



REAL ESTATE INVESTMENT TRUST (REIT) AND INFLATION

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การลงทุนในอสังหาริมทรัพย์มักถือกันว่าเป็นการลงทุนที่ใช้ป้องกันเงินเฟ้อได้ดี การศึกษานี้ทำการตรวจสอบในลักษณะเชิงประจักษ์ต่อข้อมูลการลงทุนในอสังหาริมทรัพย์ทางอ้อม คือ กองทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์ (REIT) ซึ่งจดทะเบียนในตลาดหลักทรัพย์ออสเตรเลีย (ASX) ว่าสามารถให้การปกป้องจากภาวะเงินเฟ้อได้หรือไม่ โดยใช้วิธีของชาร์ป (Sharpe) ปี ค.ศ. 1992 สร้างกลุ่มหลักทรัพย์จากสินทรัพย์ 5 ประเภท คือ กองทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์ หุ้นสามัญ หุ้นกู้ ทุนมนุษย์ และสินค้าโภคภัณฑ์ ให้มีอัตราผลตอบแทนเลียนแบบอัตราเงินเฟ้อ ทั้งนี้ผลของการศึกษาเปิดเผยว่ามีเพียงกองทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์ และสินค้าโภคภัณฑ์ที่มีสัดส่วนสำคัญในกลุ่มหลักทรัพย์ซึ่งเลียนแบบอัตราเงินเฟ้อดังกล่าว โดยมีน้ำหนัก 35% และ 65% ตามลำดับ หลักฐานที่ค้นพบดังกล่าวสนับสนุนว่าการลงทุนในอสังหาริมทรัพย์ทางอ้อมสามารถป้องกันความเสี่ยงจากเงินเฟ้อได้

คำสำคัญ : กองทรัสต์เพื่อการลงทุนในอสังหาริมทรัพย์ REIT เงินเฟ้อ ป้องกันความเสี่ยง

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ABSTRACT

Real estate investment is conventionally perceived as a good protection against inflation. This study empirically investigates indirect real estate investment, i.e. Real Estate Investment Trust (REIT) listed in the Australian Securities Exchange (ASX), whether it provides safeguard against inflation. A portfolio of 5 asset classes, REITs, ordinary shares, bonds, human capital, and commodities, is constructed to resemble inflation. Adopting Sharpe 1992's methodology, the findings reveal that only REITs and commodities carry a significant weight, 35% and 65% respectively, in the portfolio corresponding to inflation. Therefore, inflation-hedging capability of indirect real estate investment is evidently supported.

Keywords : Real Estate Investment Trust, REIT, Inflation, hedge



I. INTRODUCTION

Traditionally, real estate is commonly perceived to be a good hedging vehicle against inflation, in addition to its diversification benefit when adding them in the investment portfolio. A number of empirical studies has been undertaken to investigate if real estate could effectively hedge against inflation adopting both traditional static regression methods and other dynamic methods. However, most of previous researches were conducted on a single-asset basis, not portfolio of assets. Normally, either individual or institutional investors invest in many assets at one time, so-called portfolio of assets. Therefore, it would be beneficial to both types of investors if a portfolio basis is adopted to examine whether any asset in the mixed-asset portfolio, especially real estate, really provide a protection against inflation.

This study applies *asset class factor model* of Sharpe (1992) to construct a mixed-asset portfolio to empirically investigate the hedging characteristics of five different asset classes in the portfolio against inflation. The contribution of each asset class to hedge against inflation will be determined by the estimated coefficient. The primary objective of this study is to identify hedging effectiveness of real estate investment; consequently, both direct and indirect real estate investment will be examined. As a result of this study, investors might be able to construct an efficient portfolio that could safeguard their investment's returns against inflation.

II. REVIEW OF RELATED LITERATURES

As real estate has traditionally been perceived as a good hedging instrument against inflation, investors and researchers have conducted a number of empirical researches in order to examine the hedging effectiveness of real estate investment. The review is conducted on both property funds and REITs related literatures and studies, although property funds possess less flexibility than REITs. Nevertheless, property funds are somewhat comparable to REITs e.g. (1) units of property funds are offered to public and traded on the exchange, (2) proceeds of the unit offerings and sales are invested in real properties and/or leasehold interest which generate regular rental income, (3) majority of property fund's earnings are distributed to unit holders. Furthermore, this study also reviewed literatures concerning traditional real estate investment i.e. direct investment in real properties.



Fisher (1930) was a pioneer of inflation hedging concept. Fisher wrote a seminal paper hypothesizing about capability of an asset to hedge against inflation, which later was coined as 'Fisher hypothesis'. Fisher contended that the expected real rate of return should be independent of the inflation rate. Fama and Schwert (1977) is one of the classic empirical studies regarding inflation hedging characteristic of assets. Five asset classes, i.e. (1) Treasury bills, (2) Government bonds, (3) Residential real estate, (4) Labour income, and (5) Common stocks, were analysed and investigated whether they could hedge against either expected or unexpected inflation. The Ordinary Least Square (OLS) model was utilised to test hedging ability of each asset class. Nominal returns of three-months US Treasury bills were employed as a proxy for expected inflation. Consequently, the unexpected inflation was the difference between the actual inflation and the expected inflation, i.e. nominal returns on Treasury bills. The findings of Fama and Schwert (1977) revealed that residential real estate was the only asset that hedged against both expected and unexpected inflation.

Rubens, Bond, and Webb (1989) argued that the proxy of unexpected inflation, i.e. the difference between the actual inflation and the nominal returns on Treasury bills, adopted in Fama and Schwert (1977) were ex-post. Ruben *et al.* employed the Livingston price expectations (LPE) series, which is an opinion survey amongst several economists regarding future US inflation and economy, as a proxy of expected inflation instead. Three financial asset classes, i.e. (1) Treasury bills, (2) Government bonds, and (3) Common stock, and three types of real estate, i.e. (1) Residential real estate, (2) Business real estate, and (3) Farmland real estate, were examined. The findings exhibited that the only asset which completely hedged against inflation was residential real estate. Moreover, only residential and farmland real estate statistically demonstrated a complete hedge against unexpected inflation.

Hoesli (1994) empirically tested real estate mutual funds in Switzerland to determine whether they could effectively hedge against inflation whereas Hamelink and Hoesli (1996) constructed and employed a hedonic price index of residential real estate to investigate inflation hedging characteristic of real estate in Switzerland instead. Additionally, Hoesli, Lizieri, and Macgregor (2006) studied short-run and long run relationship between inflation and commercial real estate, e.g. real properties, REITs, and property funds, in US and UK real estate markets. ARIMA model was used in Hoesli (1994) to develop the anticipated real interest rates because Hoesli asserted that the anticipated real interest rates were



non-constant and followed a random walk model over time. Results of short run were statistically insignificant; nonetheless, there were evidences confirmed that real estate mutual funds could be a somewhat effective hedging instrument in the long run. Hamelink and Hoesli (1996) also used econometric models, AR(1), QTARCH, and ARCH-M, to estimate rate of anticipated inflation. Both real estate and real estate mutual funds in Switzerland were found to be capable of hedging inflation in the findings of Hamelink and Hoesli. On the contrary, Hoesli, Lizieri, and Macgregor (2006) discovered that three-quarter and four-quarter moving averages of inflation were the best estimators of anticipated inflation both in UK and in US. However, only four-quarter moving average was used as a proxy for expected inflation and error correction model (ECM) was adopted to explore both short-run and long run relationship between inflation and return on real estate, both real properties and securitized real estate, in Hoesli *et al.* (2006). The findings of Hoesli *et al.* supported that both direct real estate investment and REITs could effectively hedge against expected inflation in the long-run model of US market. Additionally, the UK long-run model also presented similar results, there were evidences of inflation hedging for both real properties and securitized real estate. However, only direct real estate investment could effectively hedge against both anticipated and unanticipated inflation in the short-run model of UK. On the other hand, the findings of US short-run model were not in line with the traditional perception regarding hedging ability of real estate. There was no evidence, in short-run, to support the hypothesis that real estate could be an effective hedging instrument to protect wealth against inflation in US market.

Sing and Low (2000) conducted a thorough empirical study regarding inflation hedging characteristics of real estate in Singapore. The inter-temporal changes of inflation hedging effectiveness in different periods, including difference level of effectiveness during high and low inflation regimes, were examined by Sing and Low. The results revealed that only shop and industrial real estate that could effectively hedge against both actual and anticipated inflation. In the case of unexpected inflation, it seemed that only industrial real estate could hedge against inflation. Furthermore, the evidences showed that residential real estate was a good hedging instrument against unexpected inflation during the period of low inflation whereas industrial real estate was a good hedging instrument against both expected and unexpected inflation during the regime of high inflation.

Chu and Sing (2004) employed the conventional ordinary least square (OLS) method to examine inflation hedging effectiveness of three property classes, i.e. (1) residential



property, (2) commercial property, (3) office property, in China. In addition, long-term relationship between inflation and real estate was investigated through the cointegration analysis. Chu and Sing used ARIMA as a proxy of expected inflation. The results of the study are in sharp contrast to abovementioned studies. Neither inflation hedging characteristics of real properties nor long-term relationship between real property and inflation could be statistically identified in Chinese real estate market.

Although the aforementioned researches are interesting and useful, all of them only examined inflation hedging characteristic of real estate, and other assets, on a single-asset basis. The econometric models were employed and the coefficients were statistically test on each individual asset one by one. Owing to the single asset basis of analysis, none of the studies really determined whether one asset class could hedge against inflation more effectively than other asset classes or not. In practice, both individual and institutional investors normally invest in a portfolio which consists of different asset classes. Therefore, it will be beneficial to examine the level of contribution of different assets, existing in the same portfolio, to hedge against inflation. As a result, Investors and fund managers would be able to develop an investment strategy to protect their investments against inflation accordingly.

Table 1 Comparative table of empirical findings

Author(s) & Year	Proxy for Real Estate Investment	Empirical Findings
Fama and Schwert (1977)	Residential real estate	It hedged against both expected and unexpected inflation
Rubens, Bond, and Webb (1989)	(1) Residential real estate (2) Business real estate (3) Farmland real estate	<ul style="list-style-type: none"> • Only residential real estate completely hedged against inflation. • Only residential and farmland real estate statistically & completely hedged against unexpected inflation



Author(s) & Year	Proxy for Real Estate Investment	Empirical Findings
Hoesli (1994)	Real estate mutual funds	It could somewhat effectively hedge against inflation only in the long run.
Hamelink and Hoesli (1996)	(1) Residential real estate (2) Real estate mutual funds	Both could effectively hedge against inflation.
Sing and Low (2000)	Real properties	<ul style="list-style-type: none">• Only shop and industrial real estate that could effectively hedge against both actual and anticipated inflation• only industrial real estate could hedge against unexpected inflation
Chu and Sing (2004)	(1) Residential property (2) Commercial property (3) Office property	None of the properties could statistically hedge against inflation.
Hoesli, Lizieri, and Macgregor (2006)	Commercial real estate	<ul style="list-style-type: none">• Both direct real estate investment and REITs in US could effectively hedge against expected inflation in the long run.• Only direct real estate investment in UK could effectively hedge against both anticipated and unanticipated inflation in the short-run.



III. RESEARCH DATA AND METHODOLOGY

A. Research Data

This study attempts to examine the level of contribution of real estate investment, the emphasis is on securitized real estate i.e. Real Estate Investment Trust (REIT), to hedge against inflation in comparison with other asset classes which are combined in the same investment portfolio. The country of analysis is Australia, this is due to the integration of real estate market and the longevity of available data. Even though U.S. is the largest market and the oldest of indirect real estate investment, REIT, the nature of U.S. REIT market is characterized by distinctive regional and sub-regional segmentations. Inevitably, a study of one segment will be a poor representation of the overall market. Therefore, Australian REIT market, which is the second largest and oldest REIT market, is a more appropriate unit of analysis.

All time-series data utilized in this research paper are retrieved from Thomson Reuters – DataStream database. The sample period under examination spans from last quarter of 1989 – second quarter of 2014 on a quarterly basis. Inflation is represented by Australian consumer price index which is retrieved and transformed to natural logarithm. Proxies of real estate investment are price index of Australian residential property, which represents direct real estate investment, and price index of S&P Australian REIT, which represents indirect real estate investment. However, only one proxy of real estate investment is included in the model at a time.

To investigate inflation hedging effectiveness, i.e. contribution of individual asset in the mixed-assets portfolio to hedge against inflation, of different asset classes, 5 asset classes, which are traditionally perceived by investors that they provide a hedge against inflation, are selected for the model. The following table describes inflation and 5 asset classes applied for this paper:

**Table 2** Description of 5 Asset Classes

Asset Classes	Description
CPI	Quarterly consumer price index of Australia.
REIT	Quarterly price index of S&P Australian REIT listed in the Australian Securities Exchange (ASX) as a proxy of indirect real estate investment.
HPI	Quarterly price index of residential property in 8 major cities of Australia as a proxy of traditional direct real estate investment.
SH_INX	Quarterly price index of all ordinary shares listed in the Australian Securities Exchange (ASX) as a proxy of common stock investment.
C_BOND_INX	Quarterly UBS composite bond index of all bonds in Australian capital market as a proxy of investment in fixed-income security.
AVG_W_WAGE	Quarterly average weekly earning in Australia as a proxy of human capital.
COM_INX	Quarterly RBA index of commodity prices in Australia as a proxy of investment in commodity products.

B. Methodology

To investigate inflation hedging contribution of each individual asset class which is included in the mixed-asset portfolio, methodology, so-called *asset class factor model*, suggested by Sharpe (1992) is adapted and employed. A portfolio consisting of 5 different asset classes, including real estate, ordinary shares, bonds, human capital, and commodities, is constructed in order to resemble changes of inflation. The coefficient for each asset class would represent its contribution to hedge against inflation in the mixed-asset portfolio. The asset class factor model is shown below:



$$R_i = (b_{i1}F_1 + b_{i2}F_2 + \dots + b_{in}F_n) + e_i \tag{1}$$

Where R_i is a rate actual of inflation

F_1 is value of asset 1

F_2 is value of asset 2

F_n is value of asset n

b_{i1} through b_{in} are the sensitivities of R_i to asset F_1 through F_n

e_i is other components of rates of actual inflation R_i

To determine contribution of real estate in term of inflation hedge in comparison with other asset classes, three constraints need to be imposed on the regression model: First, each coefficient represent a proportion or weight of each asset class in the mixed-asset portfolio in which its return resemble changes of inflation. Therefore, each coefficient is constrained to be non-negative. Moreover, its value has to lie in between 0 to 1, assuming that there is no short position. The mixed-asset portfolio is a passive portfolio with the style as the rate of inflation, this implies that the proportion or weight of each asset class contributed to target portfolio remains constant throughout the period under examination. Second, the sum of all coefficients must equal 1 since the sum of all coefficients is effectively the sum of proportion or weight of each asset class in the target portfolio which replicates changes of inflation. Last but not least important, the mixed-asset portfolio which is constructed from 5 different asset classes is the portfolio that has the lowest residual term of e_i , or tracking error which is the difference between the rates of inflation and the returns of the mixed-asset portfolio. R-square, R^2 , of the *asset class factor model* is determined by following equation:

$$R^2 = 1 - \frac{\sum_i^n (R_i - R_{pi})^2}{\sum_i^n (R_i - [E(R)]_i)^2} \tag{2}$$

Where R_i is a rate actual of inflation

R_{pi} is the quarterly return of the portfolio constructed from 5 asset classes.

The R^2 represents the portion of variance of R_i which is explained by all asset classes and 1 minus R^2 , thus, indicates the unexplained portion.



IV. EMPIRICAL RESULT

Two regression models are run and tested, (1) REIT model – the model in which REIT is used as a proxy for real estate investment in a mixed-asset portfolio, (2) HPI model – the model in which House Price Index is used as a proxy for real estate investment in a mixed-asset portfolio. Table 3 shows the output of parameter estimates of REIT model from statistical software package, SPSS.

Table 3 Parameter Estimates – REIT Model

Dependent variable: LN_CPI

Parameter	Estimate	Std. Error
LN(REIT)	0.351**	.076
LN(SH_INX)	0.000	.129
LN(C_BOND_INX)	0.000	.089
LN(AVG_W_WAGE)	0.000	.089
LN(COM_INX)	0.649**	.078

**Significant at 0.01

Results clearly indicate that the only significant asset classes, which contribute to hedge against inflation of a REIT model, are REIT and commodity asset. None of the coefficients of ordinary shares, bonds, and average weekly wage, is statistically significantly different from zero. Coefficients of REIT and commodity asset are 0.351 and 0.649 respectively. Therefore it can be interpreted that REIT can hedge against inflation more effectively than ordinary share, bonds, and average weekly wage but less effectively than commodity asset. The practical explanation of coefficients is that the wage of REIT investment in the mixed-asset portfolio that corresponds to inflation is approximately 35% whereas that of commodity asset is approximately 65%. The percentage of unexplained portion is shown implicitly in ANOVA table (not presented here). Since the R-square represents the portion of variance of R_i which is explained by all asset classes in the mixed-asset portfolio, 1 minus R^2 effectively is a tracking error of the regression model – REIT model. R-square of REIT model is 0.594



or 59.4%, which means that the REIT model could explain the variation of inflation approximately 60%. In addition, the unexplained portion or tracking error of REIT model is approximately 40%.

A result of parameter estimates of the HPI model is somewhat different from the REIT model. The weight of direct real estate investment, house price index as a proxy, is only 5%. Furthermore, this proportion, represented by coefficient, is not statistically significantly different from zero. It can be concluded that there is no empirical evidence to support inflation hedging characteristic of direct real estate investment. The weight of average weekly wage is 10.4%; however, it is statistically insignificant either. In addition, the weight of both ordinary shares and bonds are zero signifying that neither ordinary shares nor bonds could contribute to effectively hedge against inflation when they are added in the mixed-asset portfolio. The only asset class that could effectively hedge against inflation in the HPI model is commodity asset. Its weight is approximately 85% and it is statistically significant. Supported by empirical evidences, it could be stated that commodity asset offers highest contribution to hedge against inflation in the mixed-asset portfolio consisting of 5 asset classes, i.e. real estate, ordinary shares, bonds, average weekly wage, and commodity asset.

V. CONCLUDING REMARKS

This study runs the test on the inflation hedging characteristics of 5 different asset classes during the last quarter of 1989 to the second quarter of 2014. The 5 asset classes are selected by adopting the framework and concepts in the classical work on asset return and inflation of Fama and Schwert (1977). The test uncovers that a mixed-asset portfolio, which its return correspond to rate of inflation, could be constructed by employing the *asset class factor model* of Sharpe (1992) in order to examine inflation hedging contribution of each asset class. The proxies of real estate investment are REIT and house price index, which is put in the regression model one by one at a time. The empirical evidences verify the conventional belief that certain asset classes are good hedge against inflation. The findings reveal that it is indirect real estate investment, i.e. REIT, not direct real estate investment which could effectively hedge against inflation. In addition, commodity asset is found to be the best asset class among the 5 selected asset classes in the mixed-asset portfolio to hedge against inflation. The proportion or weight of commodity asset is exceptionally high in comparison to other asset classes, approximately 65% in the REIT model and 85% in the HPI model.



The findings of this study offer more understanding concerning inflation hedging characteristic of assets, especially real estate investment. Nevertheless, there are two limitations of this empirical study that are not negligible. Firstly, returns of mixed-asset portfolio are tested against *ex-post* inflation, or actual inflation. In fact, inflation can be decomposed into expected inflation and unexpected inflation. Therefore, further study should explore inflation hedging characteristics of assets by testing asset returns against expected and unexpected inflation. Secondly, a proxy of direct real estate investment, price index of residential property in 8 major cities of Australia, includes only price appreciation. However, the common nature of real estate is normally entitled regular stream of rental income. Hence, further studies should find a measure to correct these limitations.

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