BB
Mr. Md. Firoz Hossain	Deputy Director, Statistics Department, BB
Mr. Md. Ferdous Al Hussaini	Deputy Director, Banking Regulation and Policy Department, BB
Mr. Mohammad Arif Hasan	Joint Director, Financial Stability Department, BB
Mr. Md. Jamel Tabriz	Deputy Director, Department of off-site Supervision, BB
Mr. Sabed Bin Ahsan	VP & Head of Sales-DBH
A. H. M. Mostofa Kamal	Senior Assistant Vice President- Technical & Property Service-DBH
Mr. Md. Habibur Rahman	Statistical Officer-Bangladesh Bureau of Statistics (BBS)
Mrs. Ishrat Jahan	Deputy Director-Bangladesh Bureau of Statistics (BBS)
Mr. Md. Abdus Salam Azad	CEO & Managing Director-Janata Bank Limited
Mr. Mashfiul Bari	General Manager-Janata Bank Limited
Md. Fazlul Haque	Assistant General Manager, General Advances Division, Head Office, Dhaka.-Sonali Bank Limited
Mr. Syed Mansur Mustafa	DMD & Chief Credit Officer-IFIC Bank Limited
Mr. Syed Hassanuzzaman	EVP & Head of Branches & SME-IFIC Bank Limited
Mr. Md. Shahjahan	DMD-Bangladesh House Building Finance Corporation (BHBFC)
Mr. Chanu Gopal Ghosh	GM -Bangladesh House Building Finance Corporation (BHBFC)

Appendix I. RPPI Technical Note

Residential Property Price Index (RPPI) Technical Note

1. Background

The residential property price index (RPPI) measures the price evolution for residential new apartments in Dhaka. Reliable property price indexes are essential for the Bangladesh Bank (BB) to assess developments and risks in the real estate market and to understand the linkages between residential real estate markets and financial soundness.

2. Coverage

The coverage of the RPPI is limited to Dhaka city and covers the primary (new dwellings) market for apartments.

3. Data Sources

The BB collects data from Delta Brac Housing Finance Corporation, ltd (DBH) on loans for new apartments.

4. Periodicity

The RPPI is disseminated on a quarterly basis.

5. Base Period

The RPPI is an annually chain-linked price index that uses the year 2015/106 as reference year. The average of the quarterly indexes for 2015/16 equals 100.

6. Dissemination

The RPPI is released on a quarterly basis, 45 days after the end of the reference period.

7. Methodology - Conceptually

To compile an RPPI, key characteristics of the dwellings are required to assure a constant quality index. As with any price index the target is to follow the price trend by comparing like-with-like. For property price indexes this is particularly challenging since a direct price comparison requires comparable dwellings or the same dwelling to be available in consecutive periods. This is generally not the case with residential properties where the same residential property is only sold every couple of decades. Given the infrequent sale and the heterogeneity of residential

properties, quality adjustment techniques are required to derive measures of pure price change. This means that the data requirements for a high quality RPPI are extensive and rely heavily on detailed characteristics about each property given there are a wide range of characteristics that can influence the price of a dwelling.

8. Methodology –Time Dummy Hedonic Method

The time dummy method measures the effect of "time" on the price (p). Prices of all dwellings (n) for several periods (t), are pooled in the same regression for every stratum, on their characteristics (z_{nk}^t) and on dummy variables for the periods (D_n^t). The main advantage of the method is its simplicity, since the index follows directly from the estimated time dummy parameters.

It is generally appropriate:

- with few transactions
- or aiming at compiling a monthly index
- or more detailed stratification.

A log-linear specification for each stratum is applied:

$$\ln p_n^t = \beta_0 + \sum_{t=1}^{T} \delta^t D_n^t + \sum_{k=1}^{K} \beta_k z_{nk}^t + \varepsilon_n^t$$

The index for each stratum for a period t is derived by exponentiation of the time dummy parameters $\hat{\delta}^t$:

$$I_t = \exp\left(\hat{\delta}^t\right) * 100$$

For the reference period a dummy variable is not included, the price index for the price reference period is set to equal 100.

When a new period is added to the data and the model is re-estimated, the indexes from the previous periods will most likely change since the estimated parameters $\hat{\delta}^t$ of older periods will differ from their previous estimate. Therefore, a rolling window approach would need to be applied.

9. Chaining

To avoid revisions to the indices a rolling window approach is used. Normally for quarterly indices the "shadow" prices of the characteristics ($\hat{\beta}$) are kept fixed for at least a year. This means that data from 12 months are used together. Every quarter a regression is estimated with data from the current quarter and the previous three quarters. The indices from the "new window"

and the "previous window" are chained by using the last overlap period between the two windows.

An example is given in the table below for a quarterly index:

Table 1. Example of Chaining the Indexes from Rolling Window Hedonic Regression

Quarter	Data from 2018Q1 to 2018Q4	Data from 2018Q2 to 2019Q1	Data from 2018Q3 to 2019Q2	Chained Index
2018Q1	**100.0**			**100.0**
2018Q2	101.2	**100.0**		101.2
2018Q3	101.1	101.3	**100.0**	101.1
2018Q4	100.9	101.2	100.8	100.9
2019Q1		101.0	100.3	100.7=100.9/101.2x101.0
2019Q2			101.4	101.8=100.7/100.3x101.4