SECTORAL PORTFOLIO STRATEGIES TO SUSTAIN GROWTH DURING HIGH INFLATIONARY PERIOD IN INDONESIA STOCK EXCHANGE

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ABSTRACT

Previous studies proposed that there is negative correlation between inflation and stock return. The negative correlation is assumed driven by expectations in the increasing of nominal risk free rate return thus accelerating demand of money. This assumption is in accordance with stock valuation perspective in which lower stock valuation will move in tandem with the increase of risk free rate. Given the rising inflation in Indonesia nowadays, this research is intended to improve investor's decision in hedging against inflation.

This research proposes asset pricing models with inflation factor by conducting portfolio using selective industry sectors approach. The intention is intended to discover hedging ability of some industry sectors against inflation. Accordingly can helps investors to improve investment decisions in stabilizing investment return throughout inflationary period. Research model is evaluated using single index model, reward-risk ratio and maximum drawdown strategy in Indonesia stock market.

The result of this study based on asset pricing models with inflation factor shown that consumer, property, and basic industry sectors have the potential to provide a much better inflation hedge in high inflationary period. These sectors are positively correlated with inflation in 0.05 level of significant.

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INTRODUCTION

In recent years, growing concerns about inflation have become integrated into the investment landscape. Inflation defined as a rise in the average price level of all goods and services in an economy over a period of time. Rising inflation has an insidious effect such as input prices are higher, consumers can purchase fewer goods, revenues and profits decline, and the economy slows down for a time until a steady stage is reached.

As one of the macro economic indicator to measure the stability of economy, inflation has played an important role in the determination of the central bank's monetary policy. Even when inflation itself is not a problem, the fear of inflation guides changing in macroeconomic policy that will impact on the dynamics of economic growth. Instability of economy can be negative threat to investors' long-term objectives. As a result, investors are considering a variety of assets that offer inflation protection including equity investments.

Since inflation can affect the stock market return, the purpose of this research is helping investor especially for fund managers who have to keep investing in stock investment to know which sectors can give the best return for inflation hedge. Ang, Briere, and Signori (2011) explain that there are some important reasons to examine the inflation hedging ability of individual stocks as compared to stock market indices. First and most importantly is constructing portfolios based on individual sector which has higher returns and can strongly beat the inflation. These sectors will have the potential to provide a much better inflation hedge than the aggregate market. An investor seeking to hedge inflation risk would optimally hold inflation hedging constructed portfolio rather than a market-weighted index. Second, there is considerable heterogeneity across firms. Different firms have different pricing power, which is the ability of a firm to set prices for new or existing goods, or to pass on price increases to consumers resulting from movements in input prices, such as labor costs,

commodities, and interest rates. Although the overall stock market may be a poor inflation hedge, companies in certain sectors or with certain characteristics may have better inflation hedging properties than other companies.

Finally, by focusing on the drivers and characteristics of secular stock market cycles and the impact of inflation on the stock market allow investors to investigate which types of sectors are better inflation hedges than other. This research proposes asset pricing models with inflation factor and also examines performance of the portfolio strategies using single index model, reward-risk ratio, and maximum drawdown in Indonesia stock market for the period covering from 2000 to 2012. The asset pricing models are Capital Asset Pricing Model incorporating the inflation factor in Capital Asset Pricing Model. Researcher also expects the conceptual approach toward investment strategy in this research can be applied to the current market environment.

Nowadays, Indonesia is facing its highest inflation rate in year after fuel prices were increased in June 2013 to deal with the budget and current account deficits that were putting pressure on our country's economy. In June 2013, inflation accelerated to 5.9% year on year (compared with 5.5% in May 2013) because of higher transportation costs given the fuel price hike, and stock market already shrank around 12% just in one month. Facing the rising inflation can affect in decreasing of real returns on equities that can be strongly influence the investor's decision in equity investment. Investors especially for fund managers must sift through the confusion to make wise decisions on how to invest in periods of inflation. Different groups of stocks seem to perform better during periods of high inflation. Therefore, this research is focused on how the return of inflation hedging portfolio can beat the return of market that can adequately hedge inflation risk.

LITERATURE REVIEW

Fisher (1930) was the first economist to explore the impact of inflation on stock prices. He argued that during inflation the cash flows from shares go up because of rise in selling prices. Increasing in cash flows that discounted with the same required rate of returns, would give a higher value and thus share value should go up during inflation and should offer a good hedge against inflation in long run.

Rose and Marquis (1983) also stated that common stock is widely viewed as a powerful hedge against inflation where is a place to park money if someone want to preserve the purchasing power of savings over the long haul. This can be substantially improved by concentrating on stocks in certain sectors that are more closely linked to inflation cycles. Specifically, real asset investments in sectors of the economy that are stable and even in different economic phases are viewed as particularly inflation-resistant.

However, most recent studies have proven that nominal stock market returns and inflation returns are negatively correlated. The higher the inflation, the lower the real return on stocks. Fama (1981) stated the relationship between stock return and inflation is in fact induced by a negative relation between inflation and real activity. Fama's hypothesis predicts that rising inflation rates reduce real economic activity and demand for money. Geske and Roll (1983) documented a negative relationship between inflation and stock return. An increase in inflation has been expected to increase the nominal risk free rate, which in turn will raise the discount rate that used in stocks valuation. Theodore E. Day (1984) examined the relationship between real stock returns and inflation and concluded that there is negative relationship between real stock returns and inflation. Joo (2000) examined whether monetary policy accounts will cause the negative relationship between real stock returns and inflation or not. His evidence suggests that about 30% of the observed negative relationship is attributed to monetary innovations. Durai and Bhaduri (2009) found that there is a strong negative relationship between inflation and real stock return in the short and medium term.

Several studies in Indonesia capital market showed a difference result in correlation between inflation and stock market. Novianto (2008)

stated that inflation rate has negative correlation with stock market. Pasaribu, Tobing, Manurung (2010) stated that there is no correlation between stock market and inflation. Meanwhile, Widodo (2011) stated that stock market and inflation have positive correlation in long run.

METHODOLOGY

Beta Measurement

Beta measures how sensitive is an asset's return relatively, to the market as a whole. It is calculated as the covariance of the return on i and the return on the market divided by the variance of the market return. The equation for beta measurement is:

$$\boldsymbol{\beta i} = \frac{\boldsymbol{\rho i,m \; x \; \sigma m}}{\boldsymbol{\sigma m}} \qquad \textbf{(1)}$$

A positive beta indicates that the return of an asset follows the general market trend, whereas a negative beta shows that the return of an asset generally follows a trend that is opposite to that of the market.

According to Bekaert and Wang (2010), inflation beta is how many percentage points the asset's total return rises or falls, on average, for each percentage point increase in inflation. And the definition of inflation hedging is the how strongly a security's nominal return co-movement with inflation in the following time-series regression:

$$\boldsymbol{R_{it} = \alpha + \beta \pi_i + \varepsilon_i} \qquad \textbf{(2)}$$

Where:

α = The intercept

β = The sensitivity of the portfolio return of industry i with respect to the market return

R_{it} = The monthly nominal return of a stock i

π_i = The monthly rate of inflation

ε_i = Residual of the regression measuring the part of the nominal return that is not explained by inflation.

If $\beta = 1$, we say that the stock is a perfect hedge against inflation. Note that a perfect inflation hedge does not imply that the correlation between the stock return and inflation is one due to systematic risk. Negative inflation betas imply that a stock has poor returns when inflation is high.

Capital Asset Pricing Model (CAPM) and Inflation-CAPM

The CAPM is model's main prediction is that a market portfolio of invested wealth is mean-variance efficient resulting in a linear cross sectional relationship between mean excess returns. The model draws on the portfolio theory as developed by Harry Markowitz (1952).

Early theories suggested that the risk of an individual security is the standard deviation of its returns for a measurement of return volatility. Thus, the larger the standard deviation of security returns the greater the risk. An investor's main concern, however, is the risk of his or her total wealth made up of a collection of securities, the portfolio. Markowitz observed that when two risky assets are combined their standard deviations are not additive provided the returns from the two assets are not perfectly positively correlated and when a portfolio of risky assets is formed, the standard deviation risk of the portfolio is less than the sum of standard deviations of its constituents. Markowitz was the first to develop a specific measure of portfolio risk and to derive the expected return and risk of a portfolio. The Markowitz model generates the efficient frontier of portfolios and the investors are expected to select a portfolio, which is most appropriate for them, from the efficient set of portfolios available to them.

The CAPM model assumes a linear relationship between the expected return in a risky asset and its β and further assumes that β is an applicable and sufficient measure of risks that captures the cross section of average returns, that is, the model assumes that assets can only earn a high average return if they have a high market β. β drives average returns because β measures how much the inclusion of additional stock to a well diversified portfolio increases the inherent risk and volatility of the portfolio.

Inflation-CAPM incorporates the inflation factor (inflation rate) in CAPM. The inflation factor plays a role of a forecasting indicator of the portfolio return in the Inflation-CAPM portfolio strategy. The

Inflation-CAPM strategy is the portfolio strategy driven by the forecast of the industry excess portfolio return ($R_t^i - R_t^f$) with the inflation factor (I_{t-1}) after hedging the market risk. The Inflation-CAPM strategy could be practiced and expected to generate the return $\beta^{i,I} I_{t-1}$ in addition to the Inflation-CAPM α^i when the inflation factor (I_{t-1}) is not zero.

In its simplest form the CAPM is defined by the following equation:\

$$\boldsymbol{R_t^i - R_t^f = \alpha^i + \beta^{i,M}\left(R_t{}^M - R_t{}^f\right) + \varepsilon_i} \qquad \textbf{(3)}$$

Inflation-CAPM is defined by the following equation:

$$\boldsymbol{R_t^i - R_t^f = \alpha^i + \beta^{i,M}\left(R_t{}^M - R_t{}^f\right) + \beta^{i,I} I_{t-1} + \varepsilon_i} \qquad \textbf{(4)}$$

Where:

R_t^i = The portfolio return of industry i at time t

R_t^f = The risk free rate of return at time t

$\beta^{i,M}$ = $\frac{\text{COV (Ri,Rm)}}{\text{VAR (Rm)}}$= the sensitivity of the portfolio return of industry i with respect to the market return (market beta)

α^i = The intercept

ε_i = The error term

I_{t-1} = The inflation factor at time $t-1$

$\beta^{i,I}$ = The sensitivity of the portfolio return of industry i with respect to the inflation factor (inflation beta)

Single Index Model

Sharpe (1964) developed a computationally efficient method, the single index model, where return on an individual security is related to the return on a common index.

Single index model is a technique for measuring the return and risk of a stock or portfolio. The model assumes that the movement in stock returns is related only to market movements or the co-movement between stocks is due the single common influence by market performance. Hence, the measure of this index can be found by relating the stock return to the return on a stock market index.

Sensitivity of stock returns to movements in the movement of the market return is measured by Beta.

The single index model can be extended to portfolios as well. This is possible because the expected return on a portfolio is a weighted average of the expected returns on individual securities.

The formulation for single index model can be shown below:

$$\boldsymbol{r_i = a_i + \beta_i r_m} \quad \textbf{(5)}$$

Where:

r_i = Return on stock i

a_i = Component of stock i's return that is independent of the market's performance

r_m = The rate of return on the market index

β_i = A constant that measures the expected change in i

r_i given a change in r_m

The term a_i can be further broken down into a_i and e_i where a_i is the expected value of a_i and e_i is the random element of a_i.

The expected return, variance and covariance can be estimated as follows when they are used to represent the joint movement of stocks:

Mean return of stock, $\boldsymbol{r_i = a_i + \beta_i r_m}$

Variance of a stock's return, $\boldsymbol{\sigma^2 i = \beta^2 i\, \sigma^2 m + \sigma^2 e_i}$

Covariance of returns between stocks i and j, $\boldsymbol{\sigma_{ij} = \beta i \beta j \sigma^2 m}$

Where, $\sigma^2 m$ = market variance and $\sigma^2 e_i$ = unique risk factor

Reward-Risk Ratio

Reward-risk ratio or sometimes known as risk reward ratio is a ratio used by many investors to compare the expected returns of an investment to the amount of risk undertaken to capture these returns. This ratio is simplify calculated by return of asset divided the standard deviation of asset (risk). Investors can use reward-risk ratio to measure the degree of risk inherent in a given investment in relation to the potential profit associated. In general, a riskier investment must offer a greater reward to compensate investors for the increased risk

of loss. Therefore, investor will prefer to invest in asset with higher reward-risk ratio.

Maximum Drawdown

According to Ismail et al (2004), maximum drawdown is an indicator of the risk of a portfolio chosen based on a certain strategy. The maximum drawdown is the largest percentage drop in asset price over a specified time period. In other words, it is the greatest peak-to-trough of the asset returns. It is a measure of downside risk. It measures the largest single drop from peak to bottom in the value of a portfolio (before a new peak is achieved).

The calculation of maximum drawdown is:

$$Max\ Drawdown = \frac{Peak\ value\ before\ largest\ drop - lowest\ value\ before\ new\ high\ established}{Peak\ value\ before\ largest\ drop} \quad (6)$$

The higher the maximum drawdown, the worse the investment performed on a risk-adjusted basis over the specified time period; the lower the maximum drawdown, the better it performed.

FINDING AND DISCUSSION

Jakarta Composite Index has risen about 578% since 2000 until 2012. Overall Jakarta Composite Index has a positive movement in a long run even it was a big crash in 2008 caused by world financial crisis. In 2008, Jakarta Composite Index dropped to its lowest level to 1.241 from its highest level 2.721 shrank around 120% in a year.

Indonesia CPI moved up and down in average 7.7% during 2000 – 2012 where it was four different times where inflation moved up from its bottom level in previous period. When inflation is above 7.7% can be used as a benchmark for high inflationary period. In high inflationary period, stock market tended to move down as opposed to rising inflation.

The following table is the descriptive statistic of sector population during 2000 to 2012 incorporating inflation factor. From table 1.

shown that during 2000 to 2012 agriculture sector has highest return than others with 1.88% monthly return followed by mining sector with 1.55% monthly return and miscellaneous industry with 1.49% monthly return. In the other side, trade sector has lowest return with only 0.84% monthly return. It means that on average agriculture, mining, and miscellaneous industry performed better in the past twelve years. Consumer sector has highest inflation beta with 0.0446 imply that consumer sector has better returns when inflation is high. Miscellaneous industry has lowest inflation beta with 0.0000 imply that sector has poor returns when inflation is high. Therefore, investors can choose sector with high inflation beta as their investment when inflation is going up. Consumer sector also has lowest risk with 6.76% of standard deviation whereas mining sector has highest risk with 12.01% of standard deviation. The highest correlation between consumer sector return and inflation is 27.83% while the lowest correlation between miscellaneous industry and inflation is 0.00%. We can see that inflation beta and correlation reflect same results.

The authors conducted calculations on the monthly returns in the sample sectors as presented in table 1. below,

Table 1. In sample sectors, regression of monthly returns on inflation, January 2000 – December 2012

Sector	Average Return	α	Inflation β	σ	ρ
Finance	1.47%	0.0178	0.0046	7.80%	2.51%
Agriculture	1.88%	0.0264	0.0160	11.69%	5.77%
Mining	1.55%	0.0227	0.0143	12.01%	5.02%
Consumer	1.40%	0.0172	0.0446	6.76%	27.83%
Property	1.15%	0.0165	0.0216	9.46%	9.63%
Infrastructure	1.19%	0.0154	0.0152	7.88%	8.15%
Trade	0.84%	0.0120	0.0144	7.90%	7.71%
Basic Industry	0.94%	0.0136	0.0189	8.59%	9.31%
Miscellaneous Industry	1.49%	0.0190	0.0000	8.80%	0.00%

Table 2. represents in-sample sectors sorted from January 2000 until December 2012. Sectors are sorted from its highest value to lowest

value by inflation beta, sector beta, and reward-risk ratio. Maximum drawdown sectors are sorted from its lowest value to highest value.

Table 2. In-sample sectors sorted by Inflation-CAPM, Single Index Model, Reward Risk Ratio, and Maximum Drawdown

January 2000 - December 2012			
Sector	**Inflation β**	**Sector**	**Sector β**
Consumer	0.0446	Mining	1.1722
Property	0.0216	Agriculture	1.1007
Basic Industry	0.0189	Miscellaneous Industry	1.0559
Agriculture	0.0160	Basic Industry	1.0259
Infrastructure	0.0152	Property	0.9870
Trade	0.0144	Trade	0.9715
Mining	0.0143	Finance	0.9551
Finance	0.0046	Infrastructure	0.9191
Miscellaneous Industry	0.0000	Consumer	0.7453
Sector	**Reward-risk Ratio**	**Sector**	**Max DD**
Consumer	0.2063	Consumer	-0.3255
Finance	0.1877	Finance	-0.4621
Miscellaneous Industry	0.1699	Infrastructure	-0.5408
Agriculture	0.1609	Miscellaneous Industry	-0.5860
Infrastructure	0.1511	Property	-0.6187
Mining	0.1286	Trade	-0.6582
Property	0.1220	Basic Industry	-0.6976
Basic Industry	0.1092	Mining	-0.7531
Trade	0.1061	Agriculture	-0.7786

Table 3. represents out-sample sectors sorted from January 2000 until June 2002. Sectors are sorted from its highest value to lowest value by inflation beta, market beta, and Reward-risk ratio. Maximum drawdown sectors are sorted from its lowest value to highest value.

Table 3. Out-sample sectors sorted by Inflation-CAPM, Single Index Model, Reward Risk Ratio, and Maximum Drawdown

January 2000 - June 2002			
Sector	**Inflation β**	**Sector**	**Sector β**
Consumer	0.0502	Infrastructure	1.1158
Property	0.0262	Consumer	1.0998
Mining	0.0249	Agriculture	1.0615
Trade	0.0196	Trade	1.0251
Basic Industry	0.0191	Basic Industry	0.9248
Infrastructure	0.0157	Finance	0.8507
Finance	0.0135	Property	0.8481
Agriculture	0.0117	Miscellaneous Industry	0.8464
Miscellaneous Industry	0.0092	Mining	0.7021
Sector	**Reward-risk Ratio**	**Sector**	**Max DD**
Finance	0.0003	Consumer	-0.3185
Consumer	-0.0160	Mining	-0.4190
Infrastructure	-0.0217	Infrastructure	-0.4260
Miscellaneous Industry	-0.1155	Miscellaneous Industry	-0.4438
Trade	-0.1259	Finance	-0.4661
Agriculture	-0.1329	Trade	-0.5152
Property	-0.1498	Property	-0.5933
Mining	-0.1626	Agriculture	-0.6670
Basic Industry	-0.3599	Basic Industry	-0.6724

Table 4. represents out-sample sectors sorted from July 2003 until September 2006. Sectors are sorted from its highest value to lowest value by inflation beta, market beta, and Reward-risk ratio. Maximum drawdown sectors are sorted from its lowest value to highest value.

Table 4. Out-sample sectors sorted by Inflation-CAPM, Single Index Model, Reward Risk Ratio, and Maximum Drawdown

July 2003 - September 2006			
Sector	**Inflation β**	**Sector**	**Sector β**
Agriculture	0.0652	Property	1.1703
Consumer	0.0252	Mining	1.1525
Infrastructure	-0.0276	Basic Industry	1.1382
Property	-0.0354	Finance	1.1322
Basic Industry	-0.0408	Infrastructure	0.9957
Trade	-0.0676	Miscellaneous Industry	0.9914
Miscellaneous Industry	-0.0989	Trade	0.9148
Finance	-0.1523	Consumer	0.7949
Mining	-0.1758	Agriculture	0.4072
Sector	**Reward-risk Ratio**	**Sector**	**Max DD**
Agriculture	0.6265	Agriculture	-0.0678
Infrastructure	0.6187	Infrastructure	-0.1120
Finance	0.3926	Consumer	-0.1274
Mining	0.3612	Trade	-0.1403
Trade	0.3345	Finance	-0.1913
Consumer	0.3284	Basic Industry	-0.2281
Miscellaneous Industry	0.3042	Mining	-0.2311
Basic Industry	0.2890	Miscellaneous Industry	-0.2599
Property	0.2558	Property	-0.2851

Table 5. represents out-sample sectors sorted from October 2006 until March 2009. Sectors are sorted from its highest value to lowest value by inflation beta, market beta, and Reward-risk ratio. Maximum drawdown sectors are sorted from its lowest value to highest value.

Table 5. Out-sample sectors sorted by Inflation-CAPM, Single Index Model, Reward Risk Ratio, and Maximum Drawdown

October 2006 - March 2009			
Sector	**Inflation β**	**Sector**	**Sector β**
Basic Industry	0.1385	Agriculture	1.6212
Mining	0.0123	Mining	1.3908
Property	-0.0201	Miscellaneous Industry	1.1643
Trade	-0.0504	Basic Industry	1.0652
Consumer	-0.0666	Property	0.9748
Finance	-0.0813	Trade	0.9706
Infrastructure	-0.1355	Finance	0.8711
Agriculture	-0.1512	Infrastructure	0.8643
Miscellaneous Industry	-0.2606	Consumer	0.4073
Sector	**Reward-risk Ratio**	**Sector**	**Max DD**
Agriculture	0.1203	Consumer	-0.2929
Mining	0.0436	Finance	-0.4566
Property	0.0298	Basic Industry	-0.5288
Basic Industry	0.0166	Infrastructure	-0.5408
Miscellaneous Industry	0.0164	Miscellaneous Industry	-0.5860
Consumer	0.0032	Property	-0.6187
Finance	-0.0325	Trade	-0.6582
Infrastructure	-0.0821	Mining	-0.7531
Trade	-0.1642	Agriculture	-0.7786

Table 6. represents out-sample sectors sorted from July 2009 until November 2011. Sectors are sorted from its highest value to lowest value by inflation beta, market beta, and Reward-risk ratio. Maximum drawdown sectors are sorted from its lowest value to highest value.

Table 6. Out-sample sectors sorted by Inflation-CAPM, Single Index Model, Reward Risk Ratio, and Maximum Drawdown

July 2009 - November 2011			
Sector	**Inflation β**	**Sector**	**Sector β**
Infrastructure	0.1091	Miscellaneous Industry	1.2868
Consumer	0.1071	Mining	1.2157
Finance	0.0579	Property	1.1318
Trade	0.0576	Finance	1.1253
Mining	0.0380	Trade	0.9783
Miscellaneous Industry	0.0325	Agriculture	0.9715
Basic Industry	0.0176	Basic Industry	0.9705
Property	-0.0017	Consumer	0.7017
Agriculture	-0.1159	Infrastructure	0.6564
Sector	**Reward-risk Ratio**	**Sector**	**Max DD**
Consumer	0.4815	Miscellaneous Industry	-0.1288
Miscellaneous Industry	0.4250	Finance	-0.1410
Trade	0.4084	Consumer	-0.1439
Finance	0.3190	Property	-0.1517
Basic Industry	0.2909	Trade	-0.1574
Agriculture	0.2717	Basic Industry	-0.1636
Property	0.1196	Agriculture	-0.1674
Mining	0.0705	Infrastructure	-0.1791
Infrastructure	-0.0025	Mining	-0.2603

Analysis of portfolio performance

Based on sectors sorted, portfolios are constructed based on top three sorted sectors for each model. Performance of portfolios divided into short term and long term period. Short term period is assumed by return on investment in 12 months after high inflation period. Long term period is assumed by return on investment after high inflation period until end of 2012.

In out-sample performance portfolios from January 2000 until June 2002 shown that Inflation-CAPM, Reward-risk ratio, and maximum

drawdown portfolios have positive return in short term while single index portfolios has negative return. But all models have positive return for long term horizon. Inflation-CAPM portfolios underperformed than market index for short term but outperformed for long term.

Out-sample portfolio performance, January 2000 – June 2002

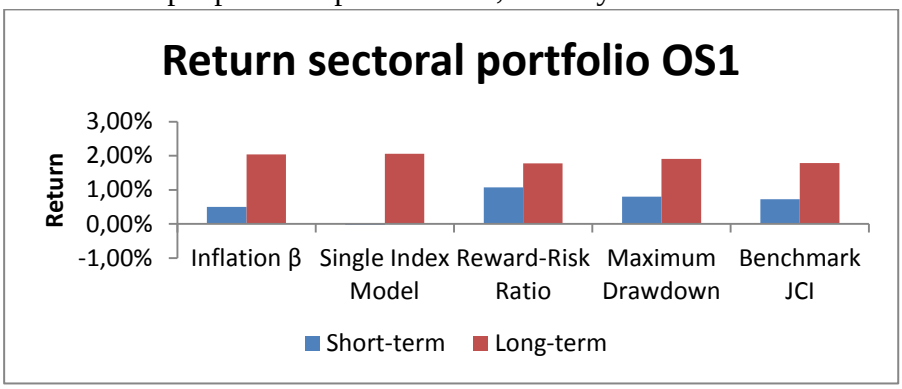

Figure 1. The comparison of short-term and long-term of portfolio returns in OS1

The highest return derived from Reward-risk ratio with 1.07% monthly return for short term while single index model derived highest return for long term with 2.06% monthly return. The worst performance derived from single index model with -0.03% monthly return for short term and Reward-risk ratio with 1.77% monthly return for long term.

In out-sample performance portfolios from July 2003 until September 2006 shown that Inflation-CAPM, single index model, Reward-risk ratio, and maximum drawdown portfolios have positive return both in short term and long term horizon. Inflation-CAPM portfolios outperformed than market index both in short term and long term. The highest return derived from single index model with 6.83% monthly return for short term and 1.58% for long term with 2.06% monthly return. The worst performance derived from single index model with -0.03% monthly return for short term and Reward-risk ratio with 1.77% monthly return for long term.

Out-sample portfolio performance, July 2003 – September 2006

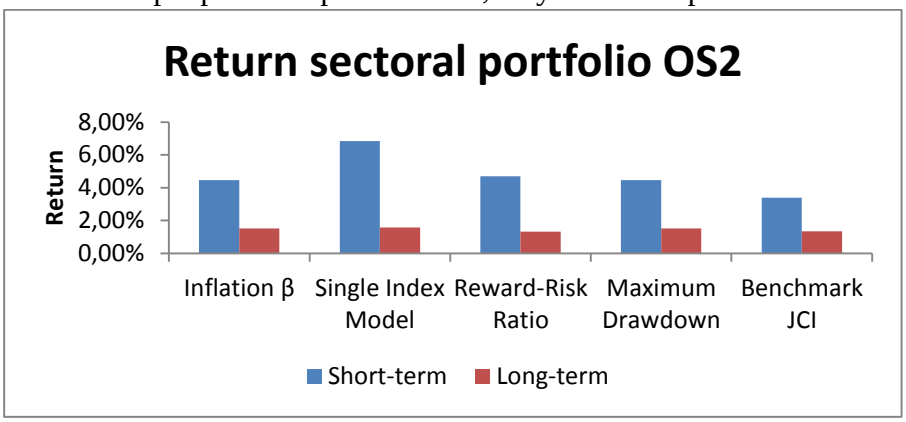

Figure 2. The comparison of short-term and long-term of portfolio returns in OS2

In out-sample performance portfolios from October 2006 until March 2009. Inflation-CAPM, single index model, Reward-risk ratio, and maximum drawdown portfolios have positive return both in short term and long term horizon. The highest return derived from single index model with 6.86% monthly return for short term while maximum drawdown model derived highest return with 2.70% monthly return for long term. The worst performance derived from Reward-risk ratio with 3.96% monthly return for short term and 1.55% monthly return for long term.

Out-sample portfolio performance, October 2006 – March 2009

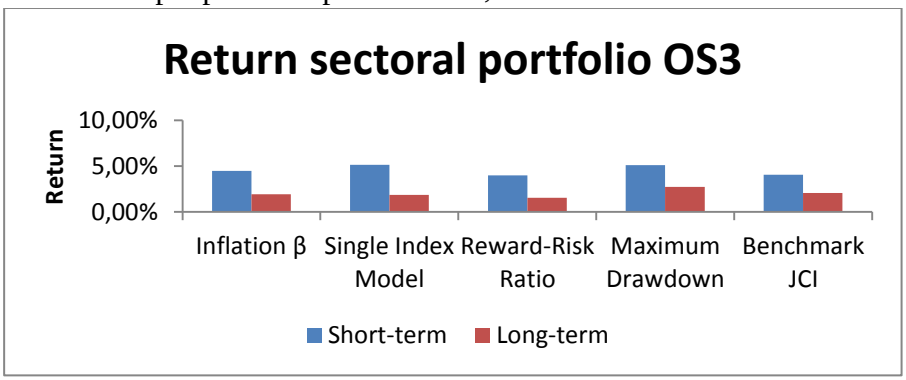

Figure 3. The comparison of short-term and long-term of portfolio returns in OS3

In out-sample performance portfolios from July 2009 until November 2011. Inflation-CAPM, Reward-risk ratio, and maximum drawdown portfolios have positive return while single index model derived negative return. The highest return derived from inflation-CAPM with 1.61% monthly return while single index model derived worst performance with -0.03%. Inflation-CAPM portfolios outperformed than market index.

Out-sample portfolio performance, July 2009 – November 2011

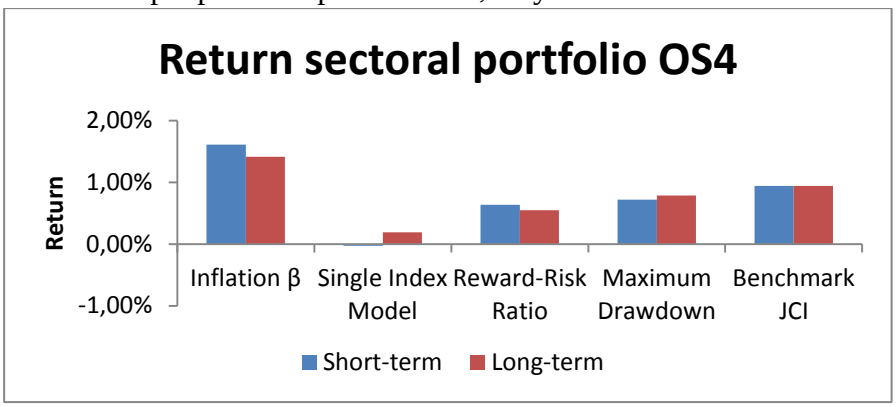

Figure 4. The comparison of short-term and long-term of portfolio returns in OS4

Frequency of selected sectors based on inflation-CAPM, Reward-risk ratio, single index model, and maximum drawdown

In every out-sample sorted sectors, author selected top three ranked sectors in each model to conclude which sectors are better to sustain growth in every high inflationary period. The most three sector that often appear in every high inflationary period will be chosen as simulation sectors portfolio for investment in 2013.

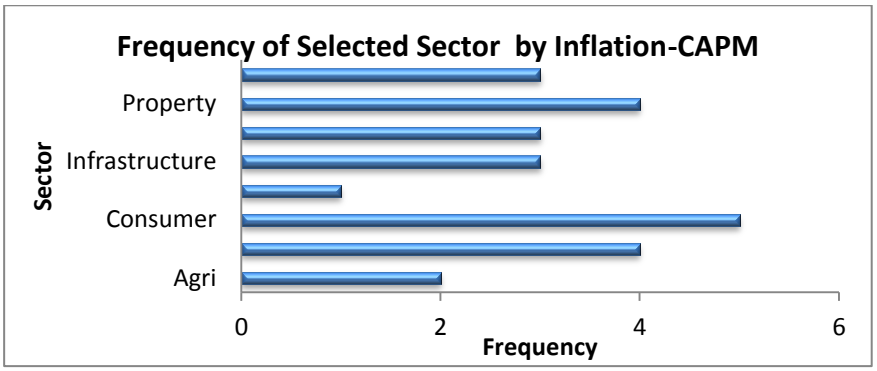

Figure 5. Frequency of selected sectors' returns by Inflation-CAPM

Based on Inflation-CAPM model, consumer sector always selected in every high inflationary period followed by property sector and basic industry.

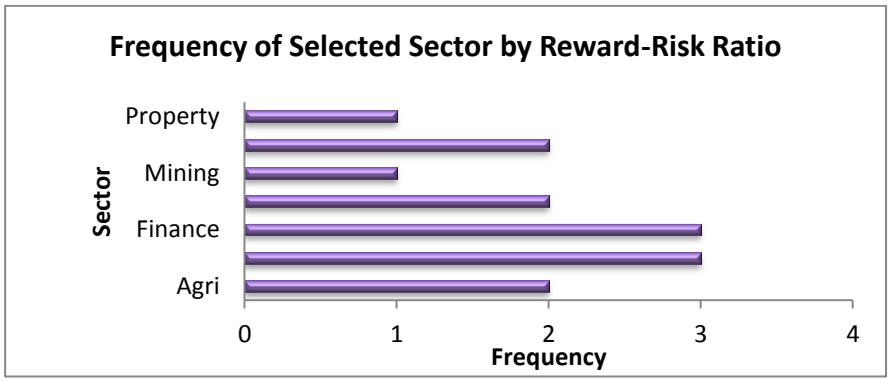

Figure 6. Frequency of selected sectors' returns by Reward risk ratio

Based on Reward-risk ratio, consumer and finance sectors have the same percentile, followed by miscellaneous industry, infrastructure, and agriculture.

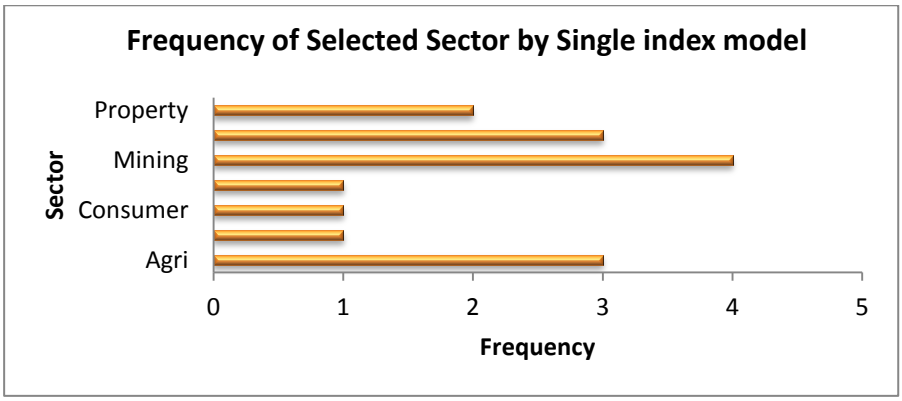

Figure 7. Frequency of selected sectors' returns by Single Index Model

Based on single index model, highest percentile comes from mining sector and followed by miscellaneous industry and agriculture.

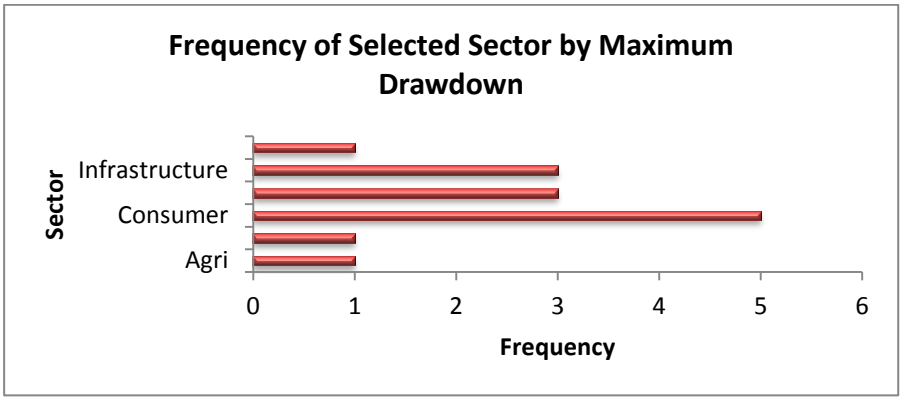

Figure 8. Frequency of selected sectors' returns by single maximum drawdown

Based on maximum drawdown, consumer sector also selected in every high inflationary period and followed by infrastructure sector and finance.

Simulation of optimum portfolio to sustain growth for investment in 2013

Optimum portfolio aims to generate better returns with minimum risk so each sector is weighted into portfolio strategy. Weighted portfolios are calculated by solver in Microsoft excel.

Table 7. Optimum portfolio simulation

	Weighted Portfolio	Portfolio Return	Portfolio Risk	Return as Holding Period
Inflation-CAPM				
Consumer	77.00%			
Basic Industry	13.47%			
Property	9.53%			
		4.06%	6.60%	27%
Single Index Model				
Mining	13.53%			
Agriculture	14.35%			
Miscellaneous Industry	72.11%			
		-0.65%	8.47%	-3%
Reward-risk Ratio				
Consumer	67.03%			
Finance	32.97%			
Miscellaneous Industry	0.00%			
		2.97%	6.39%	20%
Max DD				
Consumer	59.21%			
Finance	17.07%			
Infrastructure	23.72%			
		2.96%	6.33%	20%

Consumer sector has the largest weight as 77% in Inflation-CAPM model with 4.06% monthly return. Miscellaneous industry has largest weight as 72.11% in single index model with -0.65% monthly. Consumer sector has the largest weight as 67.03% in Reward-risk ratio with 2.97% monthly return. Consumer sector also has the largest weight in maximum drawdown model as 59.21% with 2.96% monthly return.

Hypothesis Testing

This research want to prove whether selected sectors based on Inflation-CAPM are positively related to inflation rate or not, so the research hypothesis is following:

H_0 : Selected sectors based on Inflation-CAPM are not positively related to inflation rate.

H_1 : Selected sectors based on Inflation-CAPM are positively related to inflation rate.

By using T-test, table 8. shown that all testing reject H_0. Thus, consumer, property, and basic industry sector are positively related to inflation rate. The T-test hypothesis testing shows all t-calculated is greater than t-critical with 5% level of significant.

Table 8. T-test on selected sectors based on inflation-CAPM

Consumer	t Stat	14.0021	
	t Critical	1.6547	
	p-value	1.30E-29	***Reject H_0***
Property	t Stat	15.8521	
	t Critical	1.6547	
	p-value	1.25E-34	***Reject H_0***
Basic Industry	t Stat	15.3959	
	t Critical	1.6547	
	p-value	2.40E-33	***Reject H_0***

CONCLUSION

During 2000 until 2012, agriculture sector has highest return than others with 1.88% monthly return followed by mining sector with 1.55% monthly return and miscellaneous industry with 1.49% monthly return. In the other side, trade sector has lowest return with only 0.84% monthly return. It means that on average sector agriculture, mining, and miscellaneous industry performed better in

the past twelve years. Investors with long term outlook can select these sectors as their investment option without involving the impact of inflation into equity investment.

Based on research sample, each sector has a different risk amid inflation shocks. Higher risk mostly derived from agriculture and mining sector while consumer sector has lower risk to inflation shocks. By using asset pricing models incorporating inflation factor, consumer sector has the highest inflation beta with 0.0446 imply that consumer sector has better returns in high inflationary period. Therefore, investors can choose sector with high inflation beta as their investment when inflation is going up. Consumer sector also has the lowest risk with 6.76% standard deviation and has the highest correlation with inflation. This is in accordance as defensive character of the consumer good industry which is likely to persist as an industry to meet the everyday needs of the community requires and tends to survive amid inflation shocks.

Inflation-CAPM model is more suitable for investor with long time horizon because all data that used into this method is monthly data because of CPI data only announced once in a month.

By constructing out sample portfolios in high inflationary period asset pricing model with inflation factor endorse this model that consumer, property, basic industry are positively correlated with inflation in 0.05 level of significant. Thus these sectors can be an option to invest when inflation increases.

Mining, agriculture, and miscellaneous sectors are selected based on single index model which focused on sensitivity sector return to the market return. Consumer, finance, and miscellaneous industry are selected based on reward-risk ratio which focused on expected returns of an investment to the amount of risk undertaken. Consumer, finance, and infrastructure sectors are selected based on maximum drawdown which focused on downside risk.

Consumer sector was selected as inflation hedge sector to sustain growth during high inflationary period based on Inflation-CAPM, reward-risk ratio, and maximum drawdown.

Different methods give different result both in short term and long term. Asset pricing model with inflation factor is mostly performed better than market index and other models. As it seen from the simulation of portfolio for 2013 when the inflation rate increasing, this model gives highest return with 3.65% monthly return. Reward-risk ratio gives 1.40% monthly return, maximum drawdown portfolio gives 1.98% monthly return while single index model has negative performance with -1.25% monthly return.

Optimum portfolios by calculating mean-variance efficient weights with minimum risk into portfolio provided better result in return of portfolio, increasing profit and reducing loss. By using Inflation-CAPM method, optimum portfolio consists of 77.00% consumer sector, 13.47% basic industry, and 9.53% property sector. Single index model portfolio consists of 13.53% mining sector, 14.35% agriculture, and 72.11% miscellaneous industry. Reward-risk ratio portfolio consists of 67.03% consumer sector and 32.97% finance industry. Maximum drawdown portfolio consists of 59.21% consumer sector, 17.07% finance industry, and 23.72% infrastructure. By building optimum portfolios, it shown monthly return increased 0.42% for inflation-CAPM, 1.56% for reward-risk ratio, 0.98% for maximum drawdown, and reduced loss 0.60% for single index model.

RECOMMENDATION

For Investors

- Investors are better to invest stock under sector with high inflation beta such as consumer goods industry when inflation is increasing.
- Investors can maximize their return on investment by calculating mean-variance efficient weights with minimum risk into portfolio.

For Further Research

- This research can be continued by building stock portfolios to sustain growth in high inflationary period by doing in-sample and out-sample portfolio with inflation-CAPM, single index model, reward-risk ratio, and maximum drawdown strategy.
- Another research model is needed to find out better strategy in equity investment during high inflationary period.

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