CHAPTER 4

RESEARCH METHODOLOGY
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4.1 DATA SELECTION

This empirical research focuses on the data analysed on an annual basis. This is due to the fact that the MHPI is only available on a yearly basis. As such, all the other corresponding data such as the KLPI, CPI and the T-Bill rates employed are also on an annual basis from the year 1988 until 2001 to maintain consistency.

4.2 RESEARCH HYPOTHESES

Investment in property and property stock are examined in terms of inflation hedging characteristics in the Malaysian context. The first objective is to examine if property is a good hedge against inflation. This will test the traditional belief that property is a good hedge against inflation. The next objective is to observe if there is any difference in the inflation hedging characteristics between investing directly in property or indirectly in the form of property stock.
Based on previous literature the alternate hypotheses of the study are as follows:

\( H_{A1} \): Property is a good hedge against inflation.

\( H_{A2} \): There is a difference between investment in property and property stock in terms of inflation hedging.

4.3 DATA DESCRIPTION

4.3.1 CONSUMER PRICE INDEX (CPI)

The CPI is one of the most commonly used measures of inflation. It is a Laspeye-based index where the average inter-temporal changes in prices are measured on a fixed basket of goods and services consumed by households surveyed in a base year. In this study the CPI is used as a proxy of the inflation rate. According to Fama and Schwert (1977), the rate of inflation is defined as the natural logarithm of the ratio of the values of the CPI at time \( t \) and \( t-1 \).

4.3.2 MALAYSIAN HOUSE PRICE INDEX (MHPI)

The MHPI published by the Valuation and Property Services Department, Ministry of Finance Malaysia provides indices for the housing market, which are derived from the property transactions, submitted to the Department for
stamp duty valuations. The computation of the indices is based on more than 10,000 sales data for each year. The MHPI is based on the hedonic approach to price measurement using multivariate regression analysis. The base period of the index is 1990. The index is not subject to smoothing problems, which are inherent in many appraisal-based indices. The MHPI is the closest proxy for benchmarking the performance of property assets, i.e. residential property in Malaysia.

It must be noted that in the absence of indices on rental data of property, the measure of the capital gain return to property provides an adequate proxy for the variation of the total return to property, though not of the level of the total return (Fama and Schwertz, 1977).

The indices included in this study are the National All House Price Index (also known as the MHPI), Malaysian Terraced House Price Index (MTHPI), Malaysian Semi Detached House Price Index (MSDHPH), Malaysian Detached House Price Index (MDHPI), Malaysian High Rise House Price Index (MHRHPI) and the regional indices such as the Kuala Lumpur All House Price Index (KLHPI), Selangor All House Price Index (SHPI), Johor All House Price Index (JHPI) and the Penang All House Price Index (PHPI).

4.3.3 KUALA LUMPUR PROPERTIES INDEX (KLPI)

The KLPI is an index that reflects the properties counter or sector of the KLSE and it serves as an accurate indicator of the performance of the property stock
market. This index is computed electronically, all its indices on a minute-by-minute basis and these indices are made available almost immediately to subscribers of real-time market information. The KLPI is the closest proxy for benchmarking the performance of the securitized property assets in Malaysia.

4.3.4 TREASURY BILLS (T-BILLS)

T-Bills are short term securities issued by the Malaysian Treasury to finance its working capital requirements. T-Bills are considered as sovereign debt securities that are virtually risk-free.

The main purpose of using the T-Bill as a proxy for expected inflation is the current real rate returns. Fisher (1930) stated that changes of forecasted inflation correspond with changes of the rate of interest. Fama and Schwert (1977) suggest that the expected rate of inflation is equal to nominal returns on the bill minus the expected real return in an efficient market.

The one-year lagged 12 month T-Bill rates are used in line with the MHPI data which are only available on an annual basis.
4.4 DATA ANALYSIS

4.4.1 INFLATION

Irving Fisher (1930) in his book, 'The Theory of Interest', noted that the nominal interest rate on an asset can be expressed as the sum of an expected real return and an expected inflation rate. Brown (1991) stipulated that in terms of pricing, the market is expected to use all available information and fix the price of the asset at the beginning of the period so that the expected nominal return will be the sum of the appropriate expected real return and the best possible assessment of expected inflation. The expected real return on an asset as stated by Fisher (1930) is determined by factors such as the productivity of capital, the investor's time preference and level of risk tolerance. Fisher also hypothesized that the expected real return and the expected inflation rate are unrelated. Fisher's theory can be formally expressed as:

\[
E(R_{j,t} \mid \varnothing_{t-1}) = E(i_{j,t} \mid \varnothing_{t-1}) + E(\Delta_{j,t} \mid \varnothing_{t-1})
\] ................................. (1)

where;

\(R_{j,t}\) is the nominal return on asset \(j\) from \(t-1\) to \(t\);

\(E(i_{j,t} \mid \varnothing_{t-1})\) is the appropriate equilibrium expected real return on the asset implied by the set of information \(\varnothing_{t-1}\) available at \(t-1\); and

\(E(\Delta_{j,t} \mid \varnothing_{t-1})\) is the best possible assessment of the expected value of the inflation rate \(\Delta_t\) that can be made on the basis of \(\varnothing_{t-1}\).
The proposition that expected nominal returns contain market assessments of expected inflation rates can be applied to all assets. Fisher's equation was modified by Fama and Schwert (1977) to reflect the unexpected component of the inflation rate. This means that the expected nominal rate of return of an asset is composed of three components: expected real rate of return, expected inflation and unexpected inflation. Expected inflation is the forecast level from the investor's perspective based on previous and present information and it is priced in the financial markets as an inflation premium. Unexpected inflation reflects new market information that may not have been considered previously by investors and it is this unexpected component of inflation that signifies the true inflation risk. The unexpected inflation is equal to the difference between the actual inflation and the last period's expected inflation and is expressed as follows:

\[
\text{Unexpected Inflation} = \text{Actual Inflation} - \text{Expected Inflation} \quad \text{.... (2)}
\]

Actual or observed inflation is reliably measured by the CPI change from period to period. The continuous compounded inflation rate for the period \( t \) can be denoted as:

\[
\text{Actual inflation}_t = \ln (\text{CPI}_t) - \ln (\text{CPI}_{t-1}) \quad \text{.................. (3)}
\]

For the purpose of this study, various proxies for expected inflation were tested in order to obtain a suitable proxy that would vary on a one to one
correspondence with the actual inflation. The proxies tested included the one year lagged rates of the 12 month T-Bill, 12 month fixed deposit, actual inflation, base lending, real gross domestic product growth, 12 month savings deposit and the forecasted inflation rate by Bank Negara Malaysia. It was found that the T-Bill, the fixed deposit rates and the forecasted inflation rates had significant results at the 5% confidence level but the degree of correspondence was only partial at 0.52 and 0.58 and 0.797 respectively.

The method employed, in this study, to represent expected inflation are the T-Bill rates as used by Fama and Schwert (1977). The main reason for using the T-Bill as a proxy for expected inflation is the risk free and constant real rate returns. Hence, the expected rate of inflation is computed to equal the nominal returns on the T-Bill minus the expected real return. However the forecasted inflation rates are also used as a check measure to see if there are any differences in the results. It should be noted that in Hartzell et al.'s (1986) analysis, regression tests of T-Bills and inflation during the period 1973 – 1983 showed poor proxy for expected inflation (0.338) and as a result other forms of proxy was looked into (Brown 1991).

The expected real return is defined as the continuously compounded nominal returns of the asset index minus the observed inflation rate for the period and this is expressed formally as:

\[ i_{t,t} = \ln(1 + R_{t,t}) - \Delta_{t} \]

\[ \text{................................................. (4)} \]
4.4.2 PROPERTY RETURNS

The nominal property returns are based on the MHP index and computed as follows:

\[ R_t = ln \left( \frac{MHPI_t}{MHPI_{t-1}} \right) \] \hspace{1cm} (5)

where;

\( R_t \) = nominal return on asset from time \( t-1 \) to \( t \)

\( MHPI_t \) = MHPI (the index number) in the given year

\( MHPI_{t-1} \) = MHPI (the index number) in the previous year

The nominal returns from all other property sub-indices are also calculated in the same manner.

4.4.3 PROPERTY STOCK OR KLPI RETURNS

The nominal asset returns for the KLPI are calculated as follows:

\[ R(KLPI)_t = ln \left( \frac{KLPI_t}{KLPI_{t-1}} \right) \] \hspace{1cm} (6)

where;

\( R(KLPI)_t \) = nominal return on asset from time \( t-1 \) to \( t \)

\( KLPI_t \) = an index number in the given year

\( KLPI_{t-1} \) = an index number in the previous year
4.4.4 INFLATION HEDGING TEST

An asset is said to be an inflation hedge if and only if its real return is independent of the rate of inflation (Fisher, 1930). The measurement of the inflation hedging ability is based on the classical framework of Fama and Schwert (1977) where an operational definition is given and one that is widely used in the empirical tests of an inflation hedging hypothesis. The model is as follows:

\[ R_{jt} = \alpha_j + \beta_j E(\Delta_t | \varphi_{t-1}) + \gamma_j [\Delta_t - E(\Delta_t | \varphi_{t-1})] + \varepsilon_{jt} \]  

....................(7)

where;

- \( R_{jt} \) is the nominal rate of return on asset \( j \) in period \( t \);
- \( E(\Delta_t | \varphi_{t-1}) \) is the expected inflation rate given the information \( \varphi \) at \( t-1 \);
- \( \Delta_t \) is the actual or observed inflation rate at time \( t \);
- \( [\Delta_t - E(\Delta_t | \varphi_{t-1})] \) is the unexpected inflation component;
- \( \alpha_j \), and \( \beta_j \) and \( \gamma_j \) are the regression coefficients; and
- \( \varepsilon_{jt} \) is the random term with a mean of zero.

For the purposes of this research, the regression equations used to assess the inflation-hedging attributes of the assets (property and property stock) against actual, expected and unexpected inflation are:
Actual Inflation

\[ R_t = \alpha + \delta \text{ (CPI change)} \]  

...(8)

(or \( R_t = \alpha + \delta \) (Actual Inflation))

Expected Inflation and Unexpected Inflation

\[ R_t = \alpha + \beta \text{ } E(\Delta_{i,t} | \varphi_{t-1}) + \gamma[\text{(CPI change)} - E(\Delta_{i,t} | \varphi_{t-1})] \]  

...(9)

(or \( R_t = \alpha + \beta \) (Expected Inflation) + \( \gamma \) (Actual Inflation – Expected Inflation))

where;

- \( R_t \) is the asset return in time \( t \);
- \( \text{CPI change}_t \) is the percentage change in consumer price index in time \( t \) (actual inflation);
- \( E(\Delta_{i,t} | \varphi_{t-1}) \) represents the expected inflation for time \( t \);
- \( \text{(CPI change)} - E(\Delta_{i,t} | \varphi_{t-1}) \) is the unexpected inflation estimate for time \( t \); and
- \( \alpha, \delta, \beta, \) and \( \gamma \) are regression coefficients determined for the respective regression equations.

The magnitude of the regression coefficients denotes the type of inflation-hedging characteristics of the assets in question; property and property stock.
Equation (8) above stipulates if the coefficient $\delta$ is not significantly less than 1 ($p<0.05$) then the asset is said to be a hedge against actual inflation.

Equation (9) above provides that if the coefficient $\beta$ is not significantly less than 1 ($p<0.05$) then the asset is said to be a hedge against expected inflation. Likewise if $\gamma$ is not significantly less than 1 ($p<0.05$), then the asset is a hedge against unexpected inflation. But if $\beta$ and $\gamma$ respectively are both not significantly less than 1 ($p<0.05$), then the asset is said to be complete hedge against inflation.

4.4.5 STATISTICAL ANALYSIS

This paper will not be complete without analysing some descriptive statistics such as the sample means and standard deviations of the indices used. This will show the average returns and the volatility of the returns for the different investments during the period of study.

The Pearson rank correlation coefficient ($r$) tests will also be performed to show the significance, if any, of the strength of the linear relationship between the returns of the types of investment in the study to inflation.