

https://dspace.org/

Transforming homeownership an innovative financing model with a future value approach

M Sulaimi; R Majid; O Olanrele; A Aini; Omokolade Akinsomi

https://hdl.handle.net/10539/46819
WOS

Downloaded from a DSpace repository. https://dspace.org/

The current issue and full text archive of this journal is available on Emerald Insight at:
https://www.emerald.com/insight/1753-8270.htm

Transforming homeownership: an innovative financing model with a future value approach

Rosli Said and Mardhiati Sulaimi
Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia
Rohayu Ab Majid
College of Built Environment, Universiti Teknologi MARA, Shah Alam, Malaysia
Ainoriza Mohd Aini and Olusegun Olaopin Olanrele
Faculty of Built Environment, Universiti Malaya, Kuala Lumpur, Malaysia, and
Omokolade Akinsomi
School of Construction Economics and Management, University of the Witwatersrand, Johannesburg, South Africa

Received 17 November 2023
Revised 16 January 2024
Accepted 26 January 2024

Abstract

Purpose – This study aims to address the critical need for innovative financing solutions in the global housing sector, focusing specifically on Malaysia's distinct housing finance system encompassing both conventional and Islamic loans. The primary objective is to develop a transformative housing finance model that addresses affordability challenges and reshapes the Malaysian housing landscape.

Design/methodology/approach – The study presents an alternate housing finance model for Malaysia, integrating lower monthly payments and reduced household debt. Key variables include house price appreciation rates, interest rates, initial guarantee fees and loan-to-value ratios. Inspired by the Help to Buy (HTB) scheme, the model aligns with proven global initiatives for enhanced affordability, balancing payment amounts, loan interest rates and acceptable price thresholds.

Findings – The study's findings promise to address affordability disparities and reshape Malaysia's housing finance landscape. The emphasis is on introducing a structured repayment plan that offers a sustainable path to homeownership, particularly for low-income families. Incorporating the future value adaptation concept, inspired by reverse mortgages and Islamic finance, enhances adaptability, ensuring long-term sustainability despite economic shifts.

Practical implications – The proposed model promotes widespread access to homeownership, offering practical solutions for policymakers to improve affordability, prompting adaptable risk management strategies for financial institutions and empowering potential homebuyers with increased flexibility.

Originality/value – The study introduces a transformative housing finance model for Malaysia, merging elements from reverse mortgages, Islamic finance and the HTB scheme, offering potential applicability to similar systems globally.

Keywords Homeownership, House affordability, Mortgage loan, Home financing, Financing model, Future value

Paper type Research paper



The Ministry of Higher Education Malaysia supported this work through the Fundamental Research Grant Scheme (FP129-2020). The authors also appreciate the reviewers for their constructive comments.

International Journal of Housing Markets and Analysis
Vol. 18 No. 3, 2025
pp. 825-847
© Emerald Publishing Limited
1753-8270
DOI 10.1108/IJHMA-11-2023-0156

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Introduction

The persistent global aspiration for homeownership encounters formidable financial constraints and regulatory barriers, necessitating innovative financing approaches (Said *et al.*, 2014). This study delves into Malaysia's housing finance landscape, where escalating housing costs and soaring household debt underscore the imperative for novel financing strategies. Quigley and Raphael (2004) emphasize the inextricable link between homeownership and household debt, particularly impacting urban housing affordability. The Malaysian housing market faces a unique challenge, ranking highest in household debt among Southeast Asian nations in 2022 (Asila, 2022), exacerbated by commercial banks' reluctance to finance due to repayment concerns (Mohamad Jais, 2022). Conventional banking criteria focused on creditworthiness further constrict options for potential homebuyers. Soon and Tan (2019) highlight the role of monthly income in determining affordability, while Osmadi *et al.* (2015) stress the need to curb housing costs without worsening debt burdens.

Moreover, houses in Malaysia remained unaffordable to many households due to the failure of the market to produce a sufficient quantity of affordable housing for the masses [Department of Statistics Malaysia (DOSM), 2020; Bank Negara Malaysia (BNM), 2020]. The Khazanah Research Institute (2015) showed that many blue-collar workers in Malaysia have difficulties buying a house. For them, the affordability of a standard house is four times higher than their median income (Mohamad Jais, 2022). This necessitates a housing finance model that mitigates financial strain and addresses the limitations of existing models.

The proposed model innovatively tackles the limitations of existing models by exploring solutions, thus emphasizing the urgent need for a revamped financing framework. This approach primarily targets expanding homeownership opportunities for low-income demographics, aiming to diminish the impact of traditional credit criteria and broaden the horizons for potential homebuyers. In this context, the primary objective is to relieve the monthly payment burden, especially for low-income individuals and families.

The proposed model addresses this research gap by balancing reducing monthly payments and mitigating household debt, addressing the urgency for a revamped financing framework. Mainly targeted at expanding homeownership opportunities for low-income demographics, this model endeavors to diminish the impact of traditional credit criteria, broadening the horizons for potential homebuyers. Prioritizing affordability and sustainable debt management, this model aspires to reshape Malaysia's housing finance landscape.

The paper is organized as follows: Section 2 reviews relevant literature, and Section 3 elaborates on the methodology of the proposed financing model and the simulation approach. In Section 4, the empirical analysis of the proposed model is discussed. Section 5 elaborated on the study's findings and implications. Finally, Section 6 provides the conclusion.

Literature review

Overview of global homeownership challenges

The quest for homeownership is a complex global challenge intricately woven into housing finance models, as underscored in existing literature (Ismail *et al.*, 2015). This pursuit involves a collaborative effort between financial institutions, such as banks and government agencies, extending loans to prospective homebuyers and establishing loan arrangements with predefined repayment schedules (Peter, 2017). However, achieving homeownership is filled with persistent challenges that transcend geographical boundaries.

Recent research by Arundel and Ronald (2021) and Vangeel *et al.* (2023) reveals escalating challenges in global homeownership. Arundel and Ronald's (2021) empirical findings indicate declining access, intensifying wealth disparities and increased volatility in

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

housing concentrations. Vangeel *et al.* (2023) highlight specific vulnerabilities, noting that young tenants and lower-income households face significant barriers to entering the housing market. These studies underscore a growing housing disparity, impacting social equity and economic mobility.

Examining housing finance systems worldwide reveals both commonalities and differences. Governments globally recognize the intricate interplay between housing affordability, financing and market dynamics, leading to the introduction of various schemes to facilitate homebuying. For instance, the United Kingdom's (UK) Help to Buy (HTB) scheme plays a significant role, involving equity loans that provide potential homeowners with a low-interest loan to boost their deposits (Carozzi *et al.*, 2024). This global acknowledgment underscores nations' need to seek innovative ways to address these challenges.

In Malaysia, similar efforts have been made to address homeownership challenges, notably through Rumah Selangorku, the People's Housing Project and MyHome (Rosylin *et al.*, 2017). However, the challenges persist, with eligibility requirements and high interest rates as impediments for many aspiring homeowners (Rosylin *et al.*, 2017). Like its global counterparts, Malaysia's housing finance system reflects the need for novel approaches to bridge the affordability gap.

The variations in housing finance systems worldwide highlight the need for adaptive approaches to address the diverse challenges in achieving homeownership. Understanding these variations allows exploring existing financing approaches, including equity loan schemes like the UK Government's HTB scheme. Such schemes aim to alleviate financial constraints by providing low-interest loans to boost deposits, creating a more accessible path to homeownership (Szumilo and Vanino, 2021).

By acknowledging these global interventions, nations gain insights into practical strategies for addressing housing affordability, financing and market dynamics. The synthesis of commonalities and differences in housing finance systems globally informs the ongoing quest for innovative solutions, emphasizing the importance of adaptive policies to meet the evolving needs of individuals and households seeking to fulfill the dream of homeownership.

Current state of Malaysia's housing finance system

Malaysia's housing finance landscape is characterized by a dual system comprising both conventional and Islamic loans, reflecting the country's diverse financial environment. Financial institutions and government-backed schemes are pivotal in facilitating homebuying, with Islamic banking emerging as a significant player as it offers a range of home financing facilities (Sharifah and Puspa, 2019). Despite the variety of financing options available, Malaysia faces formidable challenges in ensuring housing affordability, especially for low-income households.

Malaysia's dual housing finance system provides borrowers diverse options aligned with their preferences and religious considerations. Conventional loans, offered by commercial banks, have been a traditional avenue for home financing. However, the reluctance of these banks to finance due to escalating housing costs and household debt poses a challenge, limiting accessibility to conventional loans for many aspiring homeowners (Tan, 2021).

Islamic banking, on the other hand, introduces unique principles, such as Musharakah Mutanaqisah, establishing joint ownership between the bank and the borrower with gradual ownership transfer, Bai' Bithaman Ajil, featuring a deferred payment structure and Tawarruq (Andreas, 2007), involving a commodity trading arrangement. However, these

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

models need to be revised to address broader affordability issues, particularly for low-income individuals.

Malaysia's current housing finance models exhibit strengths and limitations, with a notable focus on the latter, particularly in catering to the needs of low-income households. Stringent eligibility criteria pose a primary hurdle, leaving many low-income individuals ineligible for housing financing [Department of Statistics Malaysia (DOSM), 2020]. High interest rates compound the issue, straining monthly payments and excluding potential borrowers (Rosylin *et al.*, 2017). The persistent affordability gap, especially for low-income groups, results from misaligned government-mandated home prices and buyers' financial capacity (Mariana *et al.*, 2020). Existing models exhibit limitations in eligibility, high interest rates and addressing the affordability gap, necessitating a comprehensive reevaluation for a more inclusive, sustainable and accessible housing ecosystem in Malaysia.

Theoretical underpinning of the proposed model

The housing finance model uniquely integrates global trends, using elements from reverse mortgages, Islamic finance and the future value approach to address Malaysia's housing challenges with a focus on affordability. Islamic finance, anchored in principles prohibiting usury (Riba) and uncertainty (Gharar), offers a distinct ethical framework for housing finance (Uddin, 2015). The proposed model integrates Islamic finance principles, such as Musharakah Mutanaqisah and Tawarruq, ensuring compliance with *Sharia* while addressing the specific needs of Malaysia's economic conditions.

Reverse mortgages, a concept familiar in global financial markets, particularly in the USA through the home equity conversion mortgage (HECM) program, contribute another layer to the model (Bishop and Shan, 2008). The proposed model innovatively adopts aspects of reverse mortgages, allowing homeowners to leverage accrued equity without relinquishing ownership or occupancy rights. Strategies from reverse mortgages, including lease-back arrangements and property subdivisions, are considered, adapting these global practices to the Malaysian context (Mohammed and Noralfishah, 2017). Drawing insights from successful global initiatives like the UK's HTB scheme, which involves equity loans to boost homebuyers' deposits, the proposed model ensures a well-rounded approach to affordability (Carozzi *et al.*, 2024).

The proposed housing finance model is anchored in the future value approach, a concept vital in finance domains (McDermott, 2017). Applying it to housing finance, as endorsed by Nor Hamizah *et al.* (2020), introduces innovation. The future value approach deducts the initial loan payment's loan-to-value (LTV) ratio, aligning with reverse mortgages. Modeling long-term housing prices using geometric Brownian motion (GBM) ensures adaptability to borrower ages and expected interest rates, alleviating monthly payment burdens for sustainable debt management (Ameira *et al.*, 2018).

This model innovates by combining Islamic finance, reverse mortgages and the future value approach, addressing Malaysia's housing finance complexities. It offers reduced monthly payments, balancing sustainability. Ethical considerations, home equity flexibility and a forward-looking approach position it as a catalyst for homeownership without burdening households.

This theoretical underpinning of the proposed model blends principles from Islamic finance, reverse mortgages and the future value approach, drawing insights from successful global initiatives like the UK's HTB scheme. This innovative framework sets the model apart from existing equity loan schemes, aligning more closely with Malaysia's economic and cultural context. The integration of ethical considerations, flexibility in leveraging home equity and a forward-looking approach through the future value concept positions the model as a promising avenue for addressing the challenges in Malaysia's housing finance

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

landscape. Rigorous scrutiny and practical testing will be essential to ensure the effectiveness and viability of this innovative approach.

Application of future value approach in developing countries

The future value approach in housing finance, explored globally, offers insights into real estate market dynamics and financial principles impacting affordability (Peterson *et al.*, 2004). In developing countries like Malaysia, a comparative analysis of its implementation in similar economies provides crucial lessons (Munusamy *et al.*, 2015). Khajvand and Tarokh (2011) introduce the idea of customer lifetime value (CLV) as a quantifiable parameter for customer segmentation in customer-based organizations. While not directly related to housing finance, estimating future customer value based on segments can be paralleled in the housing market. Shi *et al.* (2021) stress investment-driven dynamics, which is vital for policymakers in developing nations. Meulen *et al.* (2011) contribute insights into house price fluctuations and applicable lessons for uncertain housing markets.

In Malaysia, implementing the future value approach involves leveraging experiences, incorporating efficient models and addressing challenges like eligibility and high interest rates (Najihah and Ahmad Ariffian, 2021). Adapting global models to Malaysia's unique socioeconomic and cultural landscape is crucial, recognizing potential limitations in predicting long-term housing prices accurately (Meulen *et al.*, 2011). A contextualized approach, informed by global insights and local dynamics, can strategically enhance affordability and sustainable homeownership in Malaysia.

Methodology

Study area

This study encompasses Malaysia, a Southeast Asian nation (see Figure 1), comprising Peninsular Malaysia (West Malaysia) with a higher population and Sabah and Sarawak (East Malaysia) with a smaller population. The Peninsula, especially the Klang Valley area, encompassing Kuala Lumpur and Putrajaya, is the country's primary commercial center,



Source: World Map (2023)

Figure 1.
Maps of Malaysia

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

with more robust real estate development. The study's choice of Malaysia stems from its acute housing affordability challenges, a common issue in emerging markets and its distinctive feature of simultaneously operating a dual conventional and Islamic finance banking system. This research encapsulates the timeframe from 2022 to 2024, during which the innovative housing finance model was crafted, analyzed and refined.

Proposed financing model

The proposed housing finance model for Malaysia introduces four key variables crucial to its functionality: the appreciation rate of house prices, the expected interest rate, the initial guarantee fee and the LTV ratio. Each variable is thoughtfully calibrated, drawing from historical data and strategic considerations to navigate Malaysia's housing market dynamics. This concise overview aims to shed light on the intricacies of these variables, offering insights into the model's adaptability, risk management and overall effectiveness in promoting sustainable homeownership.

Appreciation rate of house price

Influential long-term trends in potential housing values are depicted by applying GBM, a concept adapted from the HECM model (Szymanoski, 1994). GBM is a prevalent model extensively used for simulating the stochastic dynamics of real estate, stock prices and exchange rates. When housing prices adhere to a lognormal distribution, GBM emerges as a stochastic model. Representing the house price as H and using the GBM framework, the stochastic housing price model can be concisely articulated using equation (1) (Ping and Ji-Pyo, 2014):

$$\frac{dH}{H} = \mu dt + \sigma dz \tag{1}$$

Where:

H = House price;
μ = Expected appreciation rate of house price;
σ = Volatility of the appreciation rate of house price; and
dz = Wiener process.

Under the stipulations in equation (1), the returns on house prices conform to a normal distribution, with the rate of house price appreciation aligning with the expected rate. Conversely, deviations from this mean increase rate are attributed to volatility (σ). Additionally, the annual appreciation rate for each property can be regarded as an independent observation stemming from a normal distribution characterized by a mean of μ and a standard deviation of σ. Across varying periods, the cumulative appreciation rate similarly adheres to a normal distribution. In this context, the mean is denoted as μt, and the standard deviation represents the $\sqrt{t}$ (Ping and Ji-Pyo, 2014). The expected house price, denoted as, E[H(N)], derived through the GBM above framework for house prices, is concisely expressed in equation (2) (Ameira *et al.*, 2018):

$$E[H(N)] = H_N = H_0 e^{\mu N + 0.5\ \sigma^2 N} \tag{2}$$

Where,

H_0 = Initial house price;
N = Number of years;
μ = Appreciation rate of house price.
σ = Volatility of the appreciation rate of house price

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

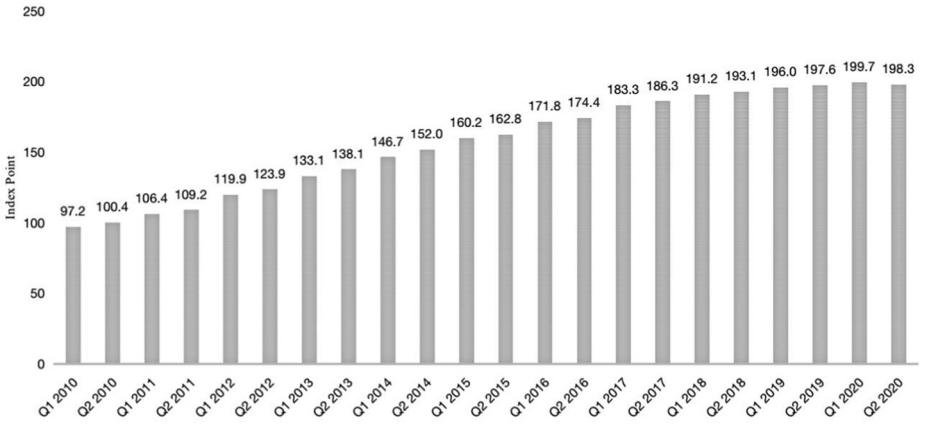
The projected house price at a future point, denoted as E[H(N)], and derived from the GBM above framework for house prices, is elucidated in equation (2). The appreciation rate in the proposed model is meticulously derived from historical data and projections to establish a robust starting point for the simulation. As elucidated in equation (2), the GBM framework integrates insights from Malaysia's house price index data (NAPIC, 2021) spanning from 2010 to 2020. The parameters, μ and σ, constants in the HECM model (Szymanoski, 1994), are initially set at an expected appreciation rate of 4% and a volatility rate of 10%. These values, serving as preliminary estimates, are open to refinement through further analysis and sensitivity testing, ensuring the model's adaptability to changing market dynamics (Lin Lee, 2009). However, it is essential to acknowledge the concern raised about assuming a set house price appreciation rate. Recognizing the inherent variability in real estate markets, future iterations of the model will consider adopting these rates based on emerging data and market conditions to enhance the model's accuracy and relevance. In the context of this research, the actual values of μ and σ can be established by using time series data sourced from Malaysia's National Property Information Centre (NAPIC).

Figure 2 shows the trend of the Malaysia House Price Index from Quarter 1, 2010, to Quarter 2, 2020 (22 years) from NAPIC (2021).

Historical data serves as the foundation for appreciation rate assumptions, ensuring the model's realism. Equation (2) allows the model to accommodate variability by projecting future house prices, providing flexibility in adjusting appreciation rates over time. This dynamic approach aligns with the inherent fluidity of real estate markets, offering a comprehensive basis for evaluating the effectiveness of the proposed financing model (Ameira *et al.*, 2018; Ping and Ji-Pyo, 2014). Table 1 shows the comprehensive house price index's statistical results. The average annual appreciation rate of house prices, μ was 3.40%.

The volatility of the appreciation rate of house prices was obtained using equation (7) for historical fluctuations and fixed at 2.41% per year:

$$\sigma = \sqrt{\frac{\sum (x_i - m)^2}{n - 1}} \tag{7}$$



Source: NAPIC (2021)

Figure 2.
Trend of Malaysia House Price Index

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Where,
σ = *Historical fluctuation from time T*;
n = *number of period*;
x_i = *the return at time T*; and
m = *average of the return*.

Expected interest rate. Pension-calculated interest rates are essential in estimating optimal monthly payments and guiding short-term loan rates in the mortgage term (Bishop and Shan, 2008; Lee *et al.*, 2010). In the HECM, fixed and floating interest rates are used (Ampofo, 2020). Fixed rates tie to 10-year government bond yields, while floating rates connect fixed margins to one-year government bond yields, harmonized with London interbank offered rate (LIBOR) (Ping and Ji-Pyo, 2014; Wang *et al.*, 2014). This flexible approach adjusts annually, aligning with LIBOR fluctuations and ensuring adaptability to market changes (Braml, 2016). Evaluating short-term loan interest rates throughout the reverse mortgage duration, as emphasized by Lee *et al.* (2010), is crucial for aligning rates with borrower well-being and system sustainability (Said *et al.*, 2022). Interest rates directly influence loan limits and monthly payments, impacting the viability of reverse mortgages (Zheng and Xikun, 2016). Researchers can manipulate rates to assess scenarios, revealing their implications on borrowers and model performance. The study highlights the delicate balance required between borrower interests, system sustainability and housing finance objectives, emphasizing the significant impact of even slight interest rate variations on borrowers and the financial landscape.

In Malaysia, the *Skim Saraan Bercagar* (SSB), the country's inaugural reverse mortgage scheme, commenced with an initial annual interest rate of 5.90%, as confirmed by the National Mortgage Corporation of Malaysia (Cagamas) in response to an announcement of an overnight policy rate increment by the Central Bank of Malaysia [National Mortgage Corporation of Malaysia (Cagamas) 2023]. In contrast, South Korea's mortgage pension system ties borrower interest rates to the prevailing interest rate through floating rates, which entail an additional 1.1% increment to the 91-day certificate of deposit (CD) bond yield (Heo *et al.*, 2016). The discount rate used for pension calculations is determined by the 10-year Treasury bond and is set at 6.33% (Ping and Ji-Pyo, 2014). Notably, the issuing financial institution adds lending interest rates to the loan balance one month after the monthly payment disbursement. This arrangement implies that borrowers are relieved from paying the interest rate directly from their monthly payments (Korea Housing Finance Corporation, 2013). Consequently, fluctuations in CD interest rates can induce changes in monthly housing payments, which may result in higher or lower payment amounts (Ellis and Berger-Thomson, 2004).

Furthermore, in the event of an interest rate increase, there is a potential need for additional collateral earlier than initially projected (Lee, 2011). In this study, the expected interest rate is computed by combining the base interest rate with the margin established by the lender, following the approach advocated by Ping and Ji-Pyo (2014). For instance, a loan

Mean	Std. Error	SD	Min	Max	Range
3.40%	7.56	35.48	97.20	199.70	102.50

Table 1.
Descriptive analysis

Source: Authors' own work

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

featuring a cumulative interest rate of 5.9% is determined by adding a margin of 3.15% to an interest rate index of 2.75%.

Initial guarantee fee. Regarding guarantee fees, the HECM model includes an initial premium of 2% based on the starting house price of the reverse mortgage, paid upfront as a lump sum (Ameira *et al.*, 2018; Bishop and Shan, 2008). In addition, a monthly guarantee fee of 0.5% of the annual interest is added to the total loan amount (Ma and Deng, 2006). Pu *et al.* (2012) noted that the borrower's loan amount encompasses initial subscription fees, service charges, interest and other relevant payments combined with the loan principal. This singular premium structure applies uniformly across all reverse mortgage products, irrespective of the borrower's age, house price or chosen payment method. In contrast, South Korea's housing pension model incorporates an initial subscription fee and an annual guarantee fee (Ping and Ji-Pyo, 2014). The initial guarantee fee, denoted as UP_0, amounts to 2% of the house price and is required on the first payment date, with its calculation outlined in equation (3). Annual guarantee fees are paid monthly, equivalent to 0.5% of the year's guarantee balance. Borrowers submit these guarantee fees to designated agencies, such as the Korea Housing Finance Corporation, which then integrates them into the total pension amount (loan balance) (Korea Housing Finance Corporation, 2013):

$$UP_0 = 2\% \times H_0 \tag{3}$$

Where,

UP_0 = Initial guarantee fees; and

H_0 = Initial house price.

Initial guarantee fees in reverse mortgages play a crucial role in risk management and sustaining program viability (Kuo *et al.*, 2011). In the new financial model, integrating these fees strategically serves multiple purposes. Aligning them with reverse mortgage terms discourages early repayments for reasons like borrower passing or relocation (Choi, 2019), ensuring financial stability. This incorporation strengthens the proposed model, addressing premature loan terminations, promoting responsible borrowing and aligning with long-term program objectives.

Loan-to-value. The initial steps in calculating the monthly reverse mortgage payments involve determining the maximum LTV ratio and the net borrowing limit, which is achieved by offsetting the house price at the end to the present value (PV) of the reverse mortgage's net borrowing limit PV (Ping and Ji-Pyo, 2014). This process necessitates calculating the expected house price and the discount rate at maturity. The LTV ratio is then obtained by dividing the initial borrowing limit by the current house price (Park, 2012). Subsequently, the PV can be computed using this value while accounting for initial costs. As Park (2012) highlighted, building upon the calculated PV, one can establish future monthly payments. In this study, the LTV was estimated using equation (4):

$$LTV = \frac{H_N}{H_0(1+r)^N} \tag{4}$$

Where,

LTV = maximum reverse mortgage loan ratio;

H_N = expected house price at the future time of expiration N; and

r = interest rate.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Once the borrower's maximum LTV ratio is established based on the loan period, the proposed model's net borrowing limit (PV) can be calculated. This computation entails multiplying the house price at the time of lending ($t = 0$) by the LTV ratio, as indicated in equation (5) while factoring in the initial guarantee fees:

$$PV = H_0 \times LTV - UP_0 \tag{5}$$

Where,
PV = present value of the net borrowing limit of the proposed model;
H_0 = house price at a current period ($t = 0$);
LTV = maximum reverse mortgage loan ratio; and
UP_0 = initial guarantee fees.

In this study, equation (6) was used to calculate monthly payments, denoted as monthly payment (PMT) and adapted from the *Musharakah Mutanaqisah* model (Abu Hasnat *et al.*, 2017):

$$PMT = \frac{i(1+i)^n PV}{(1+i)^n - 1} \tag{6}$$

Where,
PMT = monthly payment of the lifetime annuity payment method;
PV = present value of the net borrowing limit of the proposed model;
n = number of period (months); and
i = calculated expected interest rate monthly.

Simulation approach

The proposed model has been computed using the following approach (see Figure 3).

Acknowledging the experimental nature of the paper, it is crucial to emphasize the need for clarity concerning the variables in the hypothetical scenario. In response to this concern, a commitment is made to explicitly state and discuss the variables involved in the proposed model. The simulation methodology, illustrated in Figure 3, follows a systematic and iterative process to assess the proposed financing model's effectiveness under various scenarios. Equations (1–6) are instrumental in translating considerations of historical data, economic trends and model parameters into quantifiable outcomes. To assess the effectiveness of the proposed model, it is crucial to make certain assumptions regarding potential increases or decreases in housing prices. Equation (2) was used in this study to calculate expected house prices. Specifically, for the parameter values within equation (2), namely, the house price appreciation rate (μ) and the volatility of this rate (σ), data from Malaysia's house price index spanning from Quarter 1 of 2010 to Quarter 2 of 2020, sourced from the NAPIC, Ministry of Finance (NAPIC, 2021), were used for estimation purposes.

Within the Malaysian financial landscape, interest rates for deposits and lending are subject to government regulations. Therefore, this research adopts fixed interest rates for consistency.

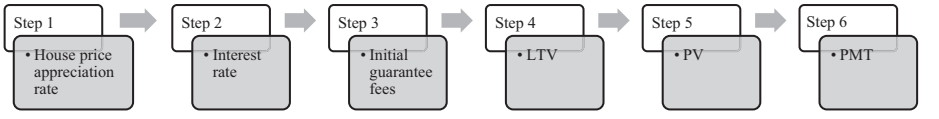


Figure 3.
Steps for computing the proposed model

Source: Authors' own work

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

The initial and annual guarantee rates are set at 2% and 0.5%, respectively, aligning with the rates used in the American HECM program and the Korean housing pension system. An anticipated interest rate of 5.9% will be applied to construct the proposed model, sourced from Malaysia's inaugural reverse mortgage scheme, the SSB (Cagamas, 2023).

The monthly payment calculation determines the maximum LTV ratio and the net borrowing limit. Equation (4) computes the LTV, dividing the initial borrowing limit by the current house price. This result determines the (PV) with the initial house price, incorporating initial guarantee fees [equation (5)]. Once PV is established, equation (6) computes the monthly payment from the Musharakah Mutanaqisah model. Illustrating the model through a hypothetical scenario underscores the commitment to transparently discussing these variables, ensuring a comprehensive understanding of the proposed financing model.

Assumptions underpinning the simulation include fixed interest rates for consistency across iterations. However, there is a recognition of the potential need to adapt interest rates in future model versions to reflect changing economic conditions. The initial guarantee fees and LTV ratios are initially assumed based on established practices but are subject to refinement as the model evolves.

The simulation has limitations due to fixed parameters representing the current state of knowledge. However, efforts will be made to refine the model based on emerging insights, new data and changing market conditions. The iterative nature of the simulation methodology allows for continuous improvement and adaptation to ensure the proposed financing model remains robust and relevant.

The raised concern about assuming a set house price appreciation rate and the willingness of lenders to bear the house price risk is acknowledged and warrants attention. It is acknowledged that entities rarely accept such risks, prompting a realization of the need for a more nuanced approach in the revised model. The goal is to refine the model by incorporating dynamic and realistic parameters, allowing for adaptability to market conditions. Acknowledging the scarcity of entities willing to bear such risks emphasizes the commitment to align the proposed model with established and successful financing schemes, such as the UK Government's HTB scheme. The proposed model aims to reflect best practices and may involve federal government bodies, such as the Finance Ministry, Housing and Local Government Ministry or Economic Planning Unit. The suggestion of a special purpose vehicle (SPV) affiliated with these ministries, operating as a small profit-making or nonprofit entity, underscores the commitment to finding a viable and sustainable solution for affordable homeownership in Malaysia's residential sector. The profit-sharing mechanism starts at the time of purchase and incorporates a lock-in period. It aims to ensure responsible and mutually beneficial financing arrangements under both conventional and Islamic financing structures. The collateralization of the purchased unit further enhances the security of the proposed model.

Empirical analysis

Empirical analysis

To illustrate the proposed model, consider a scenario in which a customer aims to purchase a house valued at Ringgit Malaysia 300,000 (RM300,000) (US$66,874.72), adhering to the maximum affordable housing price as stipulated by the National Affordable Housing Policy for 2018–2025 (National Affordable Housing Policy, 2019). In this approach, we assume an expected interest rate of 5.9%, a loan duration of 20 years and an initial guarantee fee of 2%. Equation (2) was used to compute expected housing prices, with parameters μ (rate of house price appreciation) and σ (volatility of the rate of house price appreciation) estimated at 3.40% and 2.41%, respectively, based on prior calculations. The LTV ratio was determined using equation (4), considering the expected house price and the loan duration.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Subsequently, once the maximum loan ratio for the borrower was established, the net borrowing limit (PV) within the proposed model was calculated by multiplying the house price at the lending inception ($t = 0$) by the LTV ratio, incorporating the initial guarantee fees. This process concludes with calculating the monthly payment using equation (6).

Table 2 displays the amortization schedule for a standard conventional loan, considering a house price of RM300,000 (US$66,874), a 5.9% interest rate and a 20-year loan duration. The monthly payment is computed using equation (6), where the house price is the PV.

Table 3 illustrates the amortization schedule according to the proposed model, considering a house price of RM300,000.00 (US$66,874.72), an expected interest rate of 5.90%, a 20-year loan period and initial guarantee fees of 2%. The rate of house price appreciation, μ, and the volatility of the rate of house price appreciation, σ, were estimated at 3.40% and 2.41%, respectively. By applying equation (4), we derived an LTV value of 63.08%. Subsequently, the proposed model's net borrowing limit (PV), amounting to RM183,253.85 (US$40,850.71), was calculated using equation (5), factoring in the initial guarantee fees. The monthly payment was then determined using equation (6).

Table 4 compares the initial house price, loan principal, interest, annual payment, expected property value and property value increment of 4% per annum for the conventional loan and the proposed model. Table 4 highlights a significant decrease of 38.9% from conventional loans to the proposed model. The initial principal of conventional loans is RM300,000.00 (US $66,874.72). However, with the proposed model, the loan amount is now lower at RM183,253.85 (US$40,850.17), making it more affordable. This proposed model aligns with the reverse mortgage concept, where the LTV determines the net borrowing limit (PV). The LTV value

Year	Unpaid balance	Loan amortization	Interest	Annual payment	Expected property value	Property value with 4% p.a
1	RM300,000.00	RM8,243.44	RM17,700.00	RM25,943.44	RM310,465.53	RM312,000.00
2	RM291,756.56	RM8,729.80	RM17,213.64	RM25,943.44	RM321,296.15	RM324,480.00
3	RM283,026.76	RM9,244.86	RM16,698.58	RM25,943.44	RM332,504.60	RM337,459.20
4	RM273,781.91	RM9,790.30	RM16,153.13	RM25,943.44	RM344,104.05	RM350,957.57
5	RM263,991.60	RM10,367.93	RM15,575.50	RM25,943.44	RM356,108.16	RM364,995.87
6	RM253,623.67	RM10,979.64	RM14,963.80	RM25,943.44	RM368,531.03	RM379,595.71
7	RM242,644.03	RM11,627.44	RM14,316.00	RM25,943.44	RM381,387.27	RM394,779.53
8	RM231,016.59	RM12,313.46	RM13,629.98	RM25,943.44	RM394,692.00	RM410,570.72
9	RM218,703.13	RM13,039.95	RM12,903.48	RM25,943.44	RM408,460.87	RM426,993.54
10	RM205,663.18	RM13,809.31	RM12,134.13	RM25,943.44	RM422,710.07	RM444,073.29
11	RM191,853.87	RM14,624.06	RM11,319.38	RM25,943.44	RM437,456.35	RM461,836.22
12	RM177,229.82	RM15,486.88	RM10,456.56	RM25,943.44	RM452,717.06	RM480,309.67
13	RM161,742.94	RM16,400.60	RM9,542.83	RM25,943.44	RM468,510.14	RM499,522.05
14	RM145,342.33	RM17,368.24	RM8,575.20	RM25,943.44	RM484,854.16	RM519,502.93
15	RM127,974.10	RM18,392.96	RM7,550.47	RM25,943.44	RM501,768.35	RM540,283.05
16	RM109,581.13	RM19,478.15	RM6,465.29	RM25,943.44	RM519,272.58	RM561,894.37
17	RM90,102.98	RM20,627.36	RM5,316.08	RM25,943.44	RM537,387.46	RM584,370.15
18	RM69,475.62	RM21,844.38	RM4,099.06	RM25,943.44	RM556,134.27	RM607,744.95
19	RM47,631.24	RM23,133.19	RM2,810.24	RM25,943.44	RM575,535.07	RM632,054.75
20	RM24,498.05	RM24,498.05	RM1,445.39	RM25,943.44	RM595,612.67	RM657,336.94
Total		RM300,000.00	RM218,868.73	RM518,868.73	RM285,147.14	RM345,336.94

Table 2. Amortization table for a conventional loan

Source: Authors' own work

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Year	Unpaid balance	Loan amortization	Interest	Annual payment	Expected property value	Property value with 4% p.a
1	RM183,253.85	RM5,035.47	RM10,811.98	RM15,847.45	RM310,465.53	RM190,584.01
2	RM178,218.38	RM5,332.56	RM10,514.88	RM15,847.45	RM321,296.15	RM198,207.37
3	RM172,885.82	RM5,647.19	RM10,200.26	RM15,847.45	RM332,504.60	RM206,135.66
4	RM167,238.63	RM5,980.37	RM9,867.08	RM15,847.45	RM344,104.05	RM214,381.09
5	RM161,258.26	RM6,333.21	RM9,514.24	RM15,847.45	RM356,108.16	RM222,956.33
6	RM154,925.05	RM6,706.87	RM9,140.58	RM15,847.45	RM368,531.03	RM231,874.58
7	RM148,218.18	RM7,102.58	RM8,744.87	RM15,847.45	RM381,387.27	RM241,149.57
8	RM141,115.60	RM7,521.63	RM8,325.82	RM15,847.45	RM394,692.00	RM250,795.55
9	RM133,593.97	RM7,965.40	RM7,882.04	RM15,847.45	RM408,460.87	RM260,827.37
10	RM125,628.57	RM8,435.36	RM7,412.09	RM15,847.45	RM422,710.07	RM271,260.47
11	RM117,193.20	RM8,933.05	RM6,914.40	RM15,847.45	RM437,456.35	RM282,110.88
12	RM108,260.15	RM9,460.10	RM6,387.35	RM15,847.45	RM452,717.06	RM293,395.32
13	RM98,800.05	RM10,018.25	RM5,829.20	RM15,847.45	RM468,510.14	RM305,131.13
14	RM88,781.81	RM10,609.32	RM5,238.13	RM15,847.45	RM484,854.16	RM317,336.38
15	RM78,172.49	RM11,235.27	RM4,612.18	RM15,847.45	RM501,768.35	RM330,029.83
16	RM66,937.21	RM11,898.15	RM3,949.30	RM15,847.45	RM519,272.58	RM343,231.03
17	RM55,039.06	RM12,600.14	RM3,247.30	RM15,847.45	RM537,387.46	RM356,960.27
18	RM42,438.92	RM13,343.55	RM2,503.90	RM15,847.45	RM556,134.27	RM371,238.68
19	RM29,095.36	RM14,130.82	RM1,716.63	RM15,847.45	RM575,535.07	RM386,088.23
20	RM14,964.54	RM14,964.54	RM882.91	RM15,847.45	RM595,612.67	RM401,531.75
Total		RM183,253.85	RM133,695.13	RM316,948.98	RM285,147.14	RM210,947.75

Source: Authors' own work

Table 3. Amortization table for the proposed model

Loan comparison	Initial house price	Loan principal	Interest	Annual payment	Expected property value	Property value with 4% p.a
Conventional loan	RM300,000.00	RM300,000.00	RM218,868.73	RM518,868.73	RM285,147.14	RM345,336.94
Proposed model	RM300,000.00	RM183,253.85	RM133,695.13	RM316,948.98	RM285,147.14	RM210,947.75
Difference	RM0.00	RM116,746.15	RM85,173.61	RM201,919.75	RM0.00	RM134,389.19
Percentage difference	100.0%	38.9%	38.9%	38.9%	0.0%	38.9%

Source: Authors' own work

Table 4. Comparison of conventional loan and proposed model

incorporates future value, leading to a reduction in the loan principal and a decrease in the annual payment.

Figure 4 complements the data, visually representing the unpaid balance and annual payments for both conventional loans and the proposed model. The outcomes outlined in Table 4 and illustrated in Figure 4 unequivocally illustrate the substantial disparities in annual payments between the conventional loan and the proposed model. The proposed model presents significantly lower principal, interest and annual payment figures than conventional loans. These findings underscore the considerable cost reductions that borrowers can enjoy by opting for the proposed model, with differences in each aspect hovering around 38.9%, emphasizing the substantial financial benefits of the proposed model over the conventional loan.

Moving beyond individual metrics, Table 5 delves into regional mortgage payments over different time periods within the proposed model's framework. The table captures variables

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

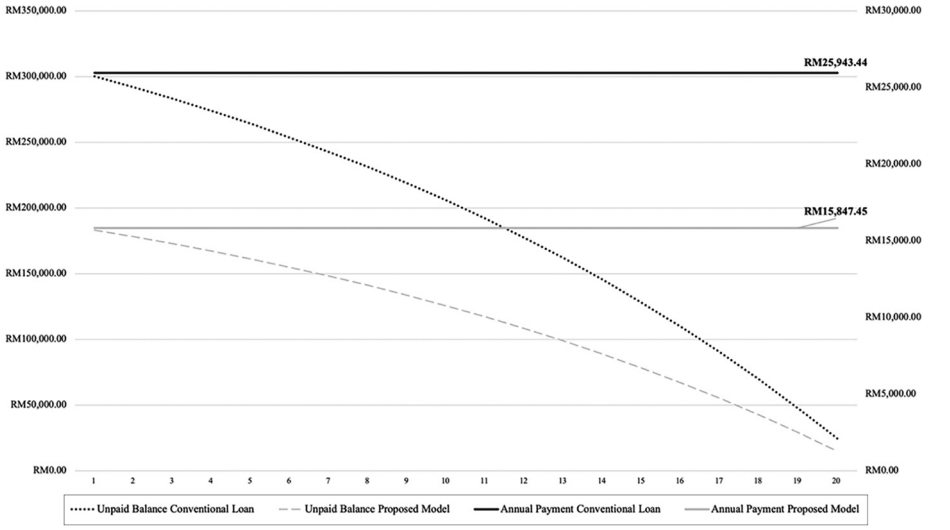


Figure 4.
Comparison of conventional loan and proposed model

Notes: This figure shows the graph plotted according to Table 5. Comparing the annual payment between the value from a conventional loan and the proposed model. This figure also shows a significant difference in the starting point for the unpaid balance value between the conventional loan and the proposed model
Source: Authors' own work

No. of periods, N	15	20	25	30	35
Initial house price, H_0	RM300,000	RM300,000	RM300,000	RM300,000	RM300,000
Interest rate, r	5.90%	5.90%	5.90%	5.90%	5.90%
Initial guarantee fee, UP_0	2.00%	2.00%	2.00%	2.00%	2.00%
Expected appreciation rate of house price, μ	3.40%	3.40%	3.40%	3.40%	3.40%
Volatility of the appreciation rate of house price, σ	2.41%	2.41%	2.41%	2.41%	2.41%
Expected house price, H_N	RM501,768.35	RM595,612.67	RM707,008.44	RM839,238.24	RM996,198.61
Loan-to-value, LTV	70.79%	63.08%	56.22%	50.11%	44.65%
Present value of the net borrowing limit of the proposed model, PV	RM206,355.67	RM183,253.85	RM162,665.24	RM144,316.43	RM127,963.76
Monthly payment, PMT	RM1,730.22	RM1,302.34	RM1,038.13	RM855.99	RM721.06

Source: Authors' own work

Table 5.
Regional mortgage payments

such as the number of periods (N), initial house price (H_0), interest rate (r), initial guarantee fee (UP_0), the anticipated house price appreciation rate (μ), the volatility of the house price appreciation rate (σ), the expected house price at the end of the period (H_N), LTV ratio, the PV of the net borrowing limit in the proposed model (PV) and monthly payment (PMT). These dynamic insights underscore the flexibility of the proposed model, allowing borrowers to tailor their financing to specific financial goals and circumstances.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

The advantages of the proposed model extend beyond mere reduction in interest rates, encompassing risk mitigation through an SPV and adaptability to evolving economic conditions. The SPV's role in minimizing risk exposure adds a layer of security to the financing structure. Moreover, the model's ability to consider variable parameters, as depicted in equation (2), ensures responsiveness to changing economic landscapes, enhancing its robustness.

In summary, the comparative analysis highlights the innovative features and advantages of the proposed model over the existing and widely used conventional loans in Malaysia. Its ability to significantly reduce loan principles and annual payments and adapt to changing economic conditions positions it as a compelling alternative. The model aligns with the evolving needs of potential homebuyers, offering a nuanced solution to enhance accessibility to affordable housing while addressing specific financial objectives.

Sensitivity analysis

Elizabeth *et al.* (2008) emphasized that the element of uncertainty plays a dual role in the process: first, it introduces variability in cash flows generated by developments, and second, it introduces uncertainty in the resulting profit figures. Even minor alterations in input variables can disproportionately affect the final output (Data *et al.*, 2016). This sensitivity to changes remains consistent, regardless of the methodology used to assess remaining values or conditions. The analysis heavily relies on the expertise of developers or analysts in identifying critical variables and understanding their susceptibility to changes over time (Elizabeth *et al.*, 2008). Given Malaysia's dynamic economy with ongoing developments and adjustments, factors like economic growth and government policies will significantly influence future housing prices and interest rates (Olanrewaju *et al.*, 2018). Therefore, conducting a sensitivity analysis is imperative to validate the proposed model.

A basic sensitivity analysis can be conducted in Excel using the "Data: Table" feature, assessing the impact on a chosen outcome when modifying two input variables (Elizabeth *et al.*, 2008). Calculations were performed to examine the sensitivity stemming from variations in the house price appreciation rate, and the outcomes are presented in Table 6.

The sensitivity analysis in Table 6, covering a range of appreciation rates from −10% to +10%, thoroughly examines the robustness and sensitivity of the proposed financial model from a third-person perspective. A notable outlier appears in the scenario involving a 15-year loan period with a −10% appreciation rate. The expected property value [H(N)] experiences a sharp decline to RM111,959.65 (US$24079.95), resulting in an unconventional LTV ratio of 15.79% and a negative monthly payment (PMT) of −RM346.98 (US$74.63). This anomaly, rooted in the principles of reverse mortgage and Islamic financing,

	$\mu - 10\%$			μ			$\mu + 10\%$		
N (years)	H(N) (RM)	LTV (%)	PMT (RM)	H(N) (RM)	LTV (%)	PMT (RM)	H(N) (RM)	LTV (%)	PMT (RM)
15	111,959.65	15.79	346.98	501,768.35	70.79	1,730.22	2,248,769.71	317.24	7,929.45
20	80,607.41	8.54	139.38	595,612.67	63.08	1,302.34	4,401,015.44	466.14	9,895.48
25	58,034.79	4.61	50.07	707,008.44	56.22	1,038.13	8,613,126.02	684.92	13,075.26
30	41,783.21	2.49	8.80	839,238.24	50.11	855.99	16,856,550.68	1,006.40	17,872.31
35	30,082.59	1.35	(11.01)	996,198.61	44.65	721.06	32,989,567.35	1,478.76	24,964.13

Source: Authors' own work

Table 6. Sensitivity analysis for housing price

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

underscores the model's unique characteristics when confronted with scenarios of significant depreciation.

This sensitivity analysis's broader appreciation rate range enriches understanding of the model's performance across diverse and extreme scenarios. The model displays heightened sensitivity to market fluctuations, evident in substantial variations in LTV and PMT across the range. Positive appreciation scenarios showcase the model's adaptability to thriving markets, while the outlier in the −10% scenario emphasizes potential vulnerabilities, particularly in the face of significant depreciation. The model's strength lies in its ability to offer insights into the financial dynamics of reverse mortgages and Islamic financing structures. However, the outlier underscores the need for caution and a nuanced understanding of the underlying mechanisms, especially in severe market downturns. This analysis highlights the importance of thorough stress testing and scenario planning to uncover potential weaknesses and ensure the model's resilience across market conditions. It also affirms the model's capacity to capture the intricacies of unconventional financial instruments, providing decision-makers with a valuable tool for a comprehensive understanding of the dynamics between house price appreciation, LTV and monthly payments.

Examining the consequences of varied interest rates unveils a critical relationship within the model. Lower interest rates correspond to elevated LTV ratios and increased monthly payments, potentially impacting affordability considerations. Conversely, higher interest rates lead to reduced LTV ratios and decreased monthly payments, potentially enhancing affordability for borrowers. This dynamic interplay emphasizes the significant impact of interest rate fluctuations on affordability considerations.

The sensitivity analysis extended to a broader range of −5%, +5% and +10%, providing a more comprehensive understanding of the model's behavior under varied scenarios. Two outliers are observed in the scenario with a −5% interest rate and another with a +10% interest rate. In the −5% interest rate scenario, the LTV ratio sharply increases to 146.22%, and the PMT rises to RM2,570.51 (US$552.56). This anomaly can be attributed to the unique characteristics of the proposed model, grounded in reverse mortgages and Islamic finance principles. The model applies the concept of future value, calculating the expected property value based on the LTV ratio and adapting from reverse mortgage structures.

An anomaly occurs in the 15-year loan scenario with a +10% interest rate, where the LTV ratio is 1.90% and PMT is negative (−RM4.07 or US$0.88). This anomaly, a result of the model's unconventional use of reverse mortgages and Islamic financing principles, arises in scenarios with extremely high interest rates. It emphasizes the need for careful consideration of extreme conditions, highlighting the unconventional nature of the model. While generally robust, the model's response to extreme conditions may yield unexpected results, underscoring the importance of understanding the financial mechanisms. These findings significantly contribute to discussions on housing affordability amid economic and interest rate fluctuations.

In a simulated market downturn scenario, where the appreciation rate of housing prices experiences a significant decrease (−10%) and interest rates moderately increase (+5%), the proposed model demonstrates heightened sensitivity. The housing market downturn resulted in a notable decline in expected property value [H(N)], leading to reduced LTV ratios. This, in turn, triggers a cascade effect, causing a decrease in monthly payments (PMT). Given the model's reliance on reverse mortgages and Islamic financing principles, this scenario underscores the need for adaptive measures.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Scenario analysis

Scenario-based analysis is crucial for addressing economic fluctuations in sensitivity analyses for housing appreciation and interest rates. Stakeholders can deploy risk mitigation in a market downturn with a −10% appreciation rate and +5% interest rates. Adjustments to expected property value and LTV ratios, balancing borrower affordability and lender risk, are vital. Drawing from the proposed model's principles, collaboration with the SPV becomes pivotal. Stakeholders can consider adaptive measures, such as introducing a dynamic LTV adjustment with the SPV, providing temporary relief to borrowers while maintaining the overall risk profile. This approach aligns with the HTB scheme and enhances the model's resilience to economic variations.

Government intervention, emphasizing policy flexibility during economic fluctuations, is crucial. Engaging with relevant government authorities for policy flexibility and seeking temporary adjustments in regulatory frameworks, especially in risk-sharing mechanisms and interest rate regulations, establishes a robust safety net during challenging economic periods. Collaborative efforts with the SPV and government entities and potential adjustments to model parameters ensure the proposed housing finance model's resilience. Proactively engaging with government authorities, advocating for policy flexibility and collaborating with the SPV serve as a robust safety net during challenging economic periods. External factors, integrated into the analysis, enhance realism. Stakeholders contribute to the model's adaptability through proactive decision-making. Each scenario provides valuable insights, empowering stakeholders, policymakers and investors to make informed decisions for a sustainable and responsive housing finance framework. By adopting an analytical approach, this study goes beyond a mechanical presentation, delving into the broader implications of its findings for the housing finance landscape. Transparently acknowledging the model's limitations underscores the commitment to continuous improvement, contributing significantly to the refinement of housing finance methodologies.

Discussion

Findings within the context of previous studies

The findings of this study, when compared with insights from previous research on financing models in reverse mortgages, the HTB scheme and Islamic finance, highlight the substantial advantages offered by the proposed model over conventional loans. Table 4 and Figure 4 highlight significant disparities in annual payments, showcasing lower principal, interest and annual payment figures in the proposed model. These outcomes align with and contribute to the existing body of knowledge, emphasizing the considerable cost reductions and financial benefits achievable through the proposed model.

The sensitivity analysis presented in Tables 6 and 7 underscores the model's adaptability to adverse conditions, particularly when interest rates exceed housing rates. Scenarios like a market downturn with decreased appreciation rates and increased interest rates vividly showcase the model's responsiveness. In 15 years, with a −10% appreciation rate and a +5% interest rate, the model adjusts by increasing LTV ratios and monthly payments, demonstrating its ability to adapt to economic challenges.

However, it is crucial to note that the model's adaptability may involve trade-offs, such as elevated LTV ratios and monthly payments. Collaboration with the SPV and government authorities becomes essential in response to these scenarios. Introducing adaptive measures and potential adjustments to model parameters, like implementing a dynamic LTV adjustment mechanism with the SPV, temporarily eases borrowers while maintaining a balanced risk profile.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

The model's adaptability in extreme conditions requires stakeholders to weigh associated trade-offs. Proactive collaboration with the SPV ensures resilience in dynamic economic landscapes. Measures introduced for effective navigation of fluctuating conditions anticipate economic uncertainties. Inspired by the UK's HTB scheme, stakeholders should consider dynamic adjustments, particularly a mechanism for dynamic LTV in partnership with the SPV, offering temporary relief to borrowers while maintaining the overall risk profile. Government intervention, seeking temporary adjustments in regulatory frameworks through active engagement with relevant authorities, is a robust safety net during challenging economic periods. In summary, this discussion aligns findings with previous studies, showcasing adaptability, proposing enhancements, actively exploring areas for improvement and transcending a mechanical presentation.

Application of future value approach in similar housing finance systems

Exploring the future value approach in housing finance provides valuable insights for Malaysia. Peterson *et al.* (2004) laid the mathematical foundation for understanding the time value of money, which is crucial in predicting housing market trends (Munusamy *et al.*, 2015). Khajvand and Tarokh's (2011) CLV concept, adaptable to housing and Mohamad Shukry *et al.*'s (2012) data mining in predicting house prices offer valuable models. Shi *et al.*'s (2021) insights on investment-driven dynamics and Meulen *et al.*'s (2011) analysis of house price fluctuations provide lessons for policymakers. In Malaysia, the proposed model, combining reverse mortgages, Islamic finance and the future value approach, can benefit from worldwide experiences for refinements.

However, challenges exist in implementing the future value approach in the Malaysian context due to its unique socioeconomic landscape and cultural considerations. While global models offer valuable insights, careful adaptation to local dynamics is crucial. Insights from Meulen *et al.* (2011) caution that forecasting models may enhance predictive power, but challenges persist in accurately predicting long-term housing price developments. Ensuring the relevance of insights from other models demands a customized approach, recognizing and addressing the distinctive challenges of the Malaysian housing market.

Implications for financial institutions, borrowers and policymakers

Implementing the proposed housing finance model poses challenges and opportunities for financial institutions. Elevated LTV ratios require a reevaluation of risk management, urging diversified portfolios. Regulatory compliance demands a meticulous review, necessitating collaboration with authorities. The integration of predictive analytics and data

Table 7. Sensitivity analysis for interest rate

	$r-5\%$		r		$r+5\%$		$r+10\%$	
N (years)	LTV (%)	PMT (RM)	LTV (%)	PMT (RM)	LTV (%)	PMT (RM)	LTV (%)	PMT (RM)
15	146.22	2,570.51	70.79	1,730.22	35.43	1,133.71	18.29	714.20
20	165.97	2,240.34	63.08	1,302.34	25.07	709.78	10.38	347.85
25	188.38	2,081.98	56.22	1,038.13	17.74	459.47	5.89	157.72
30	213.81	2,014.74	50.11	855.99	12.56	299.16	3.34	53.89
35	242.68	2,004.74	44.65	721.06	8.88	191.90	1.90	(4.07)

Source: Authors' own work

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

mining requires substantial technological investment and robust data security measures to comply with regulations and protect sensitive borrower information.

For borrowers, the implications are equally profound, promising enhanced affordability and flexibility in homeownership. The reduction in initial loan payments seeks to broaden access to homeownership, particularly benefiting individuals with moderate income levels. However, borrowers must exercise caution, carefully evaluating the long-term implications of dynamic LTV adjustments and other model parameters on their financial situations. Financial literacy and education emerge as key components for empowering borrowers to navigate the intricacies of the proposed model. Collaborative efforts between financial institutions and government entities are crucial to providing comprehensive educational resources and counseling services. The model's adaptability, especially with dynamic LTV adjustments, offers borrowers increased flexibility in repayment, a significant advantage during temporary financial challenges. Proactive engagement with financial counselors or advisors becomes paramount, encouraging the development of robust financial plans that consider potential fluctuations in monthly payments and ensuring preparedness for varying economic conditions.

Borrowers representing diverse socioeconomic backgrounds may experience distinct impacts on affordability. Recognizing and discussing how the proposed model caters to various demographics is crucial, ensuring homeownership is accessible across different income groups. Central to the model's success, policymakers must consider broader economic implications and weigh benefits against potential risks. A commitment to policy flexibility during economic fluctuations, as advocated by the study, requires a comprehensive discussion on potential policy adjustments. Stakeholders, including developers and regulatory bodies, must adapt strategies to changing market dynamics. Collaborative efforts between government, financial institutions and regulatory bodies are essential for addressing challenges, ensuring consumer protection and fostering an environment conducive to innovation. Striking a balance between innovation and regulatory compliance becomes a focal point for these entities, emphasizing the need for ongoing dialogue and cooperation to create a housing finance framework aligned with affordability, accessibility and sustainability goals.

The discussion of applying the future value approach in similar housing finance systems provides valuable insights and lessons for Malaysia. Leveraging experiences from other models enhances Malaysia's ability to refine its approach, incorporating efficient predictive models and addressing challenges unique to its socioeconomic landscape. The proposed model's implications for financial institutions, borrowers and policymakers demand a comprehensive discussion to ensure a balanced and sustainable housing finance framework.

Conclusions

The conclusion of this study encapsulates the innovative housing finance model proposed for Malaysia and its broader implications. The detailed comparative analysis highlighted substantial disparities between the conventional loan and the proposed financing model, emphasizing significant cost reductions. The model's adaptability to adverse conditions, evidenced by sensitivity analyses, reinforced its potential to navigate economic fluctuations effectively.

This study introduces a novel housing finance model amalgamating reverse mortgages, Islamic finance and the future value approach. Incorporating principles like Musharakah Mutanaqisah and Tawarruq and inspired by global initiatives like the UK's HTB scheme, the model addresses evolving homebuyer needs in Malaysia. The study identifies gaps in loan design, particularly in scenarios where interest rates exceed housing rates. Despite its

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

contributions, this study acknowledges certain limitations. The model's adaptability, while a strength, may come with trade-offs, such as increased LTV ratios and monthly payments. Further research is encouraged to delve deeper into these trade-offs' long-term implications on borrowers and financial institutions. The unique socioeconomic landscape of Malaysia poses challenges, necessitating the exploration of cultural considerations and local nuances that might impact the model's effectiveness.

The proposed model, while promising, has limitations. It may not cover all economic scenarios, and its effectiveness in diverse contexts needs exploration. Long-term impacts on community development and scalability require further investigation. Research could refine the future value adaptation and explore implementation challenges. The study acknowledges these constraints and calls for ongoing research to enhance understanding. This study lays the groundwork for Malaysia's transformative housing finance model, addressing financial metrics, showcasing adaptability and proposing measures for economic uncertainties. Its contribution lies in the innovative model and nuanced analysis of potential flaws, offering insights for improvement. Despite limitations, it opens avenues for refining the model in the dynamic landscape of Malaysian housing finance.

References

Abu Hasnat, B., Kamrul Islam, T. and Shahedin, A. (2017), "A comparative analysis between musharakah mutanaqisah and Al-Bay' bithaman ajil contracts under the Islamic home financing in Malaysia", *International Journal of Development Research*, Vol. 7 No. 1, pp. 1-8.

Ameira, S.M., Muhammad Fadhil, E., Nurul Amira, A.R. and Norkhairunnisa, M.R. (2018), "Appreciation of house price and its impact to reverse mortgage pricing", *International Journal of Engineering and Technology*, Vol. 7, pp. 257-259.

Ampofo, J.A. (2020), "The nature of mortgage repayment plans in Ghana", *Finance and Accounting Research Journal*, Vol. 2 No. 3, pp. 91-104.

Andreas, A.J. (2007), "Derivatives in Islamic finance", *International Conference on Islamic Capital Markets*.

Arundel, R. and Ronald, R. (2021), "The false promise of homeownership: Homeowner societies in an era of declining access and rising inequality", *Urban Studies*, Vol. 58 No. 6, pp. 1120-1140.

Asila, J. (2022), "Thailand, Malaysia still boast highest household debts among Asean nations: Moody's analytics", *New Straits Times*, available at: www.nst.com.my/business/2022/07/815501/thailand-malaysia-still-boast-highest-household-debts-among-asean-nations

Bank Negara Malaysia (BNM) (2020), "Household income estimates and incidence of poverty report", available at: www.bnm.gov.my/documents/20124/6459002/fsr21h2_en_housing.pdf

Bishop, T.B. and Shan, H. (2008), "Reverse mortgages: a closer look at HECM loans", *NBER Papers on Retirement Research Center Project NB08-Q2. National Bureau of Economic Research*, Cambridge, Massachusetts.

Braml, H. (2016), "The manipulation of LIBOR and related interest rates", *Studies in Economics and Finance*, Vol. 33 No. 1, pp. 106-125, doi: 10.1108/SEF-10-2014-0203.

Carozzi, F., Hilber, C.A. and Yu, X. (2024), "On the economic impacts of mortgage credit expansion policies: evidence from help to buy", *Journal of Urban Economics*, Vol. 139, p. 103611.

Choi, H.S. (2019), "A numerical analysis to study whether the early termination of reverse mortgages is rational", *Sustainability*, Vol. 11 No. 23, p. 6820, doi: 10.3390/SU11236820.

Data, M.C., Justin, D.S., Yves, C., Matthieu, K. and Dominic, C.M. (2016), "Sensitivity analysis and model validation. In secondary analysis of electronic health records", pp. 263-271.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Department of Statistics Malaysia (DOSM) (2020), "Household income and basic amenities survey report 2019", Department of Statistics Malaysia, accessed 14 November 2022, available at: www.dosm.gov.my/v1/index.php?r=column/cthemeByCat&cat=120&bul_id=TU00TmRhQ1N5TUxHVWN0T2VjbXJYZz09&menu_id=amVoWU54UTl0a21NWmdhMjFMMWcyZz09

Elizabeth, A., Nick, F. and Laura, G. (2008), "Decision theory and real estate development: a note on uncertainty", *Journal of European Real Estate Research*, Vol. 1 No. 2, pp. 162-182, doi: 10.1108/17539260810918730.

Ellis, L. and Berger-Thomson, L. (2004), "Housing construction cycles and interest rates", *Econometric Society 2004 Australasian Meetings*, Econometric Society, Australia.

Heo, Y.C., An, S. and Baeg, E.H. (2016), "Reverse mortgage as an income stabilizer for the elderly in Korea", *Asian Social Work and Policy Review*, Vol. 10 No. 1, pp. 103-112, doi: 10.1111/ASWP.12081.

Ismail, A., Bujang, A.A., Anthony Jiram, W.R., Abu Zarin, H. and Jaafar, M.N. (2015), "Factor affecting the housing financing of Bumiputera in Iskandar Malaysia", *Journal of Economics, Business and Management*, Vol. 3 No. 11, pp. 1031-1036.

Khajvand, M. and Tarokh, M.J. (2011), "Estimating customer future value of different customer segments based on adapted RFM model in retail banking context", *Procedia Computer Science*, Vol. 3, pp. 1327-1332.

Khazanah Research Institute (2015), "Making housing affordable. Kuala Lumpur: creative commons attribution", Khazanah Research Institute. Accessed 20 March 2023, available at: www.KRIinstitutes.org

Korea Housing Finance Corporation (2013), "Reverse mortgage monthly", available at: www.hf.go.kr

Kuo, C.J., Chen, C.M. and Sung, C.H. (2011), "Evaluating guarantee fees for loans to small and medium-sized enterprises", *Small Business Economics*, Vol. 37 No. 2, pp. 205-218, doi: 10.1007/S11187-009-9236-0.

Lee, J.E. (2011), "A study on the risk and cointegration of housing reverse mortgage", *Journal of the Korean Regional Development Association*, Vol. 23 No. 5, pp. 145-170.

Lee, S., Koh, S.S. and Kim, J. (2010), "A study on the appropriateness of major variables of the reverse mortgage model through simulation analysis", *The Korea Regional Science Association*, Vol. 26 No. 3, pp. 41-61.

Lin Lee, C. (2009), "Housing price volatility and its determinants", *International Journal of Housing Markets and Analysis*, Vol. 2 No. 3, pp. 293-308.

McDermott, J. (2017), "The value of forecasting in an uncertain world", *Speech Given at the New Zealand Manufacturers and Exporters Association (NZMEA) Leaders' Network Event, Christchurch*, Reserve Bank of New Zealand, New Zealand, p. 15.

Ma, S. and Deng, Y. (2006), "Insurance premium structure of reverse mortgage loans in Korea".

Mariana, M.O., Farah Eleena, Z., Noor Suzilawati, R., Mizan, H. and Zakiah, P. (2020), "Challenges and ownership issues facing by low (B40) and medium income group (M40) in Selangor", *Journal of the Malaysian Institute of Planners*, Vol. 18 No. 3, pp. 218-228.

Meulen, P.A.D., Micheli, M. and Schmidt, T. (2011), *Forecasting House Prices in Germany*, Ruhr-Universitat Bochum (RUB), Departments of Economics, Germany.

Mohamad Jais, J. (2022), "An alternative house financing model", *The Business Review*, Vol. 72 No. 4, pp. 133-143.

Mohamad Shukry, M.R., Chitrakala, M., Norhaya, K. and Izran, S.M. (2012), "Forecasting house price index using artificial neural network", *International Journal of Real Estate Studies*, Vol. 7, pp. 1-6.

Mohammed, M.I. and Noralfishah, S. (2017), "Prospect of developing reverse mortgage market in Malaysia: a SWOT analysis", *International Journal of Business Management*, Vol. 2 No. 4, pp. 1-17.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Munusamy, M., Muthuveerappan, C., Baba, M., Abdullah, M.N. and Asmoni, M. (2015), "An overview of the forecasting methods used in real estate housing price modelling", *Jurnal Teknologi*, Vol. 73 No. 5, pp. 189-193.

Najihah, A. and Ahmad Ariffian, B. (2021), "The gap between housing affordability and affordable house: a challenge for policy makers", *Journal of the Malaysian Institute of Planners*, Vol. 19 No. 3, pp. 387-399.

National Affordable Housing Policy (2019), *Dasar Perumahan Mampu Milik Negara*, Prime Minister's Office of Malaysian Official Website, available at: www.pmo.gov.my/2019/07/national-affordable-housing-policy/ (accessed 20 March 2023).

National Mortgage Corporation of Malaysia (Cagamas) (2023), "Skim saraan bercagar reverse mortgage. Cagamas berhad", available at: https://ssb.cagamas.com.my (accessed 16 August 2023).

National Property Information Centre (NAPIC) (2021), "Malaysian house price index 2021", (Overall Statistics, Issue. National Property Information Centre (NAPIC), available at: https://napic.jpph.gov.my/portal/web/guest/main-page?p_p_id=ViewStatistics_WAR_ViewStatisticsportlet&p_p_lifecycle=2&p_p_state=normal&p_p_mode=view&p_p_resource_id=fileDownload&p_p_cacheability=cacheLevelPage&p_p_col_id=column-2&p_p_col_count=1&fileURI=21961

Nor Hamizah, Z., Shuzlina, A.R., Nor Hasbiah, U. and Ismail, I. (2020), "House price prediction using a machine learning model: a survey of literature", *International Journal of Modern Education and Computer Science*, Vol. 12 No. 6.

Olanrewaju, A.L., Hamimah, A. and Seong, Y.T. (2018), "Factors affecting housing prices in Malaysia: analysis of the supply side", *Journal of the Malaysian Institute of Planners*, Vol. 16 No. 2, pp. 225-235.

Osmadi, A., Mustafa, K.E., Hassan, H. and Abdul Fattah, H. (2015), "Exploring the elements of housing price in Malaysia", *Asian Social Science*, Vol. 11 No. 24, pp. 26-38, available at: https://pdfs.semanticscholar.org/70b8/597ace5c2ed75b53775dbf05e8993f4c0ae8.pdf

Park, S. (2012), "A study on valuation of Reverse-Mortgage loan's collateral property", *Korea Real Estate Review*, Vol. 22 No. 3, pp. 37-58.

Peter, B. (2017), "The role of government and financial institutions during a housing market crisis: a case study of The Netherlands", *European Journal of Housing Policy*, Vol. 17 No. 4, pp. 591-602, doi: 10.1080/19491247.2017.1357399.

Peterson, P.P., Fabozzi, F.J. and Habegger, W.D. (2004), *Financial Management and Analysis Workbook: step-by-Step Exercises and Tests to Help You Master Financial Management and Analysis*, Vol. 135, John Wiley & Sons, Hoboken, New Jersey.

Ping, W. and Ji-Pyo, K. (2014), "The value of reverse mortgage loans: case study of the Chinese markets", *Journal of Asian Finance, Economics and Business*, Vol. 1, pp. 5-13.

Pu, M., Fan, G.Z. and Deng, Y. (2012), "Breakeven determination of loan limits for reverse mortgages under information asymmetry", *SSRN Electronic Journal*, Vol. 48, pp. 492-521, doi: 10.2139/SSRN.1774722.

Quigley, J.M. and Raphael, S. (2004), "Is housing unaffordable? Why isn't it more affordable?", *Journal of Economic Perspectives*, Vol. 18 No. 1, pp. 191-214.

Rosylin, M.Y., Norazlina, A.W. and Hanissah, H. (2017), "Does home financing promote affordability of home ownership in Malaysia? An empirical analysis between Islamic and conventional banks international journal of economics", *Management and Accounting*, Vol. 25 No. 3, pp. 601-627.

Said, R., Adair, A., McGreal, S. and Majid, R. (2014), "Inter-relationship between the housing market and housing finance system: evidence from Malaysia", *International Journal of Strategic Property Management*, Vol. 18 No. 2, pp. 138-150.

Said, R., Rohayu, A.M., Omokolade, A. and Mohammad Irfan, H. (2022), "Sustainability of residential investment in Klang valley, Malaysia", *Journal of Design and Built Environment*, Vol. 22 No. 3, pp. 134-149.

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025

Sharifah, A.S.J. and Puspa, L.G. (2019), "The structure in existing Shariah principle of Islamic home financing: a review", *The International Journal of Academic Research in Business and Social Sciences*, Vol. 8 No. 12, pp. 1337-1344, doi: 10.6007/IJARBSS/V8-I12/5231.

Shi, S., Mangioni, V., Ge, X.J., Herath, S., Rabhi, F. and Ouysse, R. (2021), "House price forecasting from investment perspectives", *Land*, Vol. 10 No. 10, p. 1009.

Soon, A. and Tan, C. (2019), "An analysis on housing affordability in Malaysian housing markets and the home buyers' preference", *International Journal of Housing Markets and Analysis*, Vol. 13 No. 3, pp. 375-392.

Szumilo, N. and Vanino, E. (2021), "Mortgage affordability and entrepreneurship: Evidence from spatial discontinuity in help-to-Buy equity loans", *Journal of Business Venturing*, Vol. 36 No. 4, p. 106105.

Szymanoski, E.J. (1994), "Risk and the home equity conversion mortgage", *Real Estate Economics*, Vol. 22 No. 2, p. 347.

Tan, S.M. (2021), *Housing Affordability and Property Overhang: A Study on B40 and M40 Homebuyers' Decision*, Master, Universiti Tunku Abdul Rahman, Petaling Jaya.

Uddin, M.A. (2015), "Principles of Islamic finance: Prohibition of Riba, Gharar, and Maysir", *Munich Personal RePec Archive*, No. 6771, pp. 1-8.

Vangeel, W., Defau, L. and De Moor, L. (2023), "Young households' diminishing access to homeownership attainment in Europe", *Sustainability*, Vol. 15 No. 8, p. 6906.

Wang, C.W., Huang, H.C. and Lee, Y.T. (2014), "On the valuation of reverse mortgage insurance", *Scandinavian Actuarial Journal*, Vol. 2016 No. 4, pp. 293-318, doi: 10.1080/03461238.2014.925967.

World Map (2023), "Maps of Malaysia", World Map. Accessed 4 October 2023, available at: theworldmap.net

Zheng, H. and Xikun, S. (2016), "The interest rate risk of reverse mortgages", *Management Science and Engineering*, Vol. 10 No. 2, pp. 24-26, doi: 10.3968/N.

Further reading

Finlay, S., Williams, P. and Whitehead, C. (2016), "Evaluation of the help to buy equity loan scheme", Department for Communities and Local Government.

Hamidah, R. and Eleeza, E.Z. (2016), "Review the issue of housing among urban dwellers in Malaysia with special reference towards affordability to home ownership", *Procedia Economics and Finance*, Vol. 35, pp. 216-223.

Corresponding author

Rosli Said can be contacted at: rosli_alambina@um.edu.my

For instructions on how to order reprints of this article, please visit our website:
www.emeraldgrouppublishing.com/licensing/reprints.htm
Or contact us for further details: **permissions@emeraldinsight.com**

Downloaded from http://www.emerald.com/ijhma/article-pdf/18/3/825/9670602/ijhma-11-2023-0156.pdf by University of the Witwatersrand user on 28 August 2025