CHAPTER 3

SAMPLE AND METHODOLOGY

This chapter is aimed to explain the sample and methodology employed in this study. The main data in this study are stock return, interest rate, and inflation rate. The chapter also presents the model and hypothesis to investigate the link between stock return and interest rate as well as the impact of growth options on equity duration.

3.1 Sample and Data

The sample covers listed companies in Honk Kong, Indonesia, Malaysia, Philippines, Singapore, Taiwan, and Thailand during July 1997 to June 2003. Table 3.1 presents the sample size in each country. Hong Kong and Malaysia have the biggest sample size in every year. The number of firms in Singapore and Taiwan increases rapidly while the number of firms in Thai decreases a little during 1997 to 2002. Compared to other countries, Indonesia and Philippines have the smallest sample size

Table 3.1: Sample Size

The table reports the number of listed companies in each country, which are included in the study.

Country	1997	1998	1999	2000	2001	2002
Hong Kong	438	474	516	520	585	645
Indonesia	199	218	183	201	200	233
Malaysia	536	630	652	656	670	682
Philippines	155	175	181	179	188	184
Singapore	199	232	248	273	326	366
Taiwan	203	207	211	291	330	353
Thailand	340	310	312	300	300	307

All data used in this study are collected from DATASTREAM (stock returns and book-to-market equity ratio) and CEIC (interest rate and inflation rate).

The interest rate variables used in this study are yield on government 10-year bonds. However, there is no these data in Indonesia and Philippines so the lending rates are used as the proxy for these two country.

3.2 Methodology

1. Select the samples for each country by using these following criteria

- Having positive book value of equity
- Having stock price at least one year from July in year t to June in year t+1

2. Calculate fiscal year-end book-to-market equity ratio (BE/ME) of the sample at June of each year and then sort the sample into each quintile on the basis of their BE/ME. At the end of that period, we recalculate BE/ME and use it to reform five portfolios. The first quintile (low BE/ME) is named as the high-growth portfolio and the fifth quintile (high BE/ME) is named as the low-growth portfolio.

3. Calculate the equally weighted monthly returns on each portfolio.

4. Estimate the following equations

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_{i,I} \Delta I_t + \varepsilon_{i,t} \quad (1)$$

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \gamma_{i,r} \Delta r_t + \gamma_{i,\pi} \Delta \pi_t + \varepsilon_{i,t} \quad (2)$$

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + s_i SMB_t + h_i HML_t + \gamma_{i,I} \Delta I_t + \varepsilon_{i,t} \quad (3)$$

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + s_i SMB_t + h_i HML_t + \gamma_{i,r} \Delta r_t + \gamma_{i,\pi} \Delta \pi_t + \varepsilon_{i,t} \quad (4)$$

Where $R_{i,t}$ = return on the portfolio i at month t

$R_{m,t}$ = the market return at month t

ΔI_t = nominal interest rate change at month t

Δr_t = real rate change at month t

$\Delta \pi_t$ = inflation rate change at month t

SMB_t = return on size factor at month t

HML_t = return on growth factor at month t

$\varepsilon_{i,t}$ = error term

The principal variables in this study are ΔI_t, Δr_t, and $\Delta \pi_t$. The equation (1) and (2) use the market return as the control variable (Sweeney and Warga (1986)), while the equation (3) and (4) use the three-factor model from Fama and French (1993) as the control variables.

In addition, the interest rate changes in equation (1) – (4) are replaced with the last one-month, two-month, and three-month interest rate changes to investigate the lagged effect of interest rate movement on stock returns. Specifically, the interest rate change at month t is replaced with the interest rate change at month t-1, t-2, and t-3 respectively.

3.3 Hypothesis

When the parameters in equation (1) – (4) are estimated, these following hypotheses will be tested by using F-test.

3.3.1 Returns on high-growth portfolio are positively correlated with interest rate, while returns on low-growth portfolio are negatively correlated with interest rate.

Since the high-growth portfolio have growth options as the major part, when interest rate rise, the increase in growth options value should substitute the decrease in value of assets in place. While the low-growth portfolio have assets in place as the major part, when interest rate rise, the decrease in value of assets in place should replace the increase in value of growth options.

This hypothesis can be presented as

$$H_0 : \gamma_1 \leq 0 \quad \text{and} \quad H_0 : \gamma_5 \geq 0$$
$$H_0 : \gamma_1 > 0 \qquad\qquad H_0 : \gamma_5 < 0$$

Where γ_1 and γ_5 are the coefficients of nominal interest rate, real interest rate, and inflation rate for high and low-growth portfolios respectively.

3.3.2 Interest rate sensitivities on high-growth portfolios are different from those of low-growth portfolios.

Because the effect of growth options changes equity duration, returns on high-growth portfolio should have interest rate sensitivity different from those on low-growth portfolio.

This hypothesis can be presented as

$$H_0 : \gamma_{1,I} = \gamma_{5,I} \quad \text{and} \quad H_0 : \gamma_{1,r} = \gamma_{5,r} \quad \text{and} \quad H_0 : \gamma_{1,\pi} = \gamma_{5,\pi}$$
$$H_1 : \gamma_{1,I} \neq \gamma_{5,I} \qquad H_1 : \gamma_{1,r} \neq \gamma_{5,r} \qquad H_1 : \gamma_{1,\pi} \neq \gamma_{5,\pi}$$

3.3.3 Interest rate exposure of each country is different from each others

Because of the different environment in each country (i.e., debt to equity ratio, financial market regulation, and etc.), the interest rate sensitivity of each country should differ from others.

The hypothesis can be presented as

- **Different in nominal interest rate**

$$H_0 : \gamma_{i,I}^1 = \gamma_{i,I}^2 = \ldots = \gamma_{i,I}^j$$
$$H_1 : \gamma_{i,I}^1 \neq \gamma_{i,I}^2 \neq \ldots \neq \gamma_{i,I}^j$$

- **Different in real rate**

$$H_0 : \gamma_{i,r}^1 = \gamma_{i,r}^2 = \ldots = \gamma_{i,r}^j$$
$$H_1 : \gamma_{i,r}^1 \neq \gamma_{i,r}^2 \neq \ldots \neq \gamma_{i,r}^j$$

- **Different in inflation rate**

$$H_0 : \gamma_{i,\pi}^1 = \gamma_{i,\pi}^2 = \ldots = \gamma_{i,\pi}^j$$
$$H_1 : \gamma_{i,\pi}^1 \neq \gamma_{i,\pi}^2 \neq \ldots \neq \gamma_{i,\pi}^j$$

Where the superscript j represents the parameters for each country and the subscript i represents portfolio i (i = 1, 2, 3, 4, 5).