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Guyana: Housing Market and Implications for Macroprudential Policies

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Guyana: Housing Market and Implications for Macroprudential Policies

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Abstract

Guyana's residential real estate prices have been rising, particularly in the capital city Georgetown, following the discovery of oil in 2015. In line with the growing demand for housing, commercial banks' housing loans have increased, prompting higher household debt. This paper presents two analyses which suggest that housing prices in Georgetown and banks' lending to the housing sector appear to be in their early stages of growth. However, given the data limitations and caveats that underpin the analyses, the findings could also indicate early signals of possible risks. Further data collection would support surveillance and deeper studies. At the same time, enhancing prudential measures would help safeguard financial and macroeconomic stability. These include strengthening the monitoring of the housing market, bank lending practices and household debt, as well as fortifying the macroprudential framework, including with more effective toolkits for early intervention.

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I. INTRODUCTION

1. Real estate prices have been rising following the discovery of oil in 2015. Anecdotal evidence and private sector surveys highlight a sharp increase in residential real estate prices in Georgetown, the capital city of Guyana, with the ratios of price-to-rent and price-to-income surpassing neighboring countries in mid-2019. At the same time, commercial banks' private dwellings mortgage lending has increased, growing by an average annual rate of 7.7 percent from 2014-2018. As a result, household indebtedness is on the rise. In Georgetown, exposure to mortgage debt accounted for around 350 percent of income in mid-2019, nearly double compared to other major cities in neighboring countries.

2. Given the recent trend in Guyana's house prices, this note presents an analysis of the housing market—with focus on Georgetown—and its implications for macroprudential policies. The evolution of real estate prices is of particular interest to policy makers, but assessing the sustainability of house price levels is a challenging task due to the difficulty in assessing *ex ante* the presence of house price "bubbles", i.e., a prolonged rapid growth in prices followed by a sudden crash. This paper addresses the following questions:

- How have housing prices, mortgage lending, and household debt evolve in recent years?
- Are urban real estate prices showing signs of "overheating"?
- Has there been changes in bank mortgage lending policies?
- What are the macroprudential measures to mitigate housing sector risks?

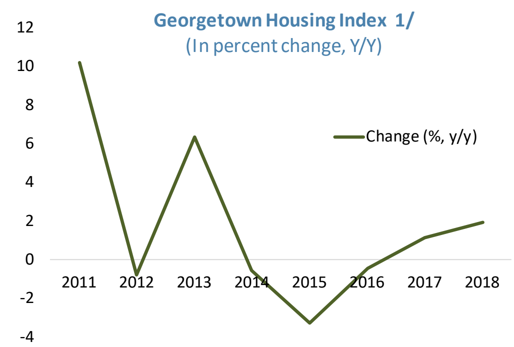
3. A thorough analysis of the housing market in Guyana is challenging in view of the limited availability of data and time series. At present, price indices for residential and commercial real estates are not available. Consumer and business sentiment indicators which are often used to gauge the private sector outlook on the real estate market, and the volume of residential dwellings that provides information on housing supply are also unavailable. To work around these data limitations, this analysis uses the Urban (Georgetown) housing price index as a proxy for real estate prices in the capital city. This index is a sub-index of the Urban (Georgetown) Consumer Price Index, which begins in 1994 and includes rent, fuel, and power. Given these challenges, the caveats underpinning this analysis must be borne in mind. In particular, the results presented herein should be interpreted as early signals of possible risks to economic and financial stability, as well as a guide to the areas where further data collection would be useful to support surveillance and further studies. Moreover, further monitoring, data collection, and studies should be extended to commercial real estate to detect early signs of "price bubbles".

4. This paper is organized as follows: Section II provides an overview of real estate prices and household debt in Georgetown as well as mortgage lending by commercial banks; Section III discusses whether housing prices have "departed" from fundamentals; Section IV analyzes the possibility of changes in bank mortgage lending policies; Section V deliberates on macroprudential toolkits to mitigate housing risks; and Section VI concludes with a discussion of policy implications.

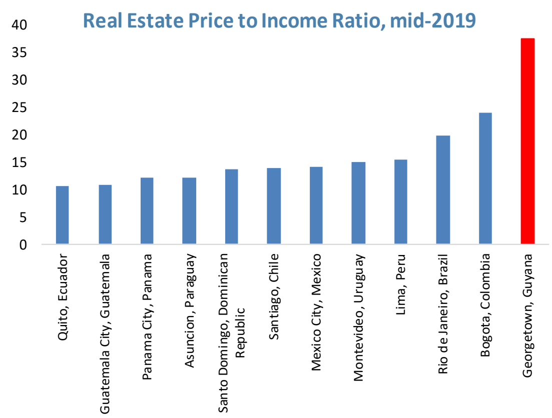
II. How have housing prices, mortgage lending, and household debt evolve in recent years?

This section discusses the trends in housing, with particular focus on Georgetown, and commercial banks' mortgage lending which has been rising since the discovery of oil in 2015.

5. **Residential real estate prices in Georgetown have been rising following the discovery of oil in 2015.** While Guyana does not have a formal house price index, the housing sub-index of the Urban (Georgetown) Consumer Price Index shows an uptick in prices since 2015. Private sources—such as Numbeo—which derive their data based on surveys suggest exuberance in Georgetown's property market in 2019 as its ratios of price-to-rent and price-to-income were above neighboring countries.



Source: Bureau of Statistics
1/ Derived from Urban Consumer Price Index (Georgetown); includes rent, fuel and power.



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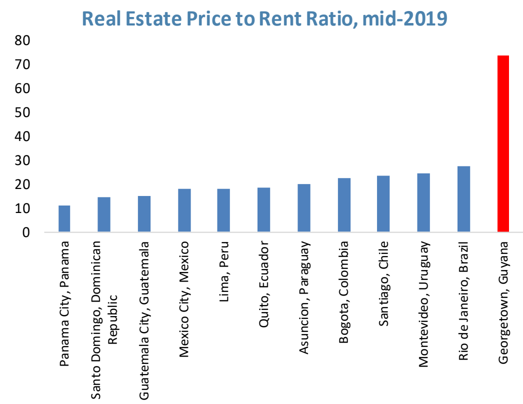
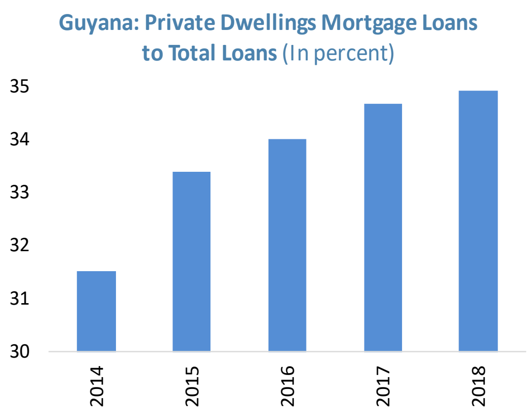
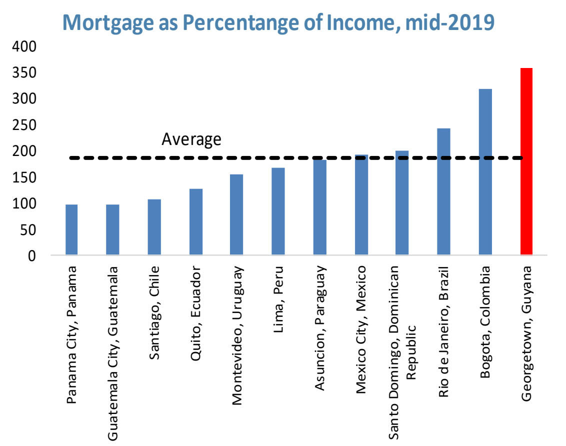


Source: Numbeo

6. **Commercial banks' mortgage lending is increasing, and household exposure to mortgage debt appears high in Georgetown.** In line with the recovery in housing prices since 2015, commercial banks' private dwellings mortgage loans grew at an average annual rate of 7.7 percent, from 2014-2018. The share of private dwellings mortgage loan to total loans increased from 31.5 percent to 34.9 percent during this period. As a result, household exposure to mortgage debt rose significantly in Georgetown, accounting for around 350 percent of income in mid-2019, based on data from Numbeo. In comparison, mortgage debt accounted for around 190 percent of income, on average, in other major cities in neighboring countries during the same period.



Source: Bank of Guyana



Source: Numbeo

III. ARE URBAN REAL ESTATE PRICES SHOWING SIGNS OF "OVERHEATING"?

This section constructs a baseline model for the growth rate in the Urban (Georgetown) Housing Prices and compares it (out-of-sample) with the actual change in housing prices from 2016 to 2018. The goal is to ascertain whether the variables that have historically explained the dynamics of house prices could also account for the rise in housing prices since 2016.

7. **The question of whether house prices have deviated significantly from "fundamentals" is difficult to answer, both theoretically and empirically.** The definition of "fundamental" is model-specific and thus, the assumptions that underpin the model would need to be taken into consideration in interpreting the results (Box 1). In addition, data limitations are caveats that must be borne in mind:

- *Absence of a real estate price index.* The Urban (Georgetown) Housing Index (a sub-index of the Urban CPI) is used as a proxy for the trend in real estate prices. This index begins in 1994 and includes rent, fuel, and power.

- *Unavailability of housing market-related indicators.* Guyana does not produce statistics on the volume of houses and dwelling, volume of real estate loans, and consumer and business sentiment indices which are, among others, important determinants of the demand and supply of housing.

Box 1. When do real estate prices depart from "fundamentals"?

The question of when and whether real estate prices are disconnected with "fundamentals" is a difficult question to answer.

Any definition of a "fundamental" is model-specific. A simple asset pricing model would define the "fundamental" price of a house as the present discounted value of all future rents that an investor receives (or avoids to pay) from owning the house. Expanding this model, in a hypothetical country where individuals migrate inter-state to search for better jobs, the value attached to the purchase of a house depends on how liquid the housing market is. In such a scenario, liquidity is another determinant of "fundamentals" that influence house prices.

In another version of the pricing model, if house buyers are credit constrained, then house prices might be lower than the present discounted value of rents. In this case, the extent to which credit constraints are present and binding would also constitute a "fundamental" determinant of house prices.

A somewhat more subtle scenario is when moral hazard is present in the market for real estate lending. Moral hazard arises when the government provides "guarantees"—implicit or explicit—to the banking sector. When these "guarantees" are present, the value of real estate would be higher than in the case where there is no guarantee.

This leads to an important caveat: the definition of "fundamental" depends on the choice of a model used and the variables that define the model. House prices may differ from levels predicted using a certain definition of "fundamental", but that same level of prices may be perfectly explained when the definition of "fundamental" is expanded to include one or more variables. Thus, to avoid confusion, this paper uses the expression "predictor" to be consistent with the econometric nature of the analysis instead of "fundamental".

8. Based on available economic variables and noting the caveats above, a baseline predictor for the growth rate in urban housing price index is constructed. First, a baseline predictor is constructed with data from 1995 to 2015 using OLS regression. It is used to predict the growth rates in housing prices from 2016 to 2018 (out-of-sample) which are then compared with the actual growth rates. Given that the housing index includes fuel and power costs, the first component is isolated by adding oil price change (Y/Y) as a covariate to capture the energy price dynamics. The explanatory variables are annual change in Urban Consumer Price Index (proxy for general price levels), annual change in oil prices (control for fuel prices), and population growth and share of urban population (proxies for demand for housing in Georgetown). A second model is constructed with full sample data from 1995 to 2018 to ascertain the extent to which the fit improves with additional data points.

9. The model is represented by the following equation:

$$Y_i = \alpha_i + \beta_1 X_{1,i} + \beta_2 X_{2,i} + \beta_3 X_{3,i} + \beta_4 X_{4,i} + \varepsilon_i$$

where:

Y_i = Urban (Georgetown) housing prices (in percent change, Y/Y)
$X_{1,i}$ = Urban (Georgetown) CPI—All Items (in percent change, Y/Y)
$X_{2,i}$ = Oil Price (in percent change, Y/Y)
$X_{3,i}$ = Population growth (in percent change, Y/Y)
$X_{4,i}$ = Share of urban population (in percent total population)
α_i = Constant
ε_i = Residuals

Variables	Data Sources
Urban (Georgetown) housing prices	Bank of Guyana (Statistical Bulletin)
Urban (Georgetown) CPI—All Items	Bank of Guyana (Statistical Bulletin)
Oil Prices	IMF World Economic Outlook (based on Petroleum spot price (APSP), in US$/barrel)
Population	United Nations (World Population Prospects 2019)
Share of urban population	The World Bank (World Development Indicators)

Results

10. The predictor derived from the regression provides a good in-sample fit. Figure 1 shows the estimated coefficients, which are all in the expected signs. Increases in inflation rate and population, including the share of urban population, lead to increasing house prices and demand for housing, in line with empirical observations. The oil price variable controls for energy prices, given that the dependent variable includes the costs of fuel and power. The coefficients of these explanatory variables are statistically significant. Housing prices and the predictor are

Figure 1. Regression Analysis with Urban (Georgetown) Housing Prices (Percent Change, Y/Y) as Dependent Variable

	Model 1 (a)	Model 1(b)
Sample period	**1995-2015**	**1995-2018**
Urban CPI All Items	0.5533**	0.58802**
	(0.2352)	*(0.20928)*
Change in Oil Price	0.04692*	0.0415*
	(0.02651)	*(0.02277)*
Population Growth	6.75491**	6.51903**
	(2.98852)	*(2.71445)*
Share of Urban Population	3.87884***	3.87821***
	(0.94874)	*(0.8784)*
Constant	-106.4155***	-106.5723***
	(26.32431)	*(24.36331)*
R-squared	0.74086	0.7589
Adjusted R-squared	0.67608	0.7082
Durbin-Watson statistics	2.5705	2.5199

Note: Note: Standard errors are in brackets. Oil price refers to petroleum spot price (APSP), in US$/barrel.

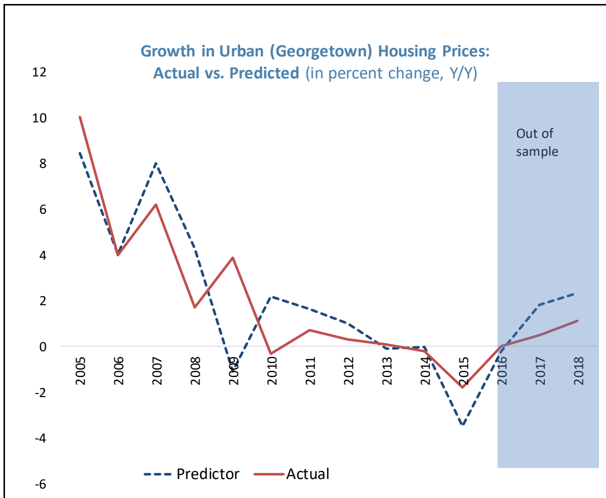
***p<0.01; **p<0.05; *p<0.10

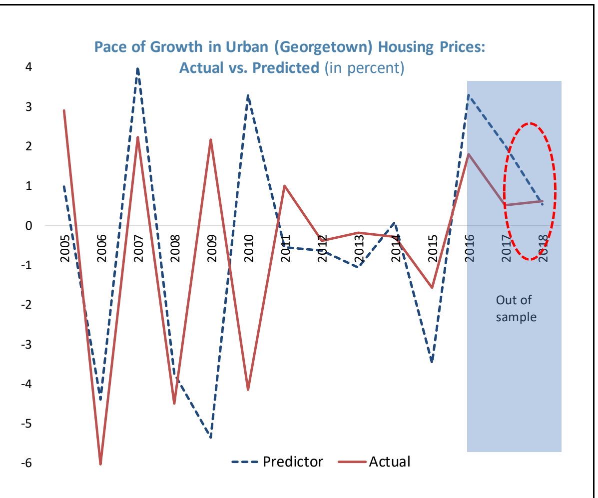
cointegrated and no significant autocorrelations are detected.[2]

- Model 1(a)—constructed using a sample between 1995 to 2015—allows the "predictor" to predict housing prices from 2016 to 2018 ("out-of-sample" period) to ascertain if they deviate significantly from the actual observed prices. This model explains 74 percent of total variation in housing prices growth and the adjusted R-squared is also high.

- Model 1(b)—constructed using a sample between 1995 to 2018—is used to check whether the full sample fit improves significantly with the additional data points. With the entire sample period, the fit only improves slightly with the regression R-squared rising to 76 percent.

11. The results suggest that the deviations between the observed growths in housing prices and the predictor are not statistically significantly in the "out-of-sample" period. Both actual and predictor show housing prices increased stably since 2015, coinciding with the discovery of oil. Large gaps between the actual and model-predicted housing prices growth rates are often indications of structural shifts in the demand for real estate properties. However, from 2016-2018, the differences between actual and predicted growths are small, averaging at around 0.5 standard deviation. Hypothesis tests based on t-distribution suggest that the deviations between the observed growth in housing prices and the predictor are not statistically significantly in 2016, 2017, and 2018 (Appendix 1). The deviations possibly reflect "missing variables". That said, from 2017 to 2018, the trajectory of the pace of growth[3] between the two indicators diverged—although the predictor showed a deceleration, the actual growth in housing prices accelerated slightly.





[2] Based on Engel-Granger test for cointegration Breusch-Godfrey serial correlation LM Test (Appendix 1).
[3] The pace of growth (or rate of change) is computed as the second order derivative of the annual growth of housing prices.

12. Continuous surveillance of developments in the housing market is important. On one hand, the divergence in the pace of growth between housing prices and the predictor in 2017-2018 could indicate early signs of a potential structural break in the relationship between housing prices and the macroeconomic variables used in the econometric model although the increase in housing prices appeared to be in early stages. On the other hand, the divergence between the two indicators could be triggered by “missing variables”. However, it would be prudent for the authorities to step up the monitoring of developments in the housing market, including household debt and bank lending practices, in case the former is true. At the same time, fortifying the macroprudential policy toolkit to stand ready to tighten them when necessary would help safeguard financial and macroeconomic stability.

13. It is also important to identify the “missing variables” that could explain the divergence between the two indicators. Unexplained increases in house prices may not necessarily be a source of concern if they are driven by improved liquidity of the housing market (Box 1). On the contrary, if the increase in prices are related to moral hazard in lending practices, then macroeconomic and financial stability could be at risk. This study should ideally be extended with alternative econometric models that include the following explanatory variables:

- Changes in property taxes. Based on the 2018 National Budget, property tax rates for both individuals and companies are reduced from 0.75 percent to 0.5 percent for the first GY$ 20 million in taxable net property, and the remainder will be taxed at 0.75 percent.

- Demand for real-estate from foreigners and Guyanese residing abroad.

- Changes in the supply of houses. Useful indicators include construction and residential permits.

- Distribution of income and household debt across different population groups.

- Business and household sentiment.

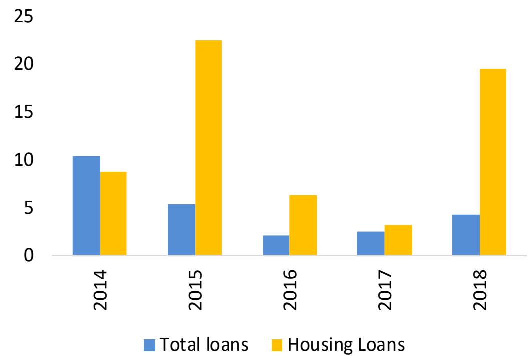
Extending this study would require further efforts by the authorities to expand data collection. In addition, increasing the frequency of the data would improve the accuracy of forecasts and help enhance surveillance.

IV. HAVE THERE BEEN CHANGES IN BANK MORTGAGE LENDING POLICIES?

This section explores the evolution of residential real estate lending in Guyana by constructing a predictor that explains the growth in commercial banks' housing loans and comparing it with the actual observed growth in 2016-2018 to ascertain whether there are any structural breaks between the two. A significant break-down in the relationship between housing loan growth and the corresponding predictor could indicate possible shifts in banks' credit policies—such as a relaxation of underwriting standards—that leads to increasing demand for real estate, which in turn, pushes prices up.

14. Over the last four years, housing loans grew at a faster pace compared to total commercial bank loans. From 2014 to 2018, commercial banks' housing loans grew by an average annual rate of 12.1 percent, close to three times the average annual growth rate of total loans. The rapid growth in housing loans led to an increase in the share of commercial banks' mortgage loans to total loans from 31.5 percent in 2014 to 34.9 percent in 2018.[4]

Growth in Commercial Banks' Total Loans and Housing Loans (In percent change, Y/Y)



Source: Bank of Guyana

15. Following the methodology developed in Section III, a predictor is constructed to explain the growth in housing loans from 1995 to 2015. The predictor is then contrasted, for the period starting from 2016, with the actual observed growth of residential loans to ascertain if there are any structural breaks between the two. A second model with full sample data from 1995 to 2018 is also constructed to ascertain if the fit improves significantly with additional data points.

16. The model is represented by the following equation:

$$Z_j = \alpha_j + \gamma_1 V_{1,j} + \gamma_2 V_{2,j} + \gamma_3 V_{3,j} + \gamma_4 V_{4,j} + \varepsilon_j$$

where:

Z_j	=	Growth in commercial banks' housing loans (in percent, Y/Y)
$V_{1,j}$	=	Prime Lending Rate (in percent)
$V_{2,j}$	=	Construction growth (in percent, Y/Y)
$V_{3,j}$	=	Population growth (in percent, Y/Y)
$V_{4,j}$	=	Nominal GDP growth (in percent change, Y/Y)

[4] In addition to commercial banks, nonbank financial institutions—such as the New Building Society, the Hand-in-Hand Trust Corporation, and credit unions—extend mortgage loans. Commercial banks account for about 70 percent of financial system total assets and originate two thirds of total real estate mortgage loans.

α_j = Constant
ε_j = Residuals

Variables	Data Sources
Commercial banks' housing loans	Bank of Guyana (Statistical Bulletin)
Prime Lending Rate	Bank of Guyana (Statistical Bulletin)
Construction sector	Guyana Bureau of Statistics
Population	The World Bank (World Development Indicators)
Nominal GDP	IMF

Results

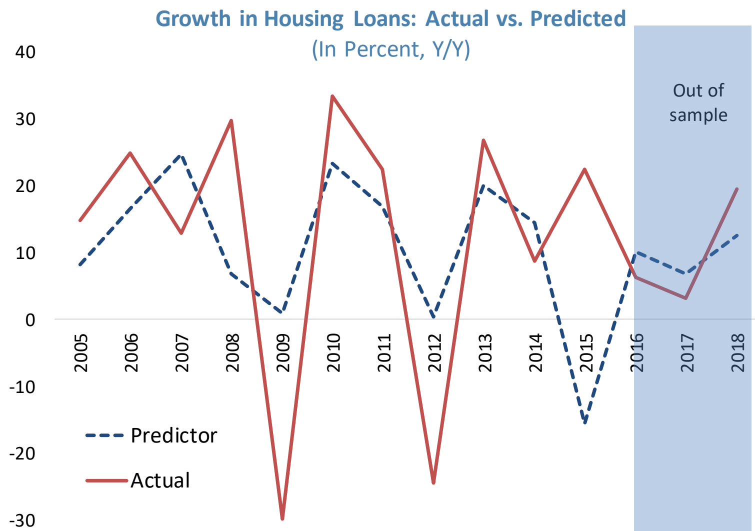
17. The predictor derived from the regression provides a reasonable in-sample fit. Figure 2 shows the estimated coefficients. Model 2(a) and Model 2(b) are constructed using three explanatory variables: prime lending rate (as proxy for the price of credit); growth in the construction sector (as proxy for volume); and population growth (as proxy for demand for housing). The coefficients of these explanatory variables are statistically significant. Model 3(a) and Model 3(b) include an additional variable—nominal GDP growth—as a proxy for income levels. The inclusion of this variable—although it is not statistically significant—improves the in-sample fit as R-squared increases from 48 percent to 53 percent. Moreover, from an economics perspective, rising income levels supports demand for housing and housing loans. The regressor coefficients are all in the expected signs. No significant autocorrelation is detected from the Breusch-Godfrey serial correlation LM Test. The Engel-Granger test for cointegration strongly also shows that housing loan growth and the predictor are cointegrated (Appendix II provides more details).

Figure 2. Regression Analysis with Growth in Commercial Banks' Housing Loans (Percent Change, Y/Y) as Dependent Variable

Sample period	Model 2(a) 1995-2015	Model 2(b) 1995-2018	Model 3(a) 1995-2015	Model 3(b) 1995-2018
Prime Lending Rate	13.38224***	13.43991***	11.46512**	11.40515***
	(3.96019)	*(3.62313)*	*(4.18723)*	*(3.81101)*
Construction growth	1.01015*	1.00453*	1.07465*	1.0864**
	(0.55929)	*(0.51442)*	*(0.55267)*	*(0.50494)*
Population growth	48.43238**	47.99398**	39.74414*	39.33508*
	(20.55105)	*(18.82824)*	*(21.38052)*	*(19.34107)*
Nominal GDP growth			1.22742	1.25768
			(0.98192)	*(0.88274)*
Constant	-196.6612***	-197.6339***	-177.8352**	-177.2343***
	(61.25398)	*(55.89663)*	*(62.11833)*	*(56.35975)*
R-squared	0.48036	0.47856	0.52659	0.52889
Adjusted R-squared	0.38866	0.40034	0.40824	0.42971
Durbin-Watson statistics	2.3032	2.4397	2.4932	2.7175

Note: Note: Standard errors are in brackets.
***p<0.01; **p<0.05; *p<0.10

18. The results suggest that growth in housing loans was slightly faster than the predictor in 2018. The divergence between actual and predicted growth rates in 2018 is 7 percentage points. However, this is not large as it accounts for 0.38 standard deviations. Hypothesis tests based on t-distribution suggest that the deviations between the observed growth in housing loans and the predictor are not statistically significantly in 2016, 2017, and 2018, indicating inconclusive evidence of any structural break in the relationship between housing loans and the predictor (Appendix 2).



19. While it is too early to conclude that banks' mortgage lending practices have changed, it would be prudent for the authorities to step up surveillance. The regression R-squared and adjusted R-squared are not high, indicating the possibility of "missing variables" or it is too early to tell if the sharp increase in housing loan in 2018 was due to changes in bank mortgage lending practices. Further analysis would be needed, particularly by expanding the explanatory variables to improve the fit, when the depth and breadth of data become more forthcoming. Notwithstanding this, it would be prudent to enhance supervisory surveillance on banks' mortgage loans and underwriting standards to mitigate risks.

V. WHAT ARE THE MACROPRUDENTIAL MEASURES TO MITIGATE HOUSING RISKS?

This section discusses the various macroprudential toolkits to address housing sector vulnerabilities from excessive credit, based on two IMF Staff Guidance Notes (IMF, 2014a and IMF, 2014b). Although the real estate market and commercial banks' lending to the housing sector in Guyana appeared to be in their early stages of growth, building up macroprudential policy toolkits with the aim of tightening them when necessary will help mitigate risks and safeguard financial and macroeconomic stability. Combining the different tools will allow several transmission channels to work, and at the same time, mitigate the shortcomings of any single tool.

20. The 2016 Financial Sector Assessment Program (FSAP) recommends that the Bank of Guyana (BoG) consider developing a formal macroprudential framework in the medium term. Under existing legislation, the BoG has powers to use countercyclical tools, including loan-to-value (LTV) and debt-to-income (DTI) requirements. In the longer term, potential implementation of countercyclical capital buffers or systemic risk surcharges would enable the BoG to apply varying capital requirements.[5]

21. A targeted use of sectoral macroprudential tools could help address the build-up of systemic risk due to excess credit to the housing sector. The tools include sectoral capital requirements (risk weights or loss given default (LGD) floors), limits on loan-to-value (LTV) ratios, and caps on debt-service-to-income (DSTI) or loan-to-income (LTI) ratios.[6] Table 1 shows the use of sectoral macroprudential tools by various advanced countries and emerging market economies, from 1990 to 2014.

Table 1. Use of Sectoral Macroprudential Tools, 1990-2014

	Advanced Economies	Emerging Market Economies	Total
Sectoral Capital Requirements	Australia (2004), Hong Kong SAR (2013), Ireland (2001), Israel (2010), Korea (2002), Norway (1998), Spain (2008), Switzerland (2013)	Argentina (2004), Brazil (2010), Bulgaria (2004), Croatia (2006), Estonia (2006), India (2004), Malaysia (2005), Nigeria (2013), Peru (2012), Poland (2007), Russia (2011), Serbia (2006), Thailand (2009), Turkey (2008), Uruguay (2006)	23

[5] The BoG is in the process of implementing a hybrid approach to the Basel framework where capital definition and operational risk are based on Basel III while market risk and the standard approach to assessing credit risk are based on Basel II.

[6] For further details, refer to **IMF, 2014a** and **IMF, 2014b**

Limits on LTV ratio	Canada (2007), Finland (2010), Hong Kong SAR (1991), Ireland (2001), Israel (2012), Korea (2002), Netherlands (2011), Norway (2010), Singapore (2010), Sweden (2010), New Zealand (2013)	Brazil (2013), Bulgaria (2004), Chile (2009), China (2001), Colombia (1999), Hungary (2010), India (2010), Indonesia (2012), Latvia (2007), Lebanon (2008), Malaysia (2010), Romania (2004), Thailand (2003), Turkey (2011)	25
Caps on DSTI ratio (including LTI caps)	Canada (2008), Hong Kong SAR (1997), Korea (2005), Netherland (2007), Norway (2010, LTI), Singapore (2013), United Kingdom (2014, LTI)	China (2004), Colombia (1999), Hungary (2010), Latvia (2007), Malaysia (2011), Poland (2010), Romania (2004), Thailand (2004)	15

Sources: IMF, 2014a and IMF, 2014b
Note: Parentheses show the time when a country started to introduce currently imposed measures since 1990.

22. **A wide range of indicators should be used to assess the need for policy action, especially the growth of mortgage loans and house prices.** These two indicators are core indicators for vulnerabilities in housing markets, since they jointly provide powerful signals of a procyclical build-up of systemic risk.[7] Deviations of house prices from long-term trends have proved useful in predicting financial stress (Borio and Drehmann, 2009); and house price-to-rent and house price-to-income ratio are often used as measures of over- or under-valuation of house prices. In addition, other indicators should be closely monitored, such as (i) the average and the distribution of LTV, DSTI, and LTI ratios across new loans over a period and outstanding loans at a given point in time; (ii) the share of foreign currency denominated mortgage loans or interest-only mortgage loans; and (iii) housing price growth by regions and types of properties.

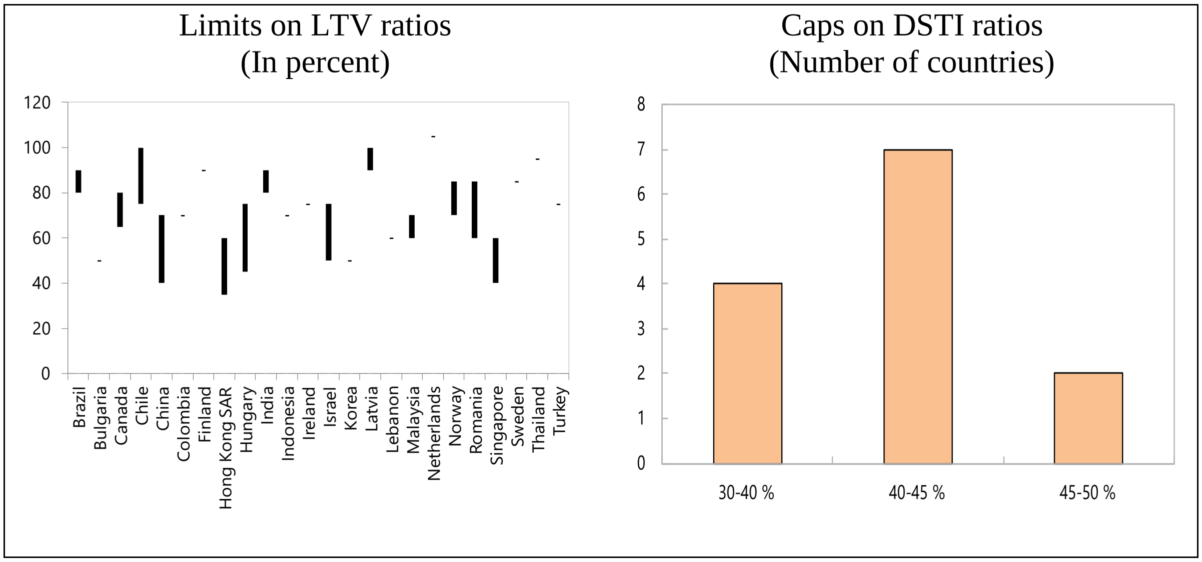
23. **Sectoral tools should be activated or tightened when multiple indicators point to rising systemic risk**. A single signal, or mixed signals from multiple indicators, may not be sufficient for action. For example, strong growth in mortgage loans without house price growth may simply indicate improving housing penetration rather than an increase in risk. Conversely, a sharp increase in house prices, without strong mortgage loan growth, may reflect a shortage of house supply requiring structural policies to improve supply rather than a macroprudential response.

24. **Policymakers should take a gradual approach when tightening or introducing sectoral tools.** When several indicators show signs of a gradual build-up of risk in the housing sector, policymakers should first intensify supervisory scrutiny and step up communication. As a next step, less distortionary sectoral capital requirements may be tightened to build additional buffers.[8] Tighter limits on LTV and/or DSTI ratios can follow if these defenses are not expected to meet policy objectives (Figure 3 below provides country examples). LTV and DSTI caps should always be imposed on the flow of new household

[7] Research shows these indicators together can predict a crisis as early as two to four years in advance (IMF, 2011a).
[8] See the BCBS consultative document (http://www.bis.org/bcbs/publ/d307.pdf) proposing a range of risk weights (from 25 to 100 percent) driven by LTV and DSTI ratios.

loans. Otherwise, it would force some existing high LTV or DSTI borrowers to provide more collateral or repay part of their loans, leading to a possible distress.

Figure 3. Limits on LTV and DSTI Ratios and Number of Countries at Each Range, 2014

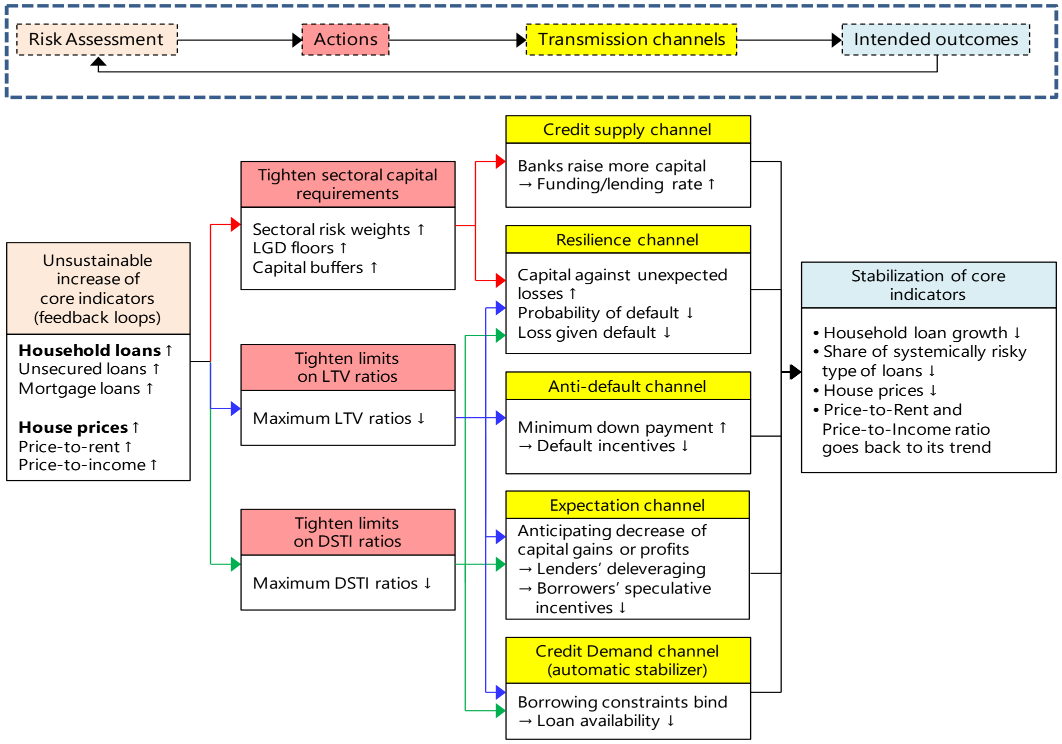


Sources: IMF, 2014a and IMF, 2014b
Note: Observed limits on LTV ratios are below 80 percent in more than half of 51 sample countries, and Most countries with caps on DSTI ratios have imposed 40–45 percent as the limit (seven out of 13 countries), and four countries restrict it to be below 35 percent

25. As sectoral tools work via a range of transmission channels, combining them can reinforce their effectiveness and mitigate the shortcomings of any single tool (Figure 4)**.** A higher risk weight forces lender to hold extra capital to buffer unexpected losses and restrains credit growth as lending rates increase due to higher funding costs.[9] Limits on LTV ratios cap the size of a mortgage loan relative to the appraised value of a house, while caps on DSTI and LTI ratios restrict the size of debt service payments to a fixed share of household incomes. They can complement each other, for example when house prices increase, LTV limits may become less effective but DSTI or LTI caps continue to restrict credit to household income. The DSTI caps also enhance the effectiveness of LTV limits by containing the use of unsecured loans to meet the minimum down payment. In a low interest rate environment, DSTI caps complement LTV limits in containing increases in household leverage, thus help mitigate defaults when interest rates eventually rise. These caps can break the procyclical feedback between credit and house prices, and can also reduce speculative demand by containing expectations of future house prices. DSTI caps work as an automatic stabilizer—becoming more binding when house prices grow faster than disposable income, thereby helping to smooth credit booms.

[9] At present, commercial banks in Guyana do not lend in foreign currencies. If such lending is extended in the future, differentiated capital charges on FX-denominated loans should be considered, particularly when they lead to large currency mismatches and open FX position.

Figure 4. Transmission Mechanism of Three Sectoral Macroprudential Instruments



Sources: IMF, 2014a and IMF, 2014b

Note: Observed limits on LTV ratios are below 80 percent in more than half of 51 sample countries, and Most countries with caps on DSTI ratios have imposed 40–45 percent as the limit (seven out of 13 countries), and four countries restrict it to be below 35 percent

26. Expanding the regulatory perimeter would contain leakages. An increase in credit by domestic nonbanks and foreign bank branches may render the sectoral tools ineffective if they are applied only to the domestic banking sector. Policymakers would need to expand the regulatory perimeter to non-banks and foreign branches. Where there are separate regulators, inter-agency cooperation would be needed at the national or cross border level. Extending the tools to un-regulated entities may require expanding the licensing regime to those institutions.

When to loosen macroprudential policies?

27. Sectoral tools can be loosened to contain feedback loops between falls in credit and house prices during housing busts. A housing bust can result in a credit crunch that puts further downward pressure on house prices. Strategic default, fire sales and contraction in the supply of credit can create negative externalities beyond the parties involved in financial contracts (IMF, 2011b; Geanakopolos, 2009; and Shleifer and Vishny, 2011).

28. Indicators that inform the tightening phase can be used for informing decisions to relax. Fast-moving indicators that could guide such decisions include house transaction volumes and spreads on household loans. A softening housing market is not sufficient alone to justify a relaxation. Evidence of a systemic stress is vital, such as simultaneous decline in prices and credit, and an increase in non-performing loans or defaults. The relaxation would reduce stress in the housing market.

29. Relaxation needs to respect certain prudential minima that could safeguard an appropriate degree of resilience against future shocks. If large additional buffers have been built during the tightening phase, they can be released to avoid a credit crunch without jeopardizing banks. However, the relaxation should not go beyond a "permanent floor", i.e. level considered safe in downturns. Policymakers should also communicate clearly that a tightening can be followed by a relaxation so that market participants do not take an adverse view of the relaxation during downturn (BIS, 2012).

30. A relaxation of these tools can be effective, but may have limited effects when it is "pushing on a string." Even if policymakers loosen sectoral instruments, banks may be reluctant to provide credit due to increased risk aversion or capital constraints, and may apply more stringent lending standards than the regulatory thresholds. Potential borrowers may be reluctant to enter the housing market while prices are still falling. Nonetheless, the relaxation would still be useful in containing the spillback from falling prices and credit.

VI. CONCLUSION AND POLICY IMPLICATIONS

31. **Housing prices in Georgetown and more generally, commercial banks' lending to the housing sector in Guyana appear to be in their early stages of growth.** There are no solid evidences as yet supporting the hypotheses that there have been structural changes in the dynamics that determine the growths in housing prices or in commercial banks' housing loan lending practices during 2016 to 2018.

32. **However, the results from the two analyses should be interpreted as early signals of possible risks and as a guide to the areas where further data collection would be useful in supporting surveillance and further studies.** The divergences in the pace of growth between housing prices and the predictor (Section III) and in the structural relationship between banks' housing loans and the corresponding predictor (Section IV) could indicate early signs of potential shifts in their dynamics. As such, it would be prudent for the authorities to strengthen the monitoring of the housing market, household debt and bank lending practices. At the same time, the macroprudential policy framework should be fortified further, including with more effective toolkits that the central bank could deploy at an early juncture when necessary, to mitigate risks to financial and macroeconomic stability. Intrusive and tighter supervision, including appropriate enforcement actions, would be needed if lax underwriting standards are detected. It is also important to identify the "missing variables" that could explain the divergences between the actual and model-predicted growth rates in housing prices and housing loans. This would require further efforts by the authorities to collect new data and increase the frequency of the data, which would also help enhance surveillance, in addition to improving the accuracy of forecasts.

33. **An extension of this study to include commercial real estate would reinforce early warning signals.** The anticipated exuberance from oil production could spillover to the commercial real estate sector, possibly leading to property price bubble. Extending this analysis to commercial real estate would require fresh efforts by the authorities to gather new data, including establishing a commercial property price index in addition to a residential property price index. In the same vein, continued efforts by the authorities to monitor and supervise banks, particularly in underwriting standards, would help ensure no lax in the quality of real estate financing.

REFERENCES

Bank for International Settlements, 2012, “Operationalising the Selection and Application of Macroprudential Instruments,” CGFS Papers No.48 (Basel: Bank for International Settlements).

Borio, C., Drehmann, M., 2009. “Assessing the Risk of Banking Crises – Revisited,” BIS Quarterly Review (Basel: Bank for International Settlements).

Geanakoplos, J., 2009. “The Leverage Cycle,” Cowles Foundation Discussion Paper No. 1715R (Connecticut: Yale University).

Ghent, A., and Kudlyak, M., 2010. “Recourse and Residential Mortgage Default: Theory and Evidence from U.S. States” Federal Reserve Bank of Richmond Working Paper No. 09-10R.

International Monetary Fund, 2011, “Housing Finance and Financial Stability—Back to Basics?,” Chapter 3 in Global Financial Stability Report, April (Washington: International Monetary Fund).

International Monetary Fund, 2011, “Toward Operationalizing Macroprudential Policies: When to Act?,” Chapter 3 in Global Financial Stability Report, September (Washington: International Monetary Fund).

International Monetary Fund, 2014, “Staff Guidance Note on Macroprudential Policy,” IMF Policy Paper, December (Washington: International Monetary Fund).

International Monetary Fund, 2014, “Staff Guidance Note on Macroprudential Policy—Detailed Guidance on Instruments,” IMF Policy Paper, December (Washington: International Monetary Fund).

Piazza, R., 2013. “Technical Note on Housing Market,” IMF Financial Sector Assessment Program (Malaysia) Technical Note (Washington: International Monetary Fund).

Shleifer, A., and Vishny, R., 2011. “Fire Sales in Finance and Macroeconomics,” Journal of Economic Perspectives—Volume 25, Number 1.

APPENDIX 1. DETAILS OF REGRESSION: GROWTH IN HOUSING PRICE (GEORGETOWN)

a) Partial Sample (1995-2015)

Dependent Variable: CPI (Urban) - Housing
Method: Least Squares
Date: 12/12/19 Time: 17:29
Sample: 1995 2015
Included observations: 21

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-106.4155	26.32431	-4.04248	0.0009
CPI (Urban) - ALL	0.5533	0.235197	2.352496	0.0318
Change in Oil Price	0.046921	0.026511	1.769895	0.0958
Share of Urban Population	3.878837	9.49E-01	4.08843	0.0009
Population Growth	6.754908	2.988517	2.260288	0.0381

R-squared	0.74086	Mean dependent var	4.650587
Adjusted R-squared	0.676076	S.D. dependent var	4.849534
S.E. of regression	2.760082	Akaike info criterion	5.072654
Sum squared resid	121.8888	Schwarz criterion	5.32135
Log likelihood	-48.26287	Hannan-Quinn criter.	5.126628
F-statistic	11.4357	Durbin-Watson stat	2.57053
Prob(F-statistic)	0.000141		

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.028544	Prob. F(2,14)	0.383
Obs*R-squared	2.69033	Prob. Chi-Square(2)	0.2605

- Based on the Breusch-Godfrey Serial Correlation LM Test, the null hypothesis (no serial correlation) is accepted at 5 percent significance level.

Series: ACTUAL FITTED
Sample: 1995 2018
Included observations: 24
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
ACTUAL	-6.365602	0.0001	-29.6674	0.0001
FITTED	-4.754748	0.0049	-23.20285	0.0032

*MacKinnon (1996) p-values.

- Based on the Engel-Granger test of cointegration, the null hypothesis (actual housing prices growth and the predictor are not cointegrated) is rejected, at 5 percent significance level.

b) Full Sample (1995-2018)

Dependent Variable: CPI (Urban) - Housing
Method: Least Squares
Date: 12/16/19 Time: 11:01
Sample: 1995 2018
Included observations: 24

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-106.5723	24.36331	-4.374294	0.0003
CPI (Urban) - ALL	0.588023	0.209281	2.809729	0.0112
Change in Oil Price	0.041499	0.022774	1.822266	0.0842
Share of Urban Population	3.878207	0.878395	4.415109	0.0003
Population Growth	6.519033	2.714447	2.401606	0.0267

R-squared	0.758917	Mean dependent var	4.136506
Adjusted R-squared	0.708162	S.D. dependent var	4.733661
S.E. of regression	2.55722	Akaike info criterion	4.89877
Sum squared resid	124.2481	Schwarz criterion	5.144198
Log likelihood	-53.78524	Hannan-Quinn criter.	4.963882
F-statistic	14.95272	Durbin-Watson stat	2.519897
Prob(F-statistic)	0.000011		

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	0.723599	Prob. F(2,18)	0.4986
Obs*R-squared	1.786003	Prob. Chi-Square(2)	0.4094

- Based on the Breusch-Godfrey Serial Correlation LM Test, the null hypothesis (no serial correlation) is accepted at 5 percent significance level.

Engel-Granger Cointegration Test

Series: ACTUAL FITTED
Sample: 1995 2018
Included observations: 24
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
ACTUAL	-4.865312	0.0038	-23.25534	0.0031
FITTED	-3.847054	0.0319	-18.64588	0.0208

*MacKinnon (1996) p-values.

- Based on the Engel-Granger test of cointegration, the null hypothesis (actual housing prices growth and the predictor are not cointegrated) is rejected, at 5 percent significance level.

c) Hypothesis Test: Are Observed Growths in Housing Prices Significantly Different from the Predictor in 2016, 2017, and 2019?

	Actual (A)	Predictor (B)	Difference (A)-(B)
1995	13.59	15.28	1.69
1996	9.17	4.34	-4.83
1997	5.42	5.47	0.06
1998	2.98	-0.35	-3.33
1999	8.07	10.21	2.14
2000	8.16	13.04	4.89
2001	3.41	1.56	-1.85
2002	7.32	9.55	2.23
2003	7.21	6.86	-0.35
2004	7.45	7.13	-0.33
2005	8.43	10.02	1.60
2006	4.02	3.98	-0.04
2007	8.01	6.20	-1.81
2008	4.27	1.69	-2.58
2009	-1.09	3.86	4.95
2010	2.19	-0.30	-2.49
2011	1.63	0.70	-0.93
2012	0.99	0.30	-0.69
2013	-0.08	0.10	0.18
2014	-0.01	-0.20	-0.19
2015	-3.48	-1.79	1.69
2016	-0.19	0.00	0.19
2017	1.82	0.51	-1.31
2018	2.34	1.11	-1.24

Hypothesis:

H_o: (A)-(B) = 0
H_1: (A)-(B) ≠ 0

Mean=-0.10; Standard deviation=2.3308; N=24

For 2016:

- Test statistic, $Zi = 0.13$
- Critical value, $t_{crit,i} = 1.711$, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zi < t_{crit,i}$. Therefore, the observed growth in housing prices is not significantly different from the predictor in 2016.

For 2017:

- Test statistic, $Zj = -0.52$
- Critical value, $t_{crit,j} = -1.711$, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zi > t_{crit,j}$. Therefore, the observed growth in housing prices is not significantly different from the predictor in 2017.

For 2018:

- Test statistic, $Zk = -0.49$
- Critical value, $t_{crit,k} = -1.711$, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zk > t_{crit,k}$. Therefore, the observed growth in housing prices is not significantly different from the predictor in 2018.

APPENDIX 2. DETAILS OF REGRESSION: GROWTH IN HOUSING LOANS

(a) Partial Sample (1995-2015)

Dependent Variable: Growth in Housing Loans
Method: Least Squares
Sample: 1995 2015

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-177.8352	62.11833	-2.862846	0.0113
Prime Lending Rate	11.46512	4.187233	2.738113	0.0146
Construction Growth	1.074646	0.55267	1.94446	0.0696
Population Growth	39.74414	21.38052	1.858895	0.0815
Nominal GDP Growth	1.227417	0.981919	1.250019	0.2293

R-squared	0.526591	Mean dependent var	15.4978
Adjusted R-squared	0.408239	S.D. dependent var	28.1575
S.E. of regression	21.66043	Akaike info criterion	9.193108
Sum squared resid	7506.789	Schwarz criterion	9.441804
Log likelihood	-91.52764	Hannan-Quinn criter.	9.247082
F-statistic	4.449361	Durbin-Watson stat	2.493197
Prob(F-statistic)	0.013151		

Breusch-Godfrey Serial Correlation LM Test:
Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.741037	Prob. F(2,14)	0.2112
Obs*R-squared	4.182774	Prob. Chi-Square(2)	0.1235

- Based on the Breusch-Godfrey Serial Correlation LM Test, the null hypothesis (no serial correlation) is accepted at 5 percent significance level.

Engel-Granger Cointegration Test
Series: ACTUAL FITTED
Sample: 1995 2015
Included observations: 21
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
ACTUAL	-6.076332	0.0004	-28.55325	0.0001
FITTED	-4.735105	0.0063	-22.73023	0.0023

- Based on the Engel-Granger test of cointegration, the null hypothesis (actual housing loans growth and the predictor are not cointegrated) is rejected, at 5 percent significance level.

(b) Full Sample (1995-2018)

Dependent Variable: Growth in Housing Loans
Method: Least Squares
Sample: 1995 2018

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Constant	-177.2343	56.35975	-3.144697	0.0053
Prime Lending Rate	11.40515	3.811013	2.992681	0.0075
Construction Growth	1.086404	0.504944	2.151534	0.0445
Population Growth	39.33508	19.34107	2.033759	0.0562
Nominal GDP Growth	1.257681	0.882736	1.424753	0.1704

R-squared	0.528888	Mean dependent var	14.77082
Adjusted R-squared	0.429707	S.D. dependent var	26.45349
S.E. of regression	19.97708	Akaike info criterion	9.0101
Sum squared resid	7582.59	Schwarz criterion	9.255528
Log likelihood	-103.1212	Hannan-Quinn criter.	9.075212
F-statistic	5.332538	Durbin-Watson stat	2.717526
Prob(F-statistic)	0.004727		

Breusch-Godfrey Serial Correlation LM Test:

Null hypothesis: No serial correlation at up to 2 lags

F-statistic	1.565836	Prob. F(2,17)	0.2376
Obs*R-squared	3.733427	Prob. Chi-Square(2)	0.1546

- Based on the Breusch-Godfrey Serial Correlation LM Test, the null hypothesis (no serial correlation) is accepted at 5 percent significance level.

Engel-Granger Cointegration Test

Series: ACTUAL FITTED
Sample: 1995 2018
Included observations: 24
Null hypothesis: Series are not cointegrated
Cointegrating equation deterministics: C
Automatic lags specification based on Schwarz criterion (maxlag=4)

Dependent	tau-statistic	Prob.*	z-statistic	Prob.*
ACTUAL	-6.873203	0	-31.40406	0
FITTED	-5.837217	0.0005	-25.07994	0.0013

- Based on the Engel-Granger test of cointegration, the null hypothesis (actual housing loans growth and the predictor are not cointegrated) is rejected, at 5 percent significance level.

(c) Hypothesis Test: Are Observed Growths in Commercial Banks' Housing loans Significantly Different from the Predictor in 2016, 2017, and 2019?

	Actual (A)	Predictor (B)	Difference (A)-(B)
1995	85.53	91.8	6.25
1996	46.52	54.4	7.84
1997	25.09	16.2	-8.90
1998	-3.24	19.2	22.43
1999	6.30	13.3	6.97
2000	16.25	24.4	8.16
2001	12.26	-23.4	-35.64
2002	7.95	21.2	13.23
2003	6.32	-5.3	-11.58
2004	5.40	-28.1	-33.53
2005	8.22	14.7	6.52
2006	16.62	24.9	8.32
2007	24.76	12.9	-11.90
2008	6.80	29.7	22.89
2009	0.98	-29.9	-30.87
2010	23.38	33.4	10.06
2011	16.93	22.5	5.55
2012	0.42	-24.5	-24.90
2013	20.05	26.8	6.77
2014	14.41	8.7	-5.67
2015	-15.50	22.5	38.00
2016	10.17	6.3	-3.82
2017	6.84	3.2	-3.63
2018	12.52	19.5	6.97

Hypothesis:

H_o: (A)-(B) = 0
H_1: (A)-(B) $\neq$ 0

Mean=-0.02; Standard deviation=18.1578; N=24

For 2016:

- Test statistic, Zi = -0.209
- Critical value, $t_{crit,i}$ =-1.711, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zi > t_{crit,i}$. Therefore, the observed growth in housing loans is not significantly different from the predictor in 2016.

For 2017:

- Test statistic, Zj = -0.199
- Critical value, $t_{crit,j}$ = -1.711, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zi > t_{crit,j}$. Therefore, the observed growth in housing loans is not significantly different from the predictor in 2017.

For 2018:

- Test statistic, Zk = -0.385
- Critical value, $t_{crit,k}$ = -1.711, based on t-distribution with 5 percent significance level and n=24

Results: Accept H_o since $Zk > t_{crit,k}$. Therefore, the observed growth in housing loan is not significantly different from the predictor in 2018.