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# The Impact of Flood Events on Residential Property Values of Semi-Detached (Semi-D) in Selangor and Klang Valley, Malaysia: A Study of Microeconomics and Macroeconomics Indicator



**Abstract:** - This research aims to investigate the impact of floods on residential property values in Selangor and Klang Valley, Malaysia. To understand the intricate relationship between property values and flood incidences, the research explores both macroeconomic and microeconomic aspects. The principal objectives are to identify significant factors influencing semi-detached (Semi-D) home values and assess the effect of flood catastrophes on the housing market. The research method employed a multiple linear regression approach to investigate the relationship between macroeconomic and microeconomic factors and the average price of semi-D houses in Klang Valley. The chosen independent factors are the length of the flood, its depth, the number of bedrooms, the built-up area, the population density, the rate of unemployment, inflation, and GDP. Data from 2000 to 2020 is gathered and evaluated to gain insight into how patterns of property values change in response to flood occurrences. The study indicates that built-up area, population density, and flood duration have a substantial influence on the average cost of semi-D homes in Klang Valley. Floods have a detrimental impact on property values; the longer they last, the lower the prices. Furthermore, there is a positive association between property values and population density, indicating higher demand in locations with high population densities. The results also emphasize how crucial it is to consider variables such as GDP, inflation, unemployment rate, number of bedrooms, and flood depth to fully understand the intricate link that exists between flood occurrences and property values.

**Keywords:** Economics, Flood, Property Values, Residential.

## I. INTRODUCTION

Due to improper city planning and geographic position [1], Malaysia often faced flooding which is a natural disaster according to a report by the World Health Organization (WHO) in 2020. When a water overflow submerges normally dry areas, flooding occurs. Floods are typically caused by strong rainfall, rapid snowmelt, and storm surges from tropical storms or tsunamis in coastal areas. Flooding is one of the most common natural catastrophes that results in significant losses to people, animals, and property [2].

For years, the affordability of properties among Malaysians has been a problem. The phenomenon of Malaysia's population growth brings up the question of housing availability since a growing population increases the requirement for homes. If the housing supply does not change to meet household demand for housing, the expanding population is likely to be hindered [3]. Fig. 1 shows, the Malaysian House Price Index (MHPI) exhibited positive annual growth, showing a modest improvement in the post-pandemic scenario. This modest increase was recorded following the opening of the country's orders on April 1, 2022, starting with 1.9% (Q4 2021) and reaching 2.4% in Q1 2022. In Q2 2022P, the MHPI was at 203.5 points, indicating a 0.5% decreased compared to 205.9 points in Q1 2022 (2.4%). For the preliminary data in Q2 2022P, house prices registered a slight quarter-on-quarter decline of 1.2%, contrasting with the 0.4% increase observed in Q1 2022. This reduction is consistent with the Consumer Sentiment Index (CSI), which fell by 8.4 points (q-o-q) to 90.8 points (Q2 2022P). A sign of buyers' cautious spending after the Overnight Policy Rate (OPR) hike in Nov 2021, as well as the rising cost of living. This research

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paper focuses on the problem in Klang Valley, about the impact of flood events on residential property values which is Single and Double Semi-D.

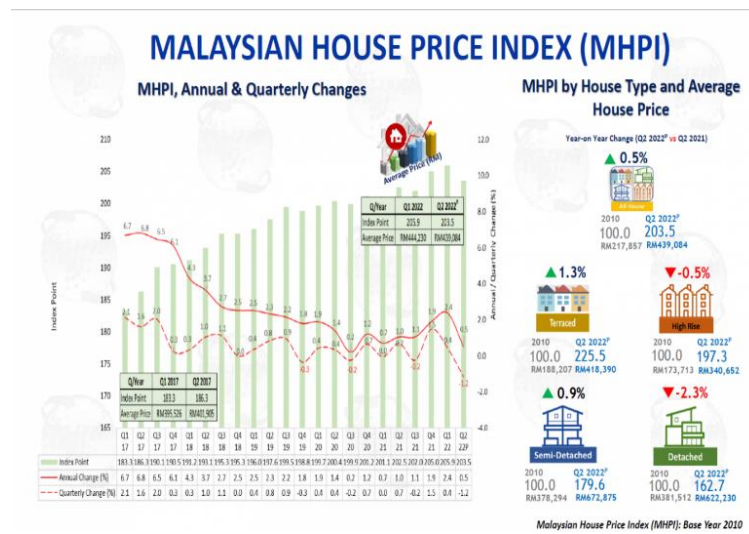


Fig. 1: Malaysia House Price Index (MHPI) 2022  
Source: Malaysia Property Market Report (2022)

## II. RESEARCH ISSUE

The threat of flooding has grown to be a common concern for landowners, raising serious concerns about the depreciation of property value. The possibility of a drop in the value of land situated in a flood-prone location has been covered in earlier research. Any land property that experiences unpredictable flooding will lose its money and have disruptions to its economic activities [4].

Klang Valley, Malaysia is the study's primary focus because of the annual flooding caused by the country's cyclical monsoon seasons. Although floods are not considered a catastrophic catastrophe in Malaysia, they still have a significant impact on the country's people and property, including land, factories, and residential buildings. Studying how the storm affected the value of residential properties is therefore important [4]. Strong typhoons that track close to the Philippines in the South China Sea may have an impact on Peninsular Malaysia's regional weather, causing stronger wind patterns and quicker movement of moist air parcels from regional oceans or seas to land regions [5]. According to News Straits Time newspaper, Klang Valley has been a hotspot for floods, especially after several rounds of heavy downpours.

## III. RESEARCH OBJECTIVE

To identify potential microeconomic and macroeconomic indicators whereby will affect residential property values which is semi-D in Klang Valley. In addition, to analyse the relationship between the residential property values which is semi-D in Klang Valley and the impact of flood events.

## IV. LITERATURE REVIEW

### A. Average Price of Semi-D House in Klang Valley (Dependent Variable)

As we can see now, property house prices in Malaysia are increasing day by day, especially in the developed city. By considering the severity of the flood occurrence as determined by the frequency, depth, and duration of the flood, the effect of flooding on residential property value has been examined. A study has discovered a negative correlation between property value and flood depth [2]. The property may sustain major damage from floods, which may lower its value. In general, little flooding does not do any harm to the property but if the water level rises over the floor, it may seriously harm the homes and lower the value of real estate in the flooded region [6]. The longer the flood, the more expensive it will be to restore the damaged property, which will lower the value of the property even more.

The factors that determine property prices in Malaysia have a big impact on them. Malaysian income can keep up with the rising cost of housing, thus speculation in the property market is not the reason for the sharp increase in home prices [7]. Since income continues to be a significant factor in determining house prices in Malaysia, the government of that country will maintain its policies of providing low-income groups with affordable housing and

implementing the My First Home Scheme (SRP), which relaxes loan application requirements for first-time homebuyers.

There are three (3) main factors influencing residential property values. The factors are home location, property finance, and health [8]. In addition, the findings showed that the location of homes, their physical layout, their construction, developers' offerings, development concepts, financing sources for real estate, social status, health, legal frameworks, and outside influences had no bearing on the cost of residential properties in Malaysia.

#### *B. Duration of Flood (Independent Variable)*

The flooding effect on real estate values has been well-researched. Property values have been demonstrated to be impacted by the duration of floods. There are also discussions about how heavy rain and flood occurrences are becoming more intense and lasting longer, which indicates how the risk of flooding is rising and how it can affect property values [9]. A study gives perspectives on the relationship between flood risk and residential rentals and property prices in the context of property valuation, suggesting that flood risk is a critical component in property valuation models [10]. Furthermore, concrete evidence of the effect of flood duration on property values demonstrated through a hedonic analysis that the value of residential property affected by flooding dropped [2].

Other than that, to examine the economic implications of climate change on property prices, a thorough flood risk assessment tool is used to provide insight into the possible long-term effects of flooding on property values [11]. The collective findings of this research highlight the importance of flood duration in affecting property values, both from an ecological standpoint and within the framework of property valuation models. Thus, to properly evaluate the effect of flooding on property values, flood duration must be considered as a crucial element in property valuation models.

Research found that a significant but transient immediate discount is offered to homes impacted by inland floods which is for houses in the lowest price quartile, this discount vanishes within 6-7 years [12]. The price recovery for coastally flooded properties is rapid which is for houses in the upper price quartile, the price reduction vanishes after a year. The results point to a quick rebound in property values and imply that the initial decline in prices following floods does not result in a permanent decline. Policy considerations and flood relief initiatives are affected by this.

#### *C. Flood Depth (Independent Variable)*

Many studies have been conducted on the impact of flood depth on residential property values. discovered a negative correlation between flood depth and property value after conducting a hedonic analysis of residential property values in Peninsular Malaysia [2]. This implies that property values tend to decline with increasing flood depth. Furthermore, flood depth was found to be a significant variable impacting property damage when global weighted regression was used to build flood-damage functions expressing regional variation [13]. All these results highlight how flood depth has a significant effect on residential property prices, highlighting the necessity of taking this into account when valuing real estate and developing metropolitan areas.

The influence of floods on the value of industrial and agricultural land holdings in Peninsular Malaysia is examined in a study [14]. The value of land property is considerably reduced by 44.6% for every metre rise in flood depth. The findings demonstrate how flood depth significantly lowers land property values in the analysed location. Based on another study, the key conclusion is that flooding has a detrimental impact on every type of property, with the impacts varying according to whether the property is in a floodplain or not [15]. Coverage affects property outside floodplains, whereas depth affects property inside floodplains. The consequences of flooding on property are all transient and they all go away two years after the flood event. However, another study, stated that property prices do not accurately reflect the information about flood risk available on regulatory floodplain maps, which causes a significant overvaluation of homes in flood zones across the United States [16]. The stability of real estate markets is called into question as a result, given the increasing prominence and severity of climate hazards.

#### *D. Number of Bedrooms (Independent Variable)*

It has been discovered that a residential property's room count has a big impact on its worth. observed that the number of rooms had a considerable beneficial impact on the overall hotel sector revenue after conducting a study on the US hotel business [17]. Furthermore, the study conducted emphasized the significance of appropriate unit sizes and numbers in determining residential environmental quality. It also revealed that the number of rooms had an impact on the evaluations made by housing workers in South Korean welfare housing [18]. These results highlight the significant influence of the number of rooms on residential property values, suggesting that real estate valuation and urban planning should take this element into account.

Research has an outcome that also demonstrates the importance of residential elements such as the number of bedrooms, the presence of bathrooms and toilets, and the availability of utilities like power and water supply, on the rental prices of homes [19]. The age of a home, the number of bedrooms, the number of other rooms, the square footage, the number of bathrooms and toilets, the type of home, the size of the building, and other amenities like pools, water, electricity, and natural gas that are provided within the home all have a significant impact on the formation of housing prices, according to discussions on the influence of home components on residential house prices.

#### *E. Built-Up Area (Independent Variable)*

There has been research recently on the effects of neighbourhood features on residential property values. According to an assessment, there is a variation in the value of urban residential real estate when it comes to the impact of public transit accessibility [20]. It also investigated how recreational spaces affect the real estate values of residential properties in Riyadh, Saudi Arabia [21], and brought attention to the unknown net benefit of being close to recreational areas because of unfavourable external conditions like noise and traffic congestion. Together, these studies highlight the intricate connection between neighbourhood features and residential property values, highlighting the necessity of thorough evaluations that consider both favourable and unfavourable outside influences.

A study discusses how Malaysia's high home prices cause middle-class and lower-class incomes to struggle with affordability [22]. From the standpoint of Malaysian real estate developers, the study explores the impact of land rules, demographics, and geographic limitations on housing costs. Based on the developers' point of view, the findings provide a substantial contribution to policymakers by emphasising the influence of land rules, demographics, and spatial limitations on housing pricing. Commercial property prices are strongly impacted by the proximity to the closest public transport station and office units placed within several radius [23]. The study adds to the body of knowledge about the beneficial correlation between the values of commercial real estate and urban rail transport.

Between 1999 and 2017, there was a notable rise in agricultural land and built-up land cover, with a corresponding decline in natural vegetation. This trend is expected to continue until 2030. The majority of built-up regions are found in central Selangor, which is also home to the Klang Valley and the densely populated cities of Kuala Lumpur and Putrajaya [24]. There is a trend of urban sprawl seen in the growth of built-up regions, which mostly occurs along the borders of existing metropolitan limits. Policymakers and urban planners may find the study's findings useful in making decisions and designing cities in the future.

#### *F. Population (Independent Variable)*

A recent study has shown interest in the relationship between residential property values and population dynamics. Underlined the need to enhance the quality of life for the mobile population and stressed the need to research the duration of residency of the mobile population in cities and its affecting elements [25]. A study also discusses the strategic use of value capture to support property-led economic development and communicate public-sector priorities related to population and geography [26]. All these studies highlight the intricate connection between population dynamics and residential property values, highlighting the necessity of thorough evaluations that consider the many effects of demographic variables.

The Hausman test results show that there is a positive correlation between home prices and the population [27]. The cost of housing will rise in tandem with the number of elderly individuals. There is a favourable correlation between past house prices and current housing prices. Residents anticipate greater increases in housing costs given the current situation of growing home prices. Consequently, high housing costs in the previous era will raise housing costs in the present time.

#### *G. Inflation (Independent Variable)*

Inflation rates have a significant impact on Malaysia's economy and are related to several financial and investment-related matters. Fig. 2 shows, inflation rate in Malaysia from 2000 till 2022 and the trend show inflation rate in Malaysia is not more than 9% since 2000. The relationship between inflation rates and property values has been the subject of several studies. [28] emphasized the influence of inflation on economic variables and offered insights into the possible consequences of inflation on property prices through their study on the unequal impacts of real exchange rates on Saudi Arabia's money demand. The value of residential property and the base lending rate (BLR) have a negative and significant association, according to a study on the macroeconomic and demographic factors influencing residential property values in Malaysia [29].



**Fig. 2:** Inflation Rate in Malaysia  
 Source: Department of Statistics Malaysia (2022)

This suggests that inflation may have an impact on property values. Research on the Malaysian real estate market showed historical trends and correlations between inflation rates and residential property values. The property market can be impacted by changes in inflation rates through a combination of macroeconomic and microeconomic factors. awareness of how inflation rates affect housing demand and property values requires an awareness of factors including purchasing power, interest rates, and consumer behavior. Research has shown the direct impact of external elements caused by inflation on property values and this has provided insights into the microeconomic mechanisms at play [2].

Regulations and governmental policies are essential in mitigating the effects of inflation on the real estate market. Comprehending the regulatory framework and policy reactions to inflation is vital for conducting a thorough evaluation of the factors influencing residential property values in the designated areas. To sum up, the review of the literature has shed light on the complex relationship that exists between Malaysian residential property values, especially in the Klang Valley and Selangor, and inflation rates. A thorough grasp of how inflation affects the real estate market is provided by the empirical data, theoretical insights, and historical trends included in the evaluated papers. This opens the door for more study and policy concerns in this area.

*H. Unemployment Rate (Independent Variable)*

The housing market is significantly impacted by unemployment rates, as demonstrated by a study [30]. Fig. 3 shows the unemployment rate in Malaysia in which the trend is up and down but not more than 5% since 2000. These effects extend to microeconomic variables like consumer confidence and housing demand as well as macroeconomic stability. This draw attention to the way that macroeconomic factors affect housing prices, emphasizing how fluctuations in the Housing Price Index (HPI) can lead to significant variations in future prices. By emphasizing that graduates must modify their mindset and develop employability skills to obtain job placements, clarifies the difficulties that local labour faces, which might have an impact on the real estate market [31].The influence of unemployment on the real estate market is significantly mitigated by government policies and regulatory frameworks. A study examines how the residential real estate market responds to the danger of flooding in areas that are susceptible to flooding, emphasizing the impact of risk knowledge on property values [32].This emphasizes how crucial risk-mitigation strategies are in determining property values.

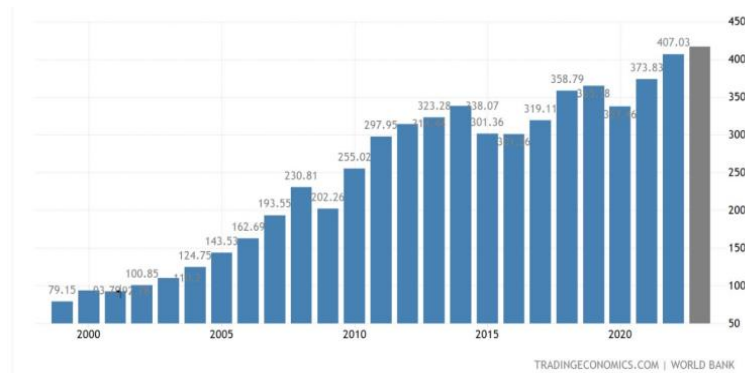


**Fig. 3:** Unemployment Rate in Malaysia  
 Source: Department of Statistics Malaysia (2020)

Furthermore, a study offers empirical data on the actions of homebuyers in the Klang Valley, suggesting a positive outlook for both short- and long-term increases in real estate prices due to the impact of market perceptions on property values [33]. Moreover, there are numerous ways in which shifts in unemployment rates could affect the real estate market. Research shows how the Tehran metro train system affects residential property values, emphasizing how homes in high- and low-income neighbourhoods are affected differently [34].

### I. GDP (Independent Variable)

GDP is a crucial macroeconomic metric that has been demonstrated to significantly influence the housing market by influencing microeconomic variables like housing demand and consumer confidence as well as macroeconomic stability. Fig. 4 shows Malaysia GDP since 2000 and the trend is steadily increasing. A variety of current studies offers insightful information about the connection between GDP and property values, estimating the unexpected changes in house prices and demand using Structural Vector Autoregressive Regression based on economic theory reasoning that takes shocks from macroeconomic factors into account[35]. This demonstrates the complex relationship that exists between property values and macroeconomic data.



**Fig. 4:** Malaysia GDP  
Source: World Bank (2023)

Empirical data and case studies are essential for comprehending the direct and indirect impacts of GDP on residential property values in the Malaysian real estate market. Based on research done in Subang Jaya, Selangor calculated the value uplift from transit investments, demonstrating the impact of infrastructure on real estate values [36]. Other than that, study had examined how Information and Communication Technology (ICT) affects economic growth in Malaysia, emphasizing the role of GDP as the dependent variable and considering individual internet usage, labor force participation, ICT contribution, and mobile cellular subscriptions as independent variables [37].

Analyzing the relationship between GDP and property values in the designated locations requires the perspectives of economists, policymakers, and real estate experts. The analysis of the literature also points out knowledge gaps regarding the precise dynamics of GDP on the values of residential properties in Selangor and the Klang Valley. Subsequent investigations may concentrate on carrying out comprehensive case studies and analyses customized for these areas, offering a more refined comprehension of the correlation between GDP and property values within this framework.

## V. RESEARCH METHODOLOGY

### A. Multiple Linear Regression

The objective of this research is to identify potential microeconomic and macroeconomic indicators whereby will affect residential property values which is semi-D in Klang Valley. In addition, to analyse the relationship between the residential property values which is semi-D in Klang Valley and the impact of flood events. Semi-D average price (SemiP) is selected to be the dependent variable impacted by the other recognised macro and microeconomic components. The macroeconomic variables selected considering the research study are the duration of the flood (Duration), the flood depth (Depth), the average number of bedrooms (Bedroom), the average built-up area (Sq Feet), the population in Klang Valley (Pop), inflation (Inf), unemployment rate (Unemp) and GDP rate (GDP).

The data provided is from 2000 until 2020, obtained as secondary data from a lot of sources. Additional assessments are performed when the regression findings are analysed using the theory deduced from the literature review. The regression findings comprise the evaluations of the descriptive statistics on the standard deviation of each mean value of the variables provided to notice the dispersion of the data and its reliability.

Theories for the eight independent variables (IV) mentioned are listed to compare with the output of the regression analysis of whether it supports the hypothesis or vice versa:

- H<sub>1</sub>: Duration of the flood (Duration) has a negative impact on SemiP
- H<sub>2</sub>: The flood depth (Depth) has a negative impact on SemiP
- H<sub>3</sub>: The average number of bedrooms (Bedroom) has a positive impact on SemiP
- H<sub>4</sub>: The average built-up area (Sq Feet) has a positive impact on SemiP
- H<sub>5</sub>: The population in Klang Valley (Pop) has a positive impact on SemiP
- H<sub>6</sub>: The inflation (Inf) has a negative impact on SemiP
- H<sub>7</sub>: The unemployment rate (Unemp) has a negative impact on SemiP
- H<sub>8</sub>: The GDP rate (GDP) has a positive impact on SemiP

The theoretical equation of multiple linear regression for the average semi-D price (SemiP) as dependent variables (DV) and the other eight related independent variables (IV) obtained are in the theoretical form as shown below:

$$DV = \beta_0 + IV_1\beta_1 + IV_2\beta_2 + IV_3\beta_3 + IV_4\beta_4 + IV_5\beta_5 + IV_6\beta_6 + IV_7\beta_7 + IV_8\beta_8 \tag{1}$$

Where it will be expressed in the form of as shown below for each different state:

$$SemiP = \beta_0 + Duration\beta_1 + Depth\beta_2 + Bedroom\beta_3 + Sq\ Feet\beta_4 + Pop\beta_5 + Inf\beta_6 + Unemp\beta_7 + GDP\beta_8 + \varepsilon \tag{2}$$

*A) Descriptive Statistics and R Square*

**Table 1.** Descriptive Statistics

	Mean	Std Deviation
SemiP	216.902	65.950
Duration	1.952380952	1.596
Depth	0.584	0.063
Bedroom	3.52380952	0.873
Sq Feet	3,050	1,182.233
Pop	5.92667	1.232
Inf	2.003	1.388
Unemp	3.37380952	0.341
GDP	4.562	3.152

The panel data-collecting approach is utilised to examine the pertinent elements influencing the average semi-D pricing, as shown in Table 1 of the descriptive statistics. Every variable has a low standard deviation value, which indicates that the data are less dispersed and have greater dependability. Because of their uniformity and symmetric distribution, these data are more concentrated at their mean. For the average built-up area, on the other hand, which is widely dispersed across its data at a wider range, it is different.

**Table 2.** Regression Statistics

Regression Statistics	
R Square	0.989404183

From Table 2 of the regression model summary, the R<sup>2</sup> is identified at 0.99 indicating a 99% change in average semi-D price (Dependent Variable) explained by the change in the duration of the flood (Duration), the flood depth (Depth), the average number of bedrooms (Bedroom), the average built-up area (Sq Feet), the population in Klang Valley (Pop), inflation (Inf), unemployment rate (Unemp) and GDP rate (GDP) (Independent Variables). R<sup>2</sup> value also indicates that there is multicollinearity since it is larger than 0.8 where the correlations of the group variable are not within an appropriate range.

*1) F-Test*

The estimated regression equation's ability to explain a statistically significant part of the total variation in the independent variable is demonstrated by the F-test. When it comes to the F-statistic test, the general guideline is that

the critical F value should be at least 0.05 or 5%. If the F-statistic value is higher than the critical value of the F-distribution, it indicates that the regression equation can explain the variance in the dependent variable.

**Table 3. F-Test**

Significance F
0.0000000001

The hypothesis for the F-test is as below, each  $\beta$  indicating the independent variables which are the duration of the flood (Duration), the flood depth (Depth), the average number of bedrooms (Bedroom), the average built-up area (Sq Feet), the population in Klang Valley (Pop), inflation (Inf), unemployment rate (Unemp) and GDP rate (GDP).

$$H_0: \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6 = \beta_7 = \beta_8 = 0$$

$$H_1: \beta_1 \neq \beta_2 \neq \beta_3 \neq \beta_4 \neq \beta_5 \neq \beta_6 \neq \beta_7 \neq \beta_8 \neq 0$$

The significant F-statistic observed in Table 3 is at the value of <0.001 which is lesser than the critical value of the F-statistic of 0.05, thus the decision is to reject  $H_0$  since significant  $F = p - \text{value} < 0.05$ . The rejection of  $H_0$  indicates at least one independent variable is significant in explaining the changes in average semi-D Price.

2) *T-Test Two Tail*

**Table 4. T-Test Two Tail**

Variable	t	p-value	Accept or Reject H0	Results
Duration	-2.532	0.027	Reject H0	Significant to Semi-D Price
Depth	-1.842	0.090	Accept H0	Insignificant to Semi-D Price
Bedroom	-1.325	0.210	Accept H0	Insignificant to Semi-D Price
Sq Feet	-4.779	0.001	Reject H0	Significant to Semi-D Price
Pop	8.008	0.001	Reject H0	Significant to Semi-D Price
Inf	-0.611	0.553	Accept H0	Insignificant to Semi-D Price
Unemp	-0.087	0.932	Accept H0	Insignificant to Semi-D Price
GDP	-0.648	0.529	Accept H0	Insignificant to Semi-D Price

The t-statistic is the value estimated coefficient divided by its standard errors. The hypothesis can be performed to test the significance of each independent variable. There is a rule of thumb to determine the significant relationship between the dependent variables and each independent variable. The rule of thumb for the t-statistic test is the critical t must be equal to +/-1.96 and the rule of decision is that if the observed value of the estimated t-statistic is more than the critical value, then there is a significant relationship between a dependent variable and the selected independent variable. Table 4 indicates the result of each coefficient at a 5% level of significance, using the two-tail test with the hypothesis below:

$$H_0: \beta_n = 0$$

$$H_1: \beta_n \neq 0$$

With  $n = 1,2,3,4,5,6,7,8$  independent variables

Based on Table 4 above, It can say that only the duration of the flood (Duration), the average built-up area (Sq Feet) and the population in Klang Valley (Pop) are significant to the average semi-D price because the observed +/-t is more than critical t, 1.96, and the p-value is lower than 0.05 while the flood depth (Depth), the average number of bedrooms (Bedroom), inflation (Inf), unemployment rate (Unemp) and GDP rate (GDP) are not significant to the average semi-D price because the the observed +/-t is less than critical t, 1.96 and the p-value is 0.05 level of significance.

1. *Regression Equation*

Table 5 shows that the regression equation as follow:

$$\text{SemiP} = -320.716 - 3.512\text{Duration} - 58.022\text{Depth} - 3.228\text{Bedroom} - 0.062\text{Sq Feet} + 132.468\text{Pop} - 0.732\text{Inf} - 0.655\text{Unemp} - 0.533\text{GDP} \dots \tag{3}$$

**Table 5.** Regression Equation

B Coefficients	
(Constant)	-320.716
Duration	-3.512
Depth	-58.022
Bedroom	-3.228
Sq Feet	-0.062
Pop	132.468
Inf	-0.732
Unemp	-0.655
GDP	-0.533

Table 5 of regression equations shows the average semi-D price regression equation concerning the macroeconomic and microeconomic variables. It indicates how the average semi-D price changes when the variables involved change. In this case, the only positive coefficient identified is the relation between the population in Klang Valley (Pop) and the average semi-D price which indicates an increase in the population in Klang Valley (Pop) by 1%, will increase the average semi-D price 132.47%. The negative coefficient explains vice versa for instance, if an increase in the duration of the flood by 1%, the average semi-D price will decrease by 3.512%, while if the flood depth (Depth) increases by 1%, the average semi-D price will decrease by 58.02%. An increase in the average number of bedrooms (Bedroom) by 1% will decrease the average semi-D price by 3.23%. If the average built-up area (Sq Feet) increases by 1%, the average price of semi-D will decrease by 0.062%. If the inflation rate increases by 1%, the average semi-D price will decrease by 0.73%. If 1% increase in the unemployment rate, the average semi-D price will decrease by 0.66% and if GDP increases by 1%, the average price of semi-D will decrease by 0.53%.

2. *Correlation Test*

Table 6 shows the average semi-D price and the average size of a bedroom show a positive correlation. This indicates that as the average price of a house increases, the average size of the bedrooms also tends to increase. This suggests that buyers are willing to pay more for houses with larger bedrooms. There is a positive correlation between average semi-D prices and population. This could be because houses in more densely populated areas are generally more expensive due to higher demand and limited land availability. Average semi-D price and average built-up area are positively correlated means that houses with larger built-up areas tend to be more expensive. This is likely because larger houses offer more living space and amenities, which buyers value. A positive correlation exists between the average semi-D price and the inflation rate. This suggests that when inflation rises, house prices also tend to increase. This is because the cost of construction materials and labour goes up during inflation, leading to higher overall property prices.

**Table 6.** Correlation

	Average Price Semi-D	Flood Duration (Day)	Flood Depth (m)	Average No of Bedroom	Average Built-up Area	Population (Million)	Inflation Rate (%)	Unemployment rate	GDP (%)
Average Price SemiD	1								
Flood Duration (Day)	0.012354854	1							
Flood Depth (m)	0.070624437	0.633721872	1						
Average No of Bedroom	0.276469206	0.557122531	0.2529908	1					
Average Built-up Area	0.975500623	0.005048617	0.0870242	0.313883302	1				
Population (Million)	0.986831086	0.030675106	0.1170085	0.307345325	0.99553999	1			
Inflation Rate (%)	-0.260594034	-0.011661374	0.0048822	-0.2247955179	-0.16552873	-0.190793	1		
Unemployment rate	0.172118383	-0.024481535	-0.145253	0.362939002	0.103150064	0.1106267	-0.532491	1	
GDP (%)	-0.348856037	-0.145461908	-0.163469	-0.30492863	-0.31722936	-0.3261138	0.5099915	-0.767277	1

Meanwhile, there is a negative correlation between average semi-D price and flood duration. This means that houses in areas with longer flood durations tend to be cheaper. This is understandable as floods can cause damage to property and pose safety risks, making them less desirable to buyers. Average semi-D price and flood depth, like flood duration, there is a negative correlation between average semi-D price and flood depth. Houses in areas with deeper floods tend to be cheaper due to the increased risk of damage and flooding. A negative correlation exists between the average semi-D price and the unemployment rate. This suggests that when unemployment rises, house prices tend to fall. This is because unemployed people are less likely to be able to afford to buy a house. There is a weak positive correlation between average semi-D price and GDP. This means that there is no strong relationship between the two factors. However, a higher GDP may generally indicate a stronger economy, which could indirectly lead to higher property prices.

## VI. CASE STUDY

### A) Discussion

The property value is expected to decrease if the attack of flood has damaged the property. Based on the study, there are many factors to determine the property value even if a flood has impacted it. The most recent flood in Selangor was in December 2021. It is the most severe flood in Selangor's history and this event surpassed previous floods in terms of water levels and damage. Some areas in Hulu Langat witnessed water levels reaching rooftops. Because of that, economic damage has been done. The floods caused extensive damage to infrastructure, homes, businesses, and essential services. Estimates put the losses in the billions of ringgits. Even if Malaysia has been hit by a flood almost every year since 2000, property at a hotspot like Klang Valley will continue to rise.

For now, it is a question of affordability for someone if they want to have property. One of the key challenges facing the Malaysian property market is affordability. The median house price remains significantly higher than the median income, particularly in urban areas like Kuala Lumpur, Klang Valley, and Penang. This disparity makes homeownership a distant dream for many Malaysians, particularly young adults, and low-income earners.

### B) Findings

Based on the analysis above, among the properties in Klang Valley, this research decided to use the average price of semi-detached houses to study because it has the middle range of price and is used as the dependent variable. Meanwhile, the duration of the flood, the flood depth for that year, the average number of bedrooms among the semi-D houses, the average built-up area, the population in Klang Valley, the rate of inflation, the unemployment rate and the GDP rate are the independent variables concerning the microeconomics and macroeconomics indicator.

The data provided is for 20 years from the year 2000 until 2020. Based on the t-test two tails in the methodology, not all independent variables are significant to the dependent variable which is the average price of semi-D. Only three independent variables which are the duration of the flood, the average built-up area, and the population in Klang Valley that significant to the average price of semi-D in Klang Valley.

### C) Recommendations

Based on a thorough analysis using multiple linear regression from 2010 to 2020, this study clarifies the multifaceted connection that exists between flood events and residential property values (semi-D) in Klang Valley, Malaysia. A few recommendations are provided to improve the scope and relevance of research projects in the future. First off, broadening the time frame beyond 2011 from 2020 would provide a more comprehensive picture of how flood events affect property values over the long run.

A stronger model would also benefit from the inclusion of various macroeconomic variables like regional economic trends and microeconomic indicators like neighbourhood-specific features. A more complete picture might be obtained by working with environmental agencies and local governments to obtain timely and reliable flood data, as well as by investigating the impact of legislative initiatives and adaptation strategies. The current investigation puts forth a sophisticated methodology that integrates microeconomics and macroeconomic variables, extends temporal constraints, and engages with pertinent parties to enhance comprehension of the dynamic correlation between flood incidents and residential property values within the region that was selected.

## VII. CONCLUSION

In conclusion, this research has uncovered important information at the intersection of macroeconomic and microeconomic variables on the complex relationship between flood events and residential property values (semi-D) in Klang Valley, Malaysia. Using multiple linear regression as a lens, our results show that the following factors jointly affect the average property prices of semi-D residences which are price, duration, flood depth, number of

bedrooms, area, population density, inflation, unemployment, and GDP. The link is multifaceted, as seen by the careful analysis of these variables, which show how a variety of factors, from specific property attributes to more general economic indicators, influence the trends that are seen.

This research not only adds empirical evidence but also lays the groundwork for future studies that will examine adaptation techniques and policy implications for sustainable property development in flood-prone areas as we negotiate the complicated landscape of flood risk and property valuation. In the real estate industry, where environmental dynamics are always changing, a comprehensive understanding provided by the integration of micro and macroeconomic views is crucial for making well-informed decisions.

#### ACKNOWLEDGMENT

The authors would like to express their gratitude to Vice Chancellor Special Project (VCSP), Universiti Teknologi MARA (UiTM) for the support of this research.

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