CHAPTER 5

RESEARCH RESULTS

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All data on annual nominal returns of the various property assets are analysed using the Statistical Package for Social Sciences (SPSS) Version 10. Research analysis is confined to the basic descriptive statistics, Pearson correlation and regression analyses. These findings provide results for the hypotheses formulated in Chapter 4 and present some explanation for the documented results.

5.1 ASSET RETURNS AND INFLATION RATE

The descriptive statistics of the asset returns and inflation for the sample period are shown in Table 1 below:

Table 1: Annual Asset Returns and Standard Deviations (1988 – 2001)

Variable	Mean (%)	Standard Deviation (%)	Pearson Correlation with Actual Inflation	Minimum (%)	Maximum (%)
Malaysian House Price Index Returns (Ret MHPI)	5.95	8.47	0.162	-9.88	22.71
Malaysian Terrace House Price Index Returns (Ret MTHPI)	5.73	5.82	-0.033	-4.96	12.66
Malaysian Semi Detached House Price Index Returns (Ret MSDHPI)	3.80	5.57	-0.174	-8.48	10.10
Malaysian Detached House Price Index Returns (Ret MDHPI)	4.75	8.55	-0.083	-14.66	14.56
Malaysian High Rise House Price Index Returns (Ret MHRHPI)	2.72	6.61	-0.241	-6.37	17.03
Kuala Lumpur House Price Index Returns (Ret KLHPI)	6.69	9.28	-0.224	-9.96	25.28
Selangor House Price Index Returns (Ret SHPI)	4.84	6.41	-0.217	-6.65	13.72
Johor House Price Index Returns (Ret JHPI)	4.68	5.19	-0.071	-6.05	11.48
Penang House Price Index Returns (Ret PHPI)	5.46	5.06	-0.205	-5.97	11.06
Kuala Lumpur Properties Index Returns (Ret KLPI)	-3.12	53.67	0.207	-120.49	108.42
Actual Rate of Inflation	3.27	1.10		1.40	5.30

5.1.1 MEAN ANNUAL RETURNS

All return measures provided a positive average return except for the KLPI. This indicates that property in general performed better than the property stock in terms of their mean annual returns over the period of study. It is pertinent to note that the 'Asian Financial Crisis' that struck the region in July 1997 had severe impact on both the stock and the property markets. However both markets made moderate recoveries in the following years but started declining from late 2000 due to the global economic slowdown.

On the whole, investment in the Malaysian residential property market gave a much higher mean annual return than that of the property stock. The mean annual return from the MHPI was 5.95% whereas the mean annual return from KLPI was -3.12%. The highest mean annual returns came from the Kuala Lumpur residential market at 6.69%, followed closely by the residential markets in Penang (5.46%), Selangor (4.84%) and Johor (4.68%). In terms of the type of residential property, the highest mean annual return was from the terraced houses at 5.73%. The next best investment was the detached houses (4.75%) and the semi-detached houses (3.8%). High rise houses showed the lowest mean annual return of 2.72% as compared to all the other types of residential property during the period of study.

All the property assets outperformed the actual mean rate of inflation at 3.27% except for the high rise house category, which indicates that the real returns for almost all the above residential property are positive. In comparison, the annual mean return of the property stock (-3.12%) performed below the actual rate of inflation. The difference in the returns between the MHPI and the KLPI is depicted in Figure 5.1. The annual returns by type of residential property and by region are shown in Figures 5.2 and 5.3 respectively.

Figure 5.1: Graphical Illustration of Annual Returns for MHPI and KLPI for the Period 1988 - 2001

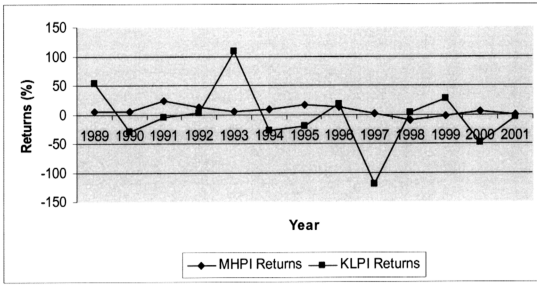


Figure 5.2: Graphical Illustration of Annual Property Returns by Category for the Period 1988 - 2001

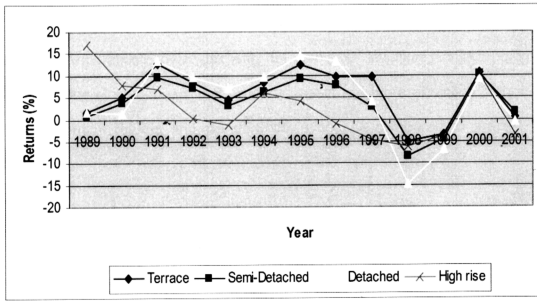
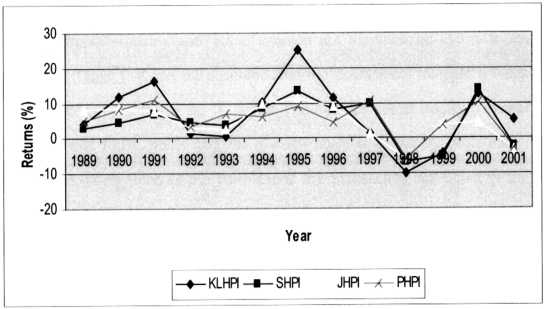


Figure 5.3: Graphical Illustration of Annual Returns by Region for the Period 1988 - 2001



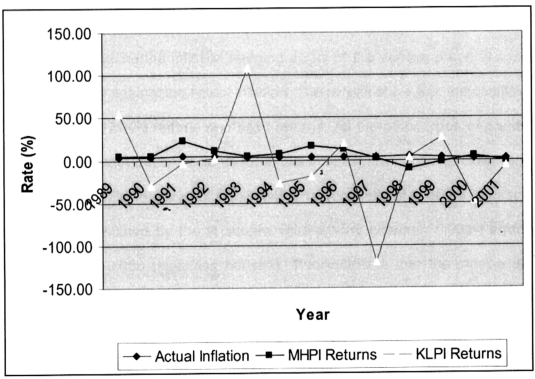
5.1.2 VOLATILITY OF RETURNS

With regard to the volatility or standard deviation, the KLPI or the property stock return has the highest standard deviation of 53.7%. Property assets have a comparatively lower risk with the standard deviation not exceeding 9.28%. It therefore appears that property assets are more attractive both in terms of mean returns and standard deviations as compared to property stock.

5.1.3 CORRELATION WITH ACTUAL INFLATION

The Pearson rank correlation coefficient, *r*, between the returns of the different property assets and actual inflation are summarized in the fourth column of Table 1. It can be observed that the coefficients indicate a weak linear relationship between the variables. The *r* values are all negative except for MHPI and KLPI, which suggest a weak positive correlation with actual inflation. However none of the correlations are statistically significant at the 5% level. From this it can be noted that neither property in general nor the property stock index moves closely with the changes in actual inflation.

Figure 5.4: Graphical Illustration of the Movement of Actual Inflation in Relation to the Annual MHPI and KLPI Returns for the Period 1988 - 2001



5.2 INFLATION HEDGING TESTS

5.2.1 INFLATION HEDGING AGAINST ACTUAL INFLATION

The results of the regression based on equation (8) covering the entire sample period from 1988 to 2001 are summarized in Table 2 as follows:

Table 2: Regression Results for Actual Inflation

Dependent variable	αj	δj	R^2	Significance
Ret MHPI	0.01716	1.319	0.028	0.595
Ret MTHPI	0.06329	-0.187	0.001	0.911
Ret MSDHPI	0.06634	-0.885	0.029	0.578
Ret MDHPI	0.06786	-0.635	0.006	0.796
Ret MHRHPI	0.07392	-1.457	0.056	0.437
Ret KLHPI	0.12800	-1.892	0.048	0.473
Ret SHPI	0.09016	-1.301	0.047	0.475
Ret JHPI	0.05653	-0.303	0.004	0.839
Ret PHPI	0.08572	-0.970	0.042	0.500
Ret KLPI	-0.38200	10.936	0.048	0.473

The tests examine the inflation hedging ability of the various property assets independently against the actual inflation. The results show that the coefficient is positive for MHPI returns and KLPI returns. All the other types of property indices show that the coefficients for actual inflation are negative. However all the above coefficients are not significant. The goodness of fit of the regression model, as indicated by the R square values, vary between 0.001 (terraced houses) and 0.056 (high rise houses). This indicates that the independent variable (actual inflation) explained only 0.1% of the variation in the dependent variable (returns from terrace houses). Whilst the highest R square value in the table above explains that the actual inflation variable explained 5.6% of the variation in the nominal returns of the high rise houses.

Since the coefficient of determination, R square, is a descriptive measure of the usefulness of the regression equation for making predictions, the low R square results indicate that there may be other factors that influenced property performance during the period of 1988 and 2001. Wurtzebach et al. (1991), in an effort to extend the inflation hedging models, postulated that property returns are a function of market balance between supply and demand (or vacancy rates) of the property, inflation and other specific property characteristics. There may have been also other economic factors, which may have characterized a particular timeframe concerning the inflation hedging attributes of property (Brown 1991; MacGregor and Nanthakumaran 1992). In this case, the financial measures that were put into place during the Asian financial crisis may have had some impact on inflation and property returns during the period of study.

5.2.2 HEDGING AGAINST EXPECTED AND UNEXPECTED INFLATION

The tests of inflation hedging against expected and unexpected inflation are conducted by running the empirical model given by equation (9). Table 3 below represents the results of the regression estimates for the components of actual inflation; expected inflation and unexpected inflation against the respective property asset returns.

Table 3: Regression Results for Expected and Unexpected Inflation

Dependent variable	αj	βj	γj	R^2
Ret MHPI	0.02387	1.017*	2.005*	0.984
Ret MTHPI	0.02513	0.979*	1.948*	0.968
Ret MSDHPI	0.02568	0.936*	1.893*	0.966
Ret MDHPI	0.02234	1.045*	2.029*	0.984
Ret MHRHPI	0.03886	0.512	1.372*	0.945
Ret KLHPI	0.02898	0.873*	1.824*	0.989
Ret SHPI	0.02696	0.908*	1.862*	0.975
Ret JHPI	0.02577	0.941*	1.883*	0.962
Ret PHPI	0.02610	1.057*	2.077*	0.956
Ret KLPI	0.02420	1.007*	2.008*	1.000

* Significant at 0.01 level (2 tailed)

The results of the regression estimates for both expected and unexpected inflation against the asset returns show that the coefficient is positive for all property assets. For expected inflation, the significant coefficients range from 0.873 to 1.057. With regard to the high rise houses, although the coefficient is positive it is not significant. This means that unlike all the other property assets, the high rise houses are not a good hedge against expected inflation.

The coefficients for the unexpected inflation are all positive, above 1.0 and are significant. The R square value is exceptionally high, ranging from 0.945 to a perfect score of 1.00. This suggests that both the independent variables (expected and unexpected inflation) explained an overwhelming 94.5% to 100.0% of the variation in the dependent variable (property asset returns).

On the whole with the exception of high rise residential property, the above results indicate that both expected and unexpected inflation significantly explain variations in residential property returns and property stock returns.

5.2.3 INFLATION HEDGING PERFORMANCE AND IMPLICATIONS

From the results of the regression estimates, it can be construed that the hedging effectiveness varied with the type of inflation. As implied by equation (9), the following definitions apply:

- A complete positive hedge against inflation is obtained when a positively signed delta/beta/gamma coefficient of an asset is not statistically different from positive one.

- A complete negative hedge against inflation is obtained when a negatively signed delta/beta/gamma coefficient for an asset is not statistically different from negative one.

- A partial positive hedge against inflation is obtained when a positively signed beta/gamma/gamma coefficient for an asset is statistically different from both positive one and zero.

- A partial negative hedge against inflation is obtained when a negatively signed delta/beta/gamma coefficient for an asset is significantly different from negative one and significantly different from zero.

- An indeterminant hedge against inflation is obtained when the delta/beta/gamma coefficient is not statistically different from zero or when the results are not significant.

The regression results from the Tables 2 and 3 can be summed up in Table 4 as follows:

Table 4: Hedging Effectiveness against Actual, Expected and Unexpected Inflation

Dependent variable	Type of Hedge		
	Actual Inflation	Expected Inflation	Unexpected Inflation
Ret MHPI	Indeterminant	Complete Positive	Complete Positive
Ret MTHPI	Indeterminant	Complete Positive	Complete Positive
Ret MSDHPI	Indeterminant	Complete Positive	Complete Positive
Ret MDHPI	Indeterminant	Complete Positive	Complete Positive
Ret MHRHPI	Indeterminant	Indeterminant	Complete Positive
Ret KLHPI	Indeterminant	Complete Positive	Complete Positive
Ret SHPI	Indeterminant	Complete Positive	Complete Positive
Ret JHPI	Indeterminant	Complete Positive	Complete Positive
Ret PHPI	Indeterminant	Complete Positive	Complete Positive
Ret KLPI	Indeterminant	Complete Positive	Complete Positive

As indicated in the above table, the results for hedging performance of the various property assets against expected and unexpected inflation are almost in direct contrast to the findings with respect to actual inflation. All property assets except for high rise houses exhibited a complete positive hedge against expected inflation. These results imply that except for high rise houses, property is a good hedge against expected inflation. In the case of unexpected inflation all the property assets had significant coefficients and proved to be a complete positive hedge. According to Fama and Schwert (1977), when the inflation hedging tests indicate that $\beta j = \gamma j = 1.0$, the asset is said to be a complete hedge against inflation. In other words the nominal return on the asset varies in one-to-one correspondence with both expected and unexpected components of the inflation rate, and the ex-post real return on the asset is uncorrelated with the ex-post inflation rate.

This indicates that property and property stock can hedge against both expected and unexpected inflation over annual holding periods. Moreover, the responses of property and property stock, in some cases are more than one to one correspondence, which means that for a 1% increase in expected inflation, property and property stock returns increase by 1%.

5.2.4 INFLATION HEDGING PERFORMANCE USING FORECASTED INFLATION AS PROXY FOR EXPECTED INFLATION

As mentioned earlier in paragraph 4.4.1 of the previous chapter, the above inflation hedging performance is further checked by the use of forecasted inflation as a proxy for expected inflation, which has a higher coefficient than T-Bills when regressed against actual inflation. The results are as follows:

Table 5: Hedging Effectiveness against Expected and Unexpected Inflation (using forecasted inflation as a proxy for expected inflation)

Dependant Variable	Expected Inflation	Unexpected Inflation
Ret MHPI	Partial Positive	Complete Positive
Ret MTHPI	Complete Positive [3]	Complete Positive
Ret MSDHPI	Complete Positive	Complete Positive
Ret MDHPI	Complete Positive	Complete Positive
Ret MHRHPI	Indeterminant	Complete Positive
Ret KLHPI	Complete Positive	Complete Positive
Ret SHPI	Complete Positive	Complete Positive
Ret JHPI	Complete Positive	Complete Positive
Ret PHPI	Complete Positive	Complete Positive
Ret KLPI	Complete Positive	Complete Positive

The results are almost similar to that of using T-Bills as a proxy for expected inflation. The only difference is that the MHPI returns appear to be a partial positive hedge against expected inflation whereas it is a complete positive hedge in Table 4 above.

5.3 HYPOTHESIS TESTING

The null hypothesis is a statement about the population value that is tested and it will be rejected only if the sample data provides substantial contradictory evidence. The alternate hypothesis is the hypothesis that includes all population values not covered by the null hypothesis. According to Zikmund (2000), hypothesis testing is based on the probability theory and because we are unable to make a statement about a sample with complete certainty, there is always the chance that an error can be made.

Hence the alternate hypothesis is deemed to be true if the null hypothesis is rejected. It should be noted that the decision to reject or fail to reject the null hypothesis depends critically on alpha, the level of significance or the probability of committing a Type I error, which is the probability of rejecting the true null hypothesis. A Type II error is made when a decision is made not to reject the null hypothesis when the alternative hypothesis is true. However both these errors cannot be minimised simultaneously without increasing the sample size as there is an inverse relationship between these two types of errors. The classical approach to this problem would be to assume that a type I error is likely to be more serious in practice than a type II error. This is done

by keeping the probability of not committing type I error at a relatively low level such as 0.01 or 0.05 confidence level, and then try to minimise the Type II error as much as possible.

In this study, the above significant results indicate that there is adequate contradictory evidence and as such, the first null hypothesis is rejected and the alternate hypothesis that property is a good hedge against inflation is confirmed. The same applies to the property stock where it is also found to be a good hedge against inflation.

The results for both property and property stock, however, fail to reject the second null hypothesis, which stipulates that there is no difference between property returns and property stock returns in terms of inflation hedging during the period of 1988 - 2001. However it must be noted that not rejecting the null hypothesis does not necessarily mean that the null hypothesis is true as there may be a possibility that there is not enough evidence against it.