

The Impact of Inflation on Stock Returns in Stock Exchange of Thailand

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ผลกระทบของอัตราเงินเฟ้อต่อผลตอบแทนของหุ้นในตลาดหลักทรัพย์แห่งประเทศไทย



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This paper aims to determine the impacts of expected and unexpected inflation on stock returns in Stock Exchange of Thailand. Moreover, this is the first paper that studies the impact consensus forecast inflation rate on stock return in Thailand.

To investigate these findings, we decided to look into the period between June 2004 - December 2019 in 8 sectors of Stock Exchange of Thailand including Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology to find the relationship between inflation and stock returns.

The results indicate expected inflation has strongly impact on stock returns, while unexpected inflation has not impact on stock return because investors believe the analysts, who use the economic indicators to forecast the inflation rate, estimate too close the actual one. Moreover, each industry will give the different result depending on the company's capability of transferring inflation shocks to prices of products and services.

Results from different inflationary regimes show that expected inflation impacts on stock returns in negative direction especially during the low inflation periods. It is because the market is quite fluctuation and inflation rate is a signal of economic situation. It can impact on macroeconomic policy and trade policy which effect to the profitability of each companies.

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Field of Study: Finance

Student's Signature

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1. Introduction

It is known that the inflation rate which is one of the most important indicators for stock market because it represents the decrease in the real value of asset and the rate of return that you need to compensate the inflation (Geske and Roll, 1983). For example, the inflation is at 3%, so your portfolio should get a return at least 3% to offset the inflation and have abnormal return. It means that you should get a higher rate of return, if it is higher inflation. However, the impact of inflation on stock return is quite complex as it comes from a company's earnings. In the period of low inflation, the companies get benefit from costs down. It leads to get more profit. In contrast, high inflation will push the costs up, so the profit will decline. Therefore, low inflation is better for the market than high inflation.

According to the (Fisher, 1930), the nominal interest rate equal to an expected real return plus an expected rate of inflation. In other words, real return is determined by return on investment and the inflationary expectation. Therefore, it is undoubtedly that inflation is related to stock return (Gupta and Inglesi-Lotz, 2012). Some several empirical studies find unexpected inflations which is the difference between the actual inflation rate and the expected inflation rate by consensus estimate which is a figure based on the combined estimates of analyst have a significant impact on stock return. For example, the studies show an unexpected inflation has a significantly negative effect on the stock market in the inflation announcement such as United Kingdom market (Lifang Lia and Paresk Kumar Narayan and Xinwei Zheng, 2010), United States market (Grahametal., 2003; Adamsetal., 2004) and Israel market (Amihud, 1996). Financial market is also inefficient in the real world. Therefore, we believe the stock price may not adjust quickly to the new information, when the figures diverge from the consensus estimate. Moreover, it depends on the inflation period (Barnes et al., 1999) and the company's capability of transferring inflation shocks to prices of products and services (Estep and Hanson, 1980). In other words, the low or high inflation period and each industry will give the different result.

In this paper, we examine the impact of inflation on stock returns, especially the reaction of stock prices with unexpected inflation, in Stock Exchange of Thailand during January 2004 to December 2019 which consist of the low and high inflation rate period. There are three main goal of this paper. First, we examine the impact between inflation and stock return in Stock Exchange of Thailand in the day before and after the announcement date. According to the efficient market hypothesis (Eugene F. Fama, 1969) addressing the statement that the stock return always fully and immediately reflects the inflation announcement. However, we believe financial market is inefficient in the real world because some people get the insider information or need time to analysis which is the same concept of (Eric Engle, 2018).

Consequently, the stock price might be reflected the information before or after publishing. Second, we examine the impact of unexpected inflation both positive and negative side on stock returns in Stock Exchange of Thailand at the announcement date because it impacts to economics activities including the price selling, wealth effect and cost in the different ways (Yakov Amihud, 1996). In generally, analyst will forecast the main indicator such as gross domestic product, interest rate, exchange rate and inflation rate. If the actual number has highly different from the estimation, it will impact the stock market. In the case of good news, we believe the stock market will response in positive direction. In contrast, we believe the stock market will response in negative direction in bad news. This concept is the same result of (Andersen et al., 2003) who suggests that macroeconomic announcements in bad news has greater impact than good news. Third, we examine impact of inflation announcement on stock returns in both high and low inflation period. (Guglielmo Maria Caporale and Fabio Spagnolo and Nicola Spagnolo, 2016) suggest that markets are responsive to negative news, and the reaction is bigger during the crisis period. Similarly, (Barnes et al., 1999) suggest that the relationship between inflation and stock returns varies across different inflationary economies. It shows negative reaction for low inflation economy but positive for high inflation economy. All of three objectives above, we focus on the stock return for 8 industries namely Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology in The Stock Exchange of Thailand because each sector has a different ability to pass inflation shocks onto prices of the products. This capability affects the sensitivity of each sector to inflation changes (Jareno, 2005)

There are three main contribution in this paper. First, the previous study is lack of consensus on inflation and no analysis considers the impact between inflation and stock returns in different inflationary regimes and industries on The Stock Exchange of Thailand. In addition, less of previous study focuses on the Asia countries. Therefore, this paper adds a consensus forecast to test the impact of inflation on stock return. Second, we believe it is very useful for the analysts and investors to have an idea which sector they should invest in different inflationary.

2. Literature Review

In this section, there are five main topics. First, the relationship between inflation and stock return. Second, the response of stock return to monetary policy announcements. Third, the effect of expected and unexpected inflation on stock return. Fourth, the effect of inflation on stock return in the different period of economic situation. Finally, the effect of inflation to stock return by industries

The relationship between inflation and stock return

Sangbae Kim and Francis In, 2004 study the relationship between stock returns and inflation by using new evidence from wavelet analysis. The study shows that there is a positive relationship between stock returns and inflation at the shortest scale (1-month period) and at the longest scale (128-month period), while a negative relationship is shown at the intermediate scales.

Jakkaphong Janrattanagul, 2009 examine the role of macroeconomic factors in explaining returns on the Stock Exchange of Thailand. The study shows that change in macroeconomic data have a significant effect in explaining the movement of the Stock Exchange of Thailand index. For example, the inflation rate has a negative effect in explaining the stock market movement in Thailand.

Aviral Kumar Tiwari and Arif Billah Dar and Niyati Bhanja and Mohamed Arouri and Frédéric Teulon, 2015 study stock returns and inflation in Pakistan. They find that stock returns are positively related to inflation. Overall results inflation does not erode the value of stocks in Pakistan and stocks could be used as hedge against inflation at least in the long-run.

The response of stock return to monetary policy announcements

Lifang Lia and Paresh Kumar Narayan and Xinwei Zheng, 2010 examine the relationship between the inflation rate and stock market in United Kingdom. The study suggests inflation announcements significantly affect stock returns on the announcement day but not on the day before or the day after the announcement.

Olaf Stotz, 2019 study stock prices respond to monetary policy decisions in United States. The result shows the movement of stock price on announcement day is greater than the day previous or after the announcement.

Gurmeet Singh & Lakshmi Padmakumari, 2020 investigate the reaction of Indian stock market to inflation announcement between July 2011 to December 2018 as India moved from WPI to CPI in 2014 and in 2016 they adopted inflation targeting.

The market reactions toward expected inflation effects stock returns since they developed economic indicators it brought a fewer surprise for investors and the predictable tend to be more stable.

The effect of expected and unexpected inflation on stock return

Greg Adams and Grant McQueen and Robert Wood, 2004 study the effects of inflation news on high frequency stock returns. The study shows news about inflation have an impact on stock returns, especially unexpected inflation. Moreover, that stocks tend to respond about 10–20 minutes.

Mustabshira Rushdi and Jae H. Kim and Param Silvapulle, 2011 study the long run relationship between real stock returns and inflation in Australia by employing the ARDL bounds tests. The empirical results show that the expected inflation had no significant effect on real stock returns, while the unexpected inflation had a significant and negative effect.

George Hondroyiannis and Evangelia Papapetrou, 2016 study the relationship between the expected and unexpected inflation rate and stock market in Greece. They find that stock returns are not related to expect and unexpected inflation for ten different industries. Moreover, the stock movement are not predictable.

Sokpo, Iorember and USAR, 2017 investigated the effect of inflation and stock returns in Nigeria by using monthly data stock market returns and CPI. It shown the positive relationship between stock returns and expected inflation as investors can managed their financial assets and compensated for an increases of general prices and align with the increase of stock returns with the stable of real returns.

The effect of inflation on stock return in the different period of economic situation

Taufiq Choudhry, 2001 study the relationship between stock returns and inflation in four high inflation countries including Argentina, Chile, Mexico and Venezuela. This result confirms that stock returns act as a hedge against inflation. It also shows that past rates of inflation also influence the current rate of stock returns.

Chulho Jung, William Shambora & Kyongwook Choi, 2007 study the effects of expected and unexpected inflation on stock returns in European Countries in the period of high inflation. The findings show that expected inflation does not impact stock returns however, in France, Italy and UK the results shows that unexpected inflation affects stock returns while there is no evidence found in Germany.

Liuyan Zhao, 2017 study stock returns under hyperinflation in China. They find that the relationship between stock return and expected inflation rate is significantly positive. Moreover, stock return is a complete hedge against expected inflation, and at least a partial hedge against unexpected inflation.

Norazza M. Haniff and Abul Mansur M. Masih, 2018 examine the effectiveness of Islamic stock returns against inflation. This study shows that the vary time scale of relationship between real stock returns and inflation. Although these two variables are independent however, during the period of the global financial crisis expected inflation and real stock returns are significantly and negatively correlated. It can be seen that during the financial crisis period stock returns may not provide a hedge against inflation.

Gurmeet Singh & Lakshmi Padmakumari, 2020 this article mentioned the effects of inflation announcement on stock market depend on the perception of investors towards economy state. The literature also included the information of inflation is already reflected by analyst forecast so inflation announcement is not significant for stock returns.

The effect of inflation to stock return by industries

John H. Boyd and Ross Levine and Bruce D. Smith, 2001 study the impact of inflation on financial sector. They find that there is a negative relationship between inflation and both banking sector development and equity market activity because inflation rises, the marginal impact of inflation on banking lending activity and stock market development diminishes rapidly.

Antonio Díaz and Francisco Jareno, 2008 study inflation news impact on stock returns by sector on the Spanish market. They suggest that the response of the abnormal returns by sector to unexpected inflation news depends on the sign of the inflation surprises and the economic scenarios. For example, in the case of negative surprises (actual lower than expected inflation rates), impact on abnormal returns is positive and significant in oil and energy, building industry, and consumer goods to high and medium economic states.

Suphaluk Somjid and Thana Sompornserm, 2014 study the relationship between inflation rate and common stock return in SET Index in the period of 2004 to 2012. The study shows inflation rate had long-term negative relationship with return on Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources and Services, except technology group index.

3. Data and sample selection

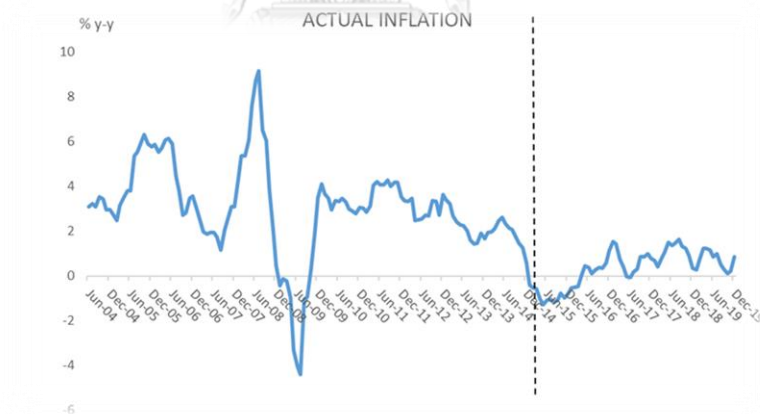
In this section, there are four main topics including sample, dependent variable, independent variable and control variable.

Sample

The sample consists three main data. First, monthly announcements of the consumer price index and the exact date of announcement from January 2004 to December 2019 were released regularly by Ministry of Commerce. The Consumer Price Index is measured by the weighted average of prices of a basket of consumer goods and services, so it can imply to the inflation rate. In order to remove the seasonal, we use a year on year inflation rate. We then divide the inflationary period. As you can see from the Figure 1 shows the significant shifts; i) June 2004 to December 2014 and ii) January 2015 to December 2019. The data was hand-collected from the website (www.moc.go.th).

Figure 1. Actual Inflation in the percentage during June 2004 to December 2019

This figure presents the historical actual inflation in Thailand during the time period of June 2004 to December 2019



Second, monthly consensus forecast of the inflation from June 2004 to December 2019 which can be collected from Bloomberg. Third, monthly stock return for 8 industries namely Agricultural and Food (AGRO), Consumer Products (CONSUMP), Financials (FINCIAL), Industrials (INDUS), Property and Construction (PROPCON), Resources (RESOURC), Services (SERVICE) and Technology (TECH) in Stock Exchange of Thailand from June 2004 to December 2019. It can be collected from Bloomberg.

Dependent Variables

The dependent variables are monthly stock return for 8 industries namely Agricultural and Food (AGRO), Consumer Products (CONSUMP), Financials (FINCIAL), Industrials (INDUS), Property and Construction (PROPCON), Resources (RESOURC), Services (SERVICE) and Technology (TECH) in Stock Exchange of Thailand from June 2004 to December 2019. It can be collected from Bloomberg.

Monthly percentage returns for each industry is calculated by the total return index (TRI) which measures the total return on the underlying index. It combines capital performance and reinvested dividend income (Peter Nyberg and Mika Vaihekoski, 2019). The total return index calculation may be expressed as:

$$\text{The total return index}_t = \frac{(\text{The total return index}_t)}{(\text{The total return index}_{t-1})} - 1 \quad (1)$$

where *The total return index_t* is the total return of the industry at time *t* and *The total return index_{t-1}* is the total return of the industry at time *t-1*

We calculate monthly stock return for 8 industries. The data covers 187 observations. The *table 1* reports the average return of Agricultural and Food is 1.65% per month (19.31% per annum) which is the highest return compared to the other sector. The second highest is Industrials with average of 1.13% per month (13.50% per annum). However, the lowest return is Consumer Products with average of 0.91% per month (10.92% per annum).

Table 1 Descriptive statistics of return in each sector

The data shows % monthly return. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively.

	Observation	Mean	Median	Standard Deviation
ARGO	187	1.65%	1.59%	4.97%
CONSUMP	187	0.91%	0.86%	3.92%
FINCIAL	187	0.95%	0.96%	3.83%
INDUS	187	1.13%	1.10%	4.18%
PROPCON	187	1.09%	1.13%	3.98%
RESOURC	187	1.08%	1.11%	4.08%
SERVICE	187	1.11%	1.10%	3.89%
TECH	187	1.12%	1.11%	4.04%

Independent Variables

The independent variables are expected inflation rate (Pe) which is consensus forecast around 5-10 brokerage firms. It can be collected from Bloomberg. Unexpected inflation rate (Pu) which is the different between actual inflation rate and expected inflation rate. It is released at the end of month.

$$Pe = \text{consensus forecast} \quad (2)$$

$$Pu = \text{actual inflation rate} - \text{consensus forecast} \quad (3)$$

We consider monthly announcements of Consumer Price Index (CPI) is measured by the weighted average of prices of a basket of consumer goods and services, so it can imply to the inflation rate. It is released by Ministry of Commerce and the exact date of each announcement, between June 2004 and December 2019. In order to remove the seasonal, we use a year on year inflation rate.

We collect the expected inflation and calculate the unexpected inflation. The data covers 187 observations. The *table 2* reports the average expected inflation is at 2.23% and higher than unexpected inflation is at -0.06%.

Table 2 Descriptive statistics of inflation rate

The data shows % year on year. Pe and Pu refer to expected inflation rate, respectively.

	Observation	Mean	Median	Standard Deviation
Pe	187	2.23%	2.25%	2.12%
Pu	187	-0.06%	-0.06%	0.34%

We also find the correlation between inflation and stock return in each sector. The *table 3* reports the correlation between expected inflation and stock return in Service is the highest at 30.74%, while Consumer Products is quite low, which is 0.98%. The correlation between unexpected inflation and stock return in Resources is the highest at 12.84%, while as Consumer Products is negative correlation with -4.03%.

Table 3 Correlation between inflation and stock return

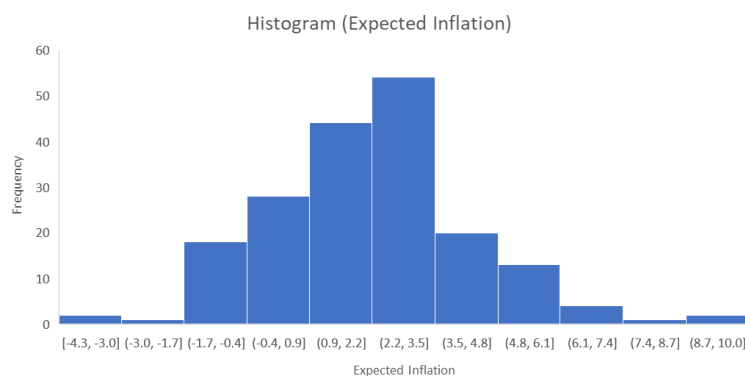
The data shows % year on year. Pe and Pu refer to expected inflation rate, respectively. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively.

	ARGO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
Pe	26.84%	0.98%	10.93%	22.19%	18.38%	25.48%	30.74%	18.42%
Pu	5.23%	-4.03%	8.25%	1.64%	10.30%	12.84%	6.96%	9.96%

We present the histogram *Figure 2* which shows the distribution of expected inflation. It can be seen that consensus' forecast is around 2.2-3.5% which is the highest frequency.

Figure 2. Histogram of expected inflation during June 2004 to December 2019

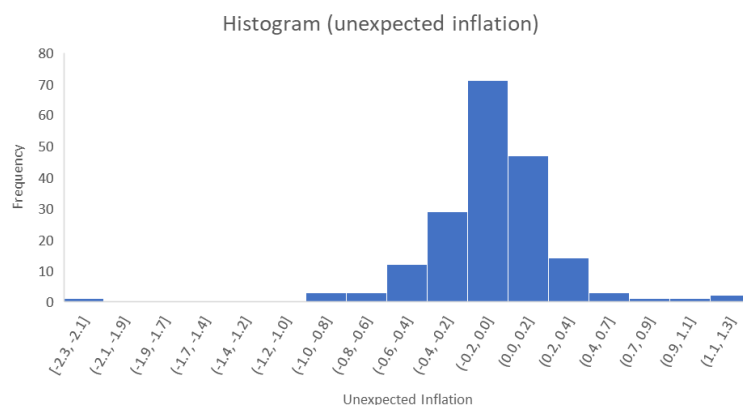
This figure presents the Histogram of expected inflation during the time period of June 2004 to December 2019



We present histogram *Figure 3* which shows the distribution of unexpected inflation. It can be seen that most number is around -0.2 to 0.0. It can imply that consensus' forecast is too close to the actual inflation rate.

Figure 3. Histogram of unexpected inflation during June 2004 to December 2019

This figure presents the histogram of unexpected inflation during the time period of June 2004 to December 2019



Control Variables

The control variables are monthly market return (MKT), high-book to market ratio minus low-book to market ratio (HML), small market capitalization minus big market capitalization (SMB) and the premium on winners minus losers (UMD). These is a component of four-factor model from Fama-French (1993) and Carhart (1997).

We collect total market return index from June 2004 to December 2019 in monthly. Monthly percentage returns for the market is calculated by the total return index (TRI) in the equation (1)

High-book to market ratio minus low-book to market ratio (HML) is the equal-weight average of the returns for the two high book to market ratio (B/M) portfolios, known as value stocks, minus the average of the returns for the two low book to market ratio (B/M) portfolios, known as growth stocks. First, we sort stocks into three book-to-market equity (B/M) groups by using the 30th and 70th percentiles of book-to-market equity (B/M) for the small and big stocks, respectively. Second, we calculate High-book to market ratio minus low-book to market ratio (HML) by finding the difference in value-weighted return of value stocks (high B/M) and growth stocks (low B/M). The equation can be expressed as follows:

$$HML = \frac{1}{2}(Small\ value + Big\ value) - \frac{1}{2}(Small\ growth + Big\ growth)$$

(4)

Small market capitalization minus big market capitalization (SMB) is the equal-weight average of the returns on the three small stock portfolios for the region minus the average of the returns on the three big stock. First, we sort stocks into two market capitalization by using the 50th percentiles of market capitalization with small market capitalization group and big market capitalization group. Second, we calculate Small market capitalization minus big market capitalization (SMB). The equation can be expressed as follows:

$$SMB = \frac{1}{3}(Small\ Value + Small\ Neutral + Small\ Growth) - \frac{1}{3}(Big\ Value + Big\ Neutral + Big\ Growth)$$

(5)

Momentum factor is the equal-weight average of the returns for the two winner portfolios minus the average of the returns for the two loser portfolios. We arrange stocks are ranked based on their past cumulative one-year return and calculate Momentum factor. The equation can be expressed as follows:

$$UMD = \frac{1}{2}(Small\ high + Big\ high) - \frac{1}{2}(Small\ low + Big\ low)$$

(6)

We collect and calculate market factors. The data covers 187 observations. The *table 4* reports the average market return, SMB and UMD are at 1.13% per month (13.53% per annum), 0.28% per month (3.41% per annum) and 0.34% per month (4.11% per annum), respectively. However, the mean of HML is -0.46% per month (-5.56% per annum).

Table 4 Descriptive statistics of market factor

The data shows % per month. MKT, HML, SMB, UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down.

	Observation	Mean	Median	Standard Deviation
MKT	187	1.13%	1.12%	4.11%
HML	187	-0.46%	-0.42%	3.06%
SMB	187	0.28%	0.26%	2.13%
UMD	187	0.34%	0.34%	2.95%

4. Methodology

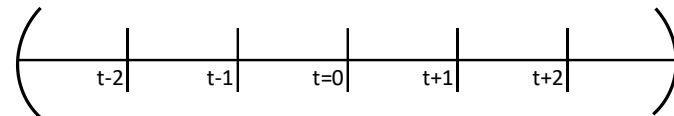
In this paper, we examine the impact of inflation on stock returns, especially the reaction of stock prices with unexpected inflation, in Stock Exchange of Thailand during June 2004 to December 2019. There are three sets of experiments to examine the impact of inflation on stock returns in Stock Exchange of Thailand. First, we test the relationship between inflation and stock return in Stock Exchange of Thailand at the day and day before and day after the announcement date. Second, we test the impact of unexpected inflation both positive and negative side on stock returns in Stock Exchange of Thailand at the announcement date. Third, we test the impact of inflation announcement on stock returns in both high and low inflation period.

Measuring impact of inflation announcement period on the stock return

Within the theoretical framework of efficient markets hypothesis, stock price is fully and immediately reflected all public information (Eugene F. Fama, 1969). However, we believe financial markets is inefficient in the real world. Therefore, it has two main possible events. First, the stock price might reflect the information before publishing, if someone get the insider information. Second, the stock price might reflect the information after publishing as people need time to analysis. In this paper, we examine the react of stock return for 8 industries in Stock Exchange of Thailand to inflation announcement using a time period of five days event window, as shown in Figure 2 consisting with the previous study of Goodhart and Smith, 1985 shows inflation rate reflected on stock return in the period of preannouncement effect and delay announcement effect on 3 days event window. Thus, we use both 3 and 5 days event window to see whether those effect exist in our study

Figure 2. Time period of five days event window

For t-2 means two days before inflation announcement, t-1 means one day before inflation announcement time, t means the day at inflation announcement, t+1 means one day after inflation announcement time and t+2 means two day before inflation announcement time



To test degree of impact of inflation announcement period on the stock return, we run regression.

Regression are based on the model:

$$Return_{t+d} = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i \quad (7)$$

Where $Return_{t+d}$ is the stock returns on the day t+d , for d = -2, -1, 0, +1, +2. Pe_t is the expected inflation rate. Pu_t is the unexpected inflation rate, which is equal to the different between actual and expected inflation rate. MKT_t is the excess risk-free monthly return of the market factor. HML_t is the value factor which is high-book to market ratio minus low-book to market ratio. SMB_t is size factor which is small market capitalization minus big market capitalization. UMD_t is momentum factor which up minus down. A statistically significant estimate of coefficient β_1 for the expected inflation rate on the date before or after the announcement implies that there is a preannouncement effect or a delay effect and coefficient β_2 for the unexpected inflation rate on the date before or after the announcement implies that there is a preannouncement effect or a delay effect (Goodhart and Smith, 1985 and Lifang Lia and Paresh Kumar Narayan and Xinwei Zheng, 2010).

Measuring impact of unexpected inflation on stock returns at the announcement date

It is known that too high inflation is not good for economy as it reduces the purchasing power. On the other hand, low to medium level is beneficial for the economy because it encourages people to buy goods and services. According to the empirical literature, positive inflation surprises (actual higher than expected inflation rate) have higher statistically significant impact on stock returns compared with negative inflation surprises (actual lower than expected inflation rate) especially during weak economy (Andersen et al., 2003 ; Antonio Díaz and Francisco Jareno, 2008). Thus, we also test the asymmetric effect, we use dummy variables in our analysis. They represent a negative unexpected inflation rate (D_{-t}) and a positive

unexpected inflation rate (D_{+t}) to investigate the impact of unexpected inflation on stock returns.

Regression are based on the model:

$$Return_t = \alpha_0 + \beta_+ D_{+t} Pu_t + \beta_- D_{-t} Pu_t + \beta_2 Pe_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i \quad (8)$$

Where $Return_t$ is the stock returns on the announcement day for 8 industries in Stock Exchange of Thailand. D_{+t} is equal to 1 if unexpected inflation is greater than zero. D_{-t} is equal to 1 if unexpected inflation is less than zero. A statistically significant estimate of coefficient β_+ for unexpected inflation is greater than zero and β_- for unexpected inflation is less than zero news (Adamsetal, 2004).

Measuring impact of inflation announcement on stock returns in different period

We further investigate the impact of inflation announcement on stock returns in different inflationary period. The empirical literature shows the effect of inflation on stock return can be either positive, negative or insignificant. It depends on inflationary regimes (Lifang Lia and Paresh Kumar Narayan and Xinwei Zheng, 2010) and the current stage of the economic cycle (Olaf Stotz, 2019). For example, (Guglielmo Maria Caporale and Fabio Spagnolo and Nicola Spagnolo, 2016) suggest that markets are responsive to negative news, and the reaction is bigger during the crisis period. However, we believe it has many factors which have an influence on the relationship between inflation and stock return such as monetary policy, economic condition and stock market structure.

To test this implication, we first divide the inflationary period because it has the significant shifts; i) June 2004 to December 2014 (high inflation rate level) and ii) January 2015 to December 2019 (low inflation rate level). We then use the equation (7) to calculate the result.

5. Empirical Results

In this paper, we examine the impact of inflation on stock returns, especially the reaction of stock prices with unexpected inflation, in Stock Exchange of Thailand during June 2004 to December 2019. There are three sets of experiments to examine the impact of inflation on stock returns in Stock Exchange of Thailand. First, we test the relationship between inflation and stock return in Stock Exchange of Thailand at the day and day before and day after the announcement date. Second, we test the impact of unexpected inflation both positive and negative side on stock returns in

Stock Exchange of Thailand at the announcement date. Third, we test the impact of inflation announcement on stock returns in both high and low inflation period.

Measuring impact of inflation announcement period on the stock return

We examine the impact of inflation on stock return in Stock Exchange of Thailand in an announcement period of five days event window including one day before, two days before, at date, one day after and two days after. *Table 5,6,7,8,9* reports the results of estimating Equation 7 using stock return of each industry from Bloomberg as a dependent variable and using expected inflation and unexpected inflation from Ministry of Commerce as an independent variable and using market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down from Thomson Reuters as a control variable.

According to efficient markets hypothesis, stock price is fully and immediately reflected all public information (Eugene F. Fama, 1969). Therefore, unexpected inflation rate, which captures a new information, will impact on stock return at the announcement date (Joyce and Read, 2002). The results are consistent with the previous study as the results show unexpected inflation have not a statistically significant on stock return in the day before or day after announcement date. However, expected inflation rate has a statistically significant on stock return as investors believe the analysts, who use the economic indicators to forecast the inflation rate, estimate too close the actual one (Gurmeet Singh & Lakshmi Padmakumari, 2020).

Overall, the results show that expected inflation has highest significant impact on stock return in Agricultural and Food. Therefore, investors should invest in stock in Agricultural and Food because they will get the highest return compared with the other sectors. It is evident from (Naheed Ali, 2012) that Agricultural and Food companies are less impact on inflation rate because they can rise the selling price to compensate the cost increase. The second highest return is Services. Inflation rate can cause both cost and revenue problem for Services companies. In the case of inflation rate increases, the expenses like salary cost will increase, while the purchasing power of customers will decrease. Thus, the Services companies need to take little time to well manage those problems (Lawrence Yu, 1999). The third highest return is Resources. Resources companies have to take more time to adjust the pricing due to price stickiness consistent with findings in the existing literature (Shahriyar Mukhtarov and Jeyhun Mammadov and Fariz Ahmadov, 2019; Hamilton, 1996). For Property and Construction, Technology, Financials, there are little significant impact on stock return as the inflation rate is indirect effect. However, Consumer Products and Industrials are not significant impact on inflation rate as most of products are related to luxury good including skincare products, furniture and automotive as all product are inflation-adjusted (Amatulli and Guido, 2012).

Two days before announcement date (Table 5)

For expected inflation, the results show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.0953 to 5.5621. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.5771 to 1.6281. It can be summarized that the returns of each industries are followed by market return.

Table 5

Effects of inflation rate on stock return in two day before announcement

The table present regressions of the impact of inflation rate on stock return by using Equation 7:

$$Return_{t-2} = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_t$$

where Pe, Pu, MKT, HML, SMB, UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0966** (2.2752)	0.1565*** (3.5104)	0.1126*** (3.8256)	0.1169*** (3.2109)	0.1186*** (2.9873)	0.1021*** (3.0683)	0.1220*** (3.7446)	0.1032*** (3.1048)
Pe	5.5621*** (4.0076)	-0.6183 (-0.4245)	1.0953* (1.6844)	3.2121 (0.0046)	2.7999** (2.1583)	3.2151*** (2.9564)	3.9426*** (3.7021)	2.5346** (2.335)
Pu	5.3749 (0.6713)	-4.6279 (-0.5507)	6.0515 (1.0909)	1.6857 (0.2457)	9.8324 (1.3138)	11.3145 (1.531)	5.1276 (0.8347)	7.5941 (1.2127)
MKT	1.6281*** (3.1665)	0.5149 (0.9542)	0.5771** (1.9852)	0.9374** (2.1274)	0.8761* (1.8226)	0.7118* (1.7667)	0.7879** (1.9974)	1.0187** (2.5331)
HML	-1.2271 (-1.3256)	-0.9348 (-0.9622)	-0.3793 (-0.5915)	-1.2954 (-1.633)	-0.6785 (-0.7842)	-1.3916* (-1.9185)	-1.9133*** (-2.694)	-0.9605 (-1.3267)
SMB	-0.2299 (-0.208)	2.2852* (1.971)	0.5123 (0.669)	1.6459* (1.739)	1.1938 (1.156)	1.2182 (1.407)	2.1848** (2.578)	1.0559 (1.222)
UMD	-0.0286 (-0.0339)	1.0228 (1.1504)	0.6545 (1.1152)	0.2574 (0.3547)	0.6161 (0.7781)	0.6852 (1.0323)	0.0698 (0.1075)	0.1025 (0.1548)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that two out of eight industries, such as Resources and Services respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.9133 to -

1.3916. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.6459 to 2.2852. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the unexpected inflation and momentum factor have not a statistically significant on stock return.

One day before announcement date (Table 6)

For expected inflation, the results show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.133 to 5.5651. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.6378 to 1.6761. It can be summarized that the returns of each industries are followed by market return.

Table 6

Effects of inflation rate on stock return in one day before announcement

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_{t-1} = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe , Pu , MKT , HML , SMB , UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.096** (2.2621)	0.1579*** (3.5232)	0.1113*** (3.8082)	0.1156*** (3.1638)	0.1163*** (2.9668)	0.1009*** (3.007)	0.1197*** (3.714)	0.103*** (3.1324)
Pe	5.5651*** (4.0141)	-0.673241 (-0.4599)	1.133* (1.7883)	3.2346 (0.0071)	2.8254** (2.2069)	3.2891*** (3.0023)	3.9748*** (3.777)	2.5144** (2.3416)
Pu	5.0131 (0.6268)	-4.4121 (-0.5224)	5.8767 (1.0675)	1.468 (0.3627)	9.6191 (1.3024)	11.1318 (1.3546)	4.6801 (0.7709)	7.5374 (1.2168)
MKT	1.6761*** (3.2632)	0.5519 (1.0175)	0.6378* (1.8041)	0.9617** (2.1756)	0.9641** (2.0327)	0.7716* (1.9012)	0.824** (2.1135)	1.0348** (2.6013)
HML	-1.2349 (-1.3354)	-0.9940 (-1.0179)	-0.3596 (-0.565)	-1.2976 (-1.6306)	-0.6766 (-0.7923)	-1.3727* (-1.8786)	-1.8186** (-2.5908)	-0.9862 (-1.377)
SMB	-0.1685 (-0.1527)	2.3728** (2.0362)	0.5405 (0.7116)	1.6347* (1.7214)	1.2586 (1.2351)	1.2179 (1.3967)	2.1818** (2.6048)	1.1119 (1.301)
UMD	-0.0316 (-0.0373)	1.1185 (1.2517)	0.6840 (1.1744)	0.2758 (0.3788)	0.6027 (0.7712)	0.6695 (1.0013)	0.0964 (0.1501)	0.0997 (0.1521)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that two out of eight industries, such as Resources and Services respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.8186 to -1.3727. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.6347 to 2.3728. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the unexpected inflation and momentum factor have not a statistically significant on stock return.

At announcement date (Table 7)

For expected inflation, the results show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.0941 to 5.56. It can be summarized that the

consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.6624 to 1.6655. It can be summarized that the returns of each industries are followed by market return.

Table 7

Effects of inflation rate on stock return in at announcement date

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_t = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe , Pu , MKT , HML , SMB , UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0966** (2.2669)	0.1619*** (3.4968)	0.1112*** (3.846)	0.1174*** (3.2147)	0.1168*** (2.9835)	0.1022*** (3.0425)	0.1202*** (3.7553)	0.1016*** (3.1169)
Pe	5.56*** (3.9948)	-0.768 (-0.5084)	1.0941* (1.8959)	3.1444 (0.0026)	2.7964** (2.1872)	3.213*** (2.9286)	3.9112*** (3.7407)	2.5417** (2.3883)
Pu	5.2656 (0.6558)	-5.0201 (-0.5756)	6.1344 (1.1261)	1.6909 (0.2458)	10.0773 (1.3663)	11.2064 (1.0578)	4.9766 (0.825)	7.8439 (1.2775)
MKT	1.6655*** (3.2345)	0.5684 (1.0149)	0.6624* (1.8936)	0.9551** (2.1618)	0.9705** (2.0489)	0.7792* (1.9171)	0.8359** (2.1579)	1.0536*** (2.6721)
HML	-1.2052 (-1.2982)	-1.0682 (-1.0594)	-0.3962 (-0.629)	-1.396* (-1.755)	-0.6806 (-0.7981)	-1.4075* (-1.9234)	-1.8324*** (-2.6274)	-1.0012 (-1.4104)
SMB	-0.2341 (-0.2114)	2.5085** (2.0847)	0.618 (0.8223)	1.7208* (1.8129)	1.2872 (1.2649)	1.2839 (1.4703)	2.2*** (2.6435)	1.1369 (1.3421)
UMD	-0.0311 (-0.0367)	1.2103 (1.3116)	0.7119 (1.2353)	0.3345 (0.4595)	0.6472 (0.8293)	0.7535 (1.1253)	0.1434 (0.2247)	0.1331 (0.2049)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that three out of eight industries, such as Industrials, Resources and Services respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.8324 to -1.396. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market

capitalization. The coefficients vary from 1.7208 to 2.5085. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the unexpected inflation and momentum factor have not a statistically significant on stock return.

One day after announcement date (Table 8)

For expected inflation, the results show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.1212 to 5.649. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.7363 to 1.7526. It can be summarized that the returns of each industries are followed by market return.

Table 8

Effects of inflation rate on stock return in one day before announcement

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_{t+1} = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe, Pu, MKT, HML, SMB, UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	ARGO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0944** (2.2081)	0.1614*** (3.5305)	0.1104*** (3.7861)	0.1194*** (3.1988)	0.1157*** (2.938)	0.1013*** (3.0044)	0.1186*** (3.6887)	0.1008*** (3.0728)
Pe	5.649*** (4.0454)	-0.8168 (-0.5471)	1.1212* (1.8678)	3.1488 (0.0058)	2.8747** (2.2362)	3.2101*** (2.9153)	3.9861*** (3.7957)	2.5867** (2.4157)
Pu	5.2729 (0.6545)	-5.072 (-0.5889)	6.1043 (1.1115)	1.0793 (0.1535)	10.083 (1.3596)	11.0741 (1.4635)	5.103 (0.8423)	7.6678 (1.2412)
MKT	1.7526*** (3.3877)	0.5939 (1.0737)	0.7363** (2.0877)	0.9839** (2.1786)	1.053** (2.211)	0.8966** (2.198)	0.8895** (2.2864)	1.1109*** (2.8002)
HML	-1.1996 (-1.288)	-1.1296 (-1.1343)	-0.4158 (-0.6547)	-1.4091* (-1.7331)	-0.7299 (-0.8512)	-1.4245* (-1.9395)	-1.8624*** (-2.6588)	-1.0403 (-1.4565)
SMB	-0.267 (-0.2402)	2.5578** (2.1524)	0.6478 (0.855)	1.7573* (1.8112)	1.43 (1.3976)	1.261 (1.4388)	2.218*** (2.6536)	1.2063 (1.4154)
UMD	-0.0458 (-0.0537)	1.2517 (1.3735)	0.7323 (1.2602)	0.3195 (0.4294)	0.7156 (0.912)	0.7631 (1.1354)	0.1619 (0.2526)	0.1304 (0.1995)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that three out of eight industries, such as

Industrials, Resources and Services respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.8624 to -1.4091. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.7573 to 2.5578. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the unexpected inflation and momentum factor have not a statistically significant on stock return.

Two days after announcement date (Table9)

For expected inflation, the results show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.1179 to 5.6723. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.7323 to 1.7725. It can be summarized that the returns of each industries are followed by market return.



Table 9

Effects of inflation rate on stock return in at announcement date

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_{t+2} = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe , Pu , MKT , HML , SMB , UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. $ARGO$, $CONSUMP$, $FINCIAL$, $INDUS$, $PROPCON$, $RESOURC$, $SERVICE$, $TECH$ refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0943** (2.1834)	0.1585*** (3.5568)	0.1092*** (3.7635)	0.1185*** (3.1682)	0.1142*** (2.9122)	0.0991*** (2.9533)	0.1177*** (3.6483)	0.1003*** (3.063)
Pe	5.6723*** (4.0205)	-0.7408 (-0.5091)	1.1179* (1.828)	3.1622 (0.0026)	2.9061** (2.2691)	3.2198*** (2.9394)	4.0321*** (3.8276)	2.5341** (2.3701)
Pu	5.0337 (0.6185)	-4.7612 (-0.5671)	5.6371 (1.0313)	1.0186 (0.1445)	9.6627 (1.3077)	10.6456 (1.4385)	4.8438 (0.7971)	7.1199 (1.1543)
MKT	1.7725*** (3.391)	0.5542 (1.0279)	0.7323** (2.0862)	0.9683** (2.139)	1.0361** (2.1835)	0.8826** (2.1748)	0.8914** (2.2841)	1.0943*** (2.7627)
HML	-1.1934 (-1.2682)	-1.0789 (-1.1115)	-0.4188 (-0.6628)	-1.416* (-1.7375)	-0.7576 (-0.8869)	-1.4788** (-2.024)	-1.8709*** (-2.6627)	-1.0743 (-1.5064)
SMB	-0.3457 (-0.3079)	2.3974** (2.0698)	0.6157 (0.8165)	1.7974* (1.8482)	1.4586 (1.4308)	1.267 (1.4532)	2.2785*** (2.7175)	1.2104 (1.4223)
UMD	-0.0161 (-0.0187)	1.1798 (1.3283)	0.6955 (1.2026)	0.2948 (0.3954)	0.6741 (0.8623)	0.7531 (1.1263)	0.1322 (0.2056)	0.1031 (0.1581)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that three out of eight industries, such as Industrials, Resources and Services respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.8709 to -1.416. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.7974 to 2.3974. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the unexpected inflation and momentum factor have not a statistically significant on stock return.

Measuring impact of unexpected inflation on stock returns at the announcement date

We examine the impact of negative and positive unexpected inflation on stock return in Stock Exchange of Thailand at the announcement date. *Table 10,11*

reports the results of estimating Equation 8 using stock return of each industry from Bloomberg as a dependent variable and using expected inflation and unexpected inflation from Ministry of Commerce as an independent variable and using market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down from Thomson Reuters as a control variable and using dummy variables which represent a negative unexpected inflation rate or the different between actual and unexpected inflation lower than zero (D_{-t}) and a positive unexpected inflation rate or the different between actual and unexpected inflation greater than zero (D_{+t})

According to efficient markets hypothesis, stock price is fully and immediately reflected all public information (Eugene F. Fama, 1969). Therefore, unexpected inflation rate, which captures a new information, will impact on stock return at the announcement date (Joyce and Read, 2002). The results are inconsistent with the previous study as the results show unexpected inflation have not a statistically significant on stock return at announcement date. However, expected inflation rate has a statistically significant on stock return as investors believe the analysts, who use the economic indicators to forecast the inflation rate, estimate too close the actual one (Gurmeet Singh & Lakshmi Padmakumari, 2020).

We test both the negative and positive unexpected inflation on stock return of each industries. We found that negative and positive unexpected inflation does not have impact on stock return. Referring to George Hondroyiannis and Evangelia Papapetrou, 2016, the study shows that stock returns are not related to negative and positive unexpected inflation for ten different industries in Greece due to the stock movement are not predictable. In contrast, Antonio Díaz and Francisco Jareno, 2008 found the negative surprises, which is actual inflation rate lower than expected inflation rates, responds significantly and positively to stock returns because inflation rate shows a signal of economic state which is out of overheating situation. Thus, the flow-through capability of companies is low. Moreover, the study of Veronesi, 1999 and Docking and Koch, 2005 show positive unexpected inflation has impact on stock return. The positive unexpected surprise can indicate the end of the depression, so it will have cash inflows to the companies to invest or expand their capacity.

Negative unexpected inflation (Table 10)

The results show the negative unexpected inflation and momentum factor have not a statistically significant on stock return.

In contrast, the results of expected inflation show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.424 to 5.9438. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and

positively to market return. The coefficients vary from 0.6759 to 1.6791. It can be summarized that the returns of each industries are followed by market return.

Table 10

Effects of negative unexpected inflation rate on stock return at announcement date
The table present regressions of the impact of unexpected inflation rate on stock return by using Equation 8:

$$Return_t = \alpha_0 + \beta_+ D_{+t} Pu_t + \beta_- D_{-t} Pu_t + \beta_2 Pe_t + \beta_3 EXMKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i, D_{+t} = 0$$

where Pe, Pu, MKT, HML, SMB, UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPON	RESOURC	SERVICE	TECH
α	0.1118** (2.5777)	0.165*** (3.4747)	0.1229*** (4.184)	0.1281*** (3.4378)	0.1328*** (3.3373)	0.1159*** (3.3909)	0.1352*** (4.1681)	0.1164*** (4.8139)
Pe	5.9438*** (4.2513)	-0.7911 (-0.5168)	1.424* (1.875)	3.3813 (0.0028)	3.2748** (2.5549)	3.6658*** (3.3295)	4.2849*** (4.0997)	2.9603*** (4.237)
Pu	0.1898 (0.6771)	-0.0023 (-0.0187)	0.1601 (1.1574)	0.1202 (1.264)	0.2298 (0.2264)	0.2143 (1.2246)	0.1851 (1.2371)	0.203 (0.5693)
MKT	1.6791*** (3.2794)	0.5622 (1.0029)	0.6759* (1.9499)	0.9617** (2.1862)	0.9915** (2.1121)	0.8009** (1.9864)	0.8489** (2.2179)	1.0708** (2.4688)
HML	-1.1435 (-1.2393)	-1.0499 (-1.0394)	-0.3507 (-0.5614)	-1.3506* (-1.7038)	-0.6202 (-0.7331)	-1.3582* (-1.8692)	-1.7716** (-2.5685)	-0.9438*** (-3.5672)
SMB	-0.1888 (-0.1717)	2.4789** (2.06)	0.6662 (0.8952)	1.7399* (1.8425)	1.3638 (1.3533)	1.3660 (1.578)	2.2433*** (2.73)	1.1984 (1.3635)
UMD	-0.0492 (-0.0585)	1.2434 (1.3489)	0.6854 (1.2023)	0.3340 (0.4616)	0.6007 (0.7781)	0.6981 (1.0528)	0.1268 (0.2014)	0.0990 (-0.0005)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that four out of eight industries, such as Industrials, Resources, Services and Technology respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.7716 to -0.9438. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.7399 to 2.4789. It can be summarized that stock in these industries are characteristic of small capitalization.

Positive unexpected inflation (Table 11)

The results show the positive unexpected inflation and momentum factor have not a statistically significant on stock return.

In contrast, the results of expected inflation show that six out of eight industries, such as Agricultural and Food, Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from 1.2555 to 5.9021. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that seven out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology, respond significantly and positively to market return. The coefficients vary from 0.6819 to 1.6999. It can be summarized that the returns of each industries are followed by market return.

Table 11

Effects of positive unexpected inflation rate on stock return at announcement date
The table present regressions of the impact of unexpected inflation rate on stock return by using Equation 8:

$$Return_t = \alpha_0 + \beta_+ D_{+t} Pu_t + \beta_- D_{-t} Pu_t + \beta_2 Pe_t + \beta_3 EXMKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i, D_{-t} = 0$$

where Pe, Pu, MKT, HML, SMB, UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2019. T-statistics are shown in parentheses. *,**,*** Significant at 10%, 5% and 1% level, respectively.

	ARGO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0979** (2.2998)	0.1722*** (3.7298)	0.1092*** (3.7645)	0.1218*** (3.3463)	0.1114*** (2.8303)	0.0939*** (2.7699)	0.1215*** (3.8005)	0.223*** (3.5231)
Pe	5.9021*** (4.1078)	-0.3272 (-0.2101)	1.2555* (1.8331)	3.5163 (0.0086)	2.9246** (2.2027)	3.2032*** (2.8013)	4.2364*** (3.9273)	5.3355*** (2.7813)
Pu	-0.1405 (-0.8872)	-0.2003 (-1.1664)	-0.0604 (-0.5597)	-0.1594 (-1.1774)	-0.0395 (-0.2699)	0.0225 (0.1787)	-0.1337 (-1.124)	-0.0674 (0.2408)
MKT	1.6999*** (3.2944)	0.602 (1.0761)	0.6819* (1.9409)	0.9888** (2.2425)	0.9907** (2.0778)	0.7885* (1.9202)	0.8685** (2.242)	0.9553*** (2.7471)
HML	-1.2151 (-1.3109)	-1.0341 (-1.029)	-0.4153 (-0.658)	-1.3908* (-1.7557)	-0.7165 (-0.8364)	-1.4523* (-1.9687)	-1.8417*** (-2.6463)	-0.0857 (-1.3437)
SMB	-0.1101 (-0.0991)	2.6119** (2.169)	0.694 (0.9177)	1.8364* (1.9348)	1.3724 (1.3372)	1.3347 (1.51)	2.3178*** (2.7796)	1.0651 (1.4321)
UMD	-0.1495 (-0.1754)	1.1249 (1.2175)	0.6354 (1.095)	0.2288 (0.3141)	0.5568 (0.707)	0.6924 (1.021)	0.031 (0.0485)	-0.0003 (0.1545)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that four out of eight industries, such as

Industrials, Resources, Services and Technology respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -1.8417 to -1.3908. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that three out of eight industries, such as Consumer Products, Industrials, and Services respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 1.8364 to 2.6119. It can be summarized that stock in these industries are characteristic of small capitalization.

Measuring impact of inflation on stock returns at the announcement date in different inflation period

We examine the impact of inflation on stock return in Stock Exchange of Thailand at the announcement date in the period of high inflation and low inflation. *Table 12,13* reports the results of estimating Equation 7 using stock return of each industry from Bloomberg as a dependent variable and using expected inflation and unexpected inflation from Ministry of Commerce as an independent variable and using market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down from Thomson Reuters as a control variable.

There are a several previous studies investigating the impact between inflation and stock return from different country and time period. Spyrou, 2004 ; Apergis and Eleftheriou, 2002 ; Engsted and Tanggaard, 2002 ; Hondroyiannis and Papapetrou, 2001 ; Hess and Lee, 1999 confirm the result of the impact of inflation rate on stock return varies over time and across countries. It is mostly depending on economics situation such as monetary policy and real economic activity.

We test the impact of inflation on stock return in both high inflation and low inflation period. In the period of high inflation, it is completely obvious that both unexpected and expected inflation has not a statistically significant on stock return, consistent with findings in the previous study (Lifang Lia and Paresh Kumar Narayan and Xinwei Zheng, 2010). It is because most of people already have an expectation for higher inflation rates during the high inflation period. If the actual inflation is higher than expected inflation, it does not affect stock return as it has already been anticipated. If the actual inflation is lower than expected inflation, it does not matter for the stock market either because the inflation rate is high enough. consistent with findings in the previous studies In contrast, Liuyan Zhao, 2017 found both unexpected and expected inflation have impact on stock return in the period of hyperinflation in China because it affects to economics activities such as purchasing power. In the period of low inflation, the outcome of the results shows that expected inflation effects stock returns. Similarly, Bermingham et al. , 2012 and Norazza M. Haniff and Abul Mansur M. Masih, 2018 shows expected inflation has impact on stock returns in negatively correlated in the period of low inflation as inflation rate is a signal of economic situation. It can impact on macroeconomic policy and trade policy which effect to the profitability of each companies. Therefore, investors should invest in Financials, Property and Construction, Services and Technology which go the opposite direction with the expected

inflation. It is because the market is quite fluctuation, so hedging investment is a good strategy. However, the unexpected inflation has not impact on stock return because investors believe the analysts, who use the economic indicators to forecast the inflation rate, estimate too close the actual one (Gurmeet Singh & Lakshmi Padmakumari, 2020).

High inflation period (Table 12)

The results show the expected inflation, unexpected inflation and momentum factor have not a statistically significant on stock return.

In contrast, the results of market return show that Agricultural and Food respond significantly and positively to market return with coefficients at 1.295. It can be summarized that the returns of each industries are followed by market return.

Table 12

Effects of inflation rate on stock return in at announcement date in high inflation period

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_t = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe , Pu , MKT , HML , SMB , UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from June 2004 to December 2014. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	ARGO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.2541*** (3.1689)	0.3085*** (3.9263)	0.16*** (2.9164)	0.2279*** (3.3485)	0.222*** (2.9233)	0.1783*** (2.8704)	0.2487*** (4.1359)	0.2581*** (4.3667)
Pe	2.2267 (1.0283)	-3.2472 (-1.5301)	0.148 (0.0999)	0.8649 (0.4705)	0.7329 (0.3574)	1.7807 (1.0615)	1.2034 (0.741)	-0.7101 (-0.4449)
Pu	7.8967 (0.8195)	1.2096 (0.1281)	9.2987 (1.4103)	4.3619 (0.5332)	13.3578 (1.4638)	15.755 (0.011)	7.4808 (1.0351)	11.0775 (1.5595)
MKT	1.295** (2.0101)	0.1801 (0.2853)	0.5339 (1.2111)	0.6436 (1.1767)	0.7778 (1.2749)	0.6119 (1.226)	0.4718 (0.9765)	0.6352 (1.3376)
HML	-0.7544 (-0.6679)	0.1604 (0.1449)	-0.1125 (-0.1455)	-1.0836 (-1.13)	-0.1532 (-0.1433)	-0.993 (-1.1348)	-1.4519* (-1.714)	-0.3994 (-0.4797)
SMB	-1.007 (-0.7479)	0.8299 (0.629)	0.208 (0.2257)	1.0702 (0.9362)	0.6362 (0.4989)	0.4585 (0.4396)	1.768* (1.7509)	0.4367 (0.44)
UMD	1.0568 (0.9544)	2.3709** (2.1849)	1.1532 (1.5222)	1.2238 (1.302)	1.4731 (1.405)	1.2715 (1.4823)	0.9538 (1.1487)	1.2268 (1.5032)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that Services respond significantly and

negatively to high-book to market ratio minus low-book to market with coefficients at -1.4519. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that Services respond significantly and positively to small market capitalization minus big market capitalization with coefficients at 1.768. It can be summarized that stock in these industries are characteristic of small capitalization.

Low inflation period (Table 13)

The results of expected inflation show that five out of eight industries, such as Financials, Property and Construction, Resources, Services and Technology, respond significantly and positively to expected inflation. The coefficients vary from -3.7727 to 0.573. It can be summarized that the consensus' inflation rate forecast has influent for the industries return. In other world, investors believe the analyst estimation.

In addition, the results of market return show that six out of eight industries, such as Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology respond significantly and positively to stock return. The coefficients vary from 0.8358 to 1.8534. It can be summarized that the returns of each industries are followed by market return.

Table 13

Effects of inflation rate on stock return in at announcement date in low inflation period

The table present regressions of the impact of inflation rate on stock return by using *Equation 7*:

$$Return_t = \alpha_0 + \beta_1 Pe_t + \beta_2 Pu_t + \beta_3 MKT_t + \beta_4 HML_t + \beta_5 SMB_t + \beta_6 UMD_t + \varepsilon_i$$

where Pe , Pu , MKT , HML , SMB , UMD refer to expected inflation rate, unexpected inflation rate, market return, high-book to market ratio minus low-book to market ratio, small market capitalization minus big market capitalization and momentum factor which up minus down. ARGO, CONSUMP, FINCIAL, INDUS, PROPCON, RESOURC, SERVICE, TECH refer to Agricultural and Food, Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology, respectively. Sample period is from January 2015 to December 2019. T-statistics are shown in parentheses. *, **, *** Significant at 10%, 5% and 1% level, respectively.

	AGRO	CONSUMP	FINCIAL	INDUS	PROPCON	RESOURC	SERVICE	TECH
α	0.0247 (0.8067)	0.1244*** (2.7046)	0.0811*** (3.5708)	0.0742** (2.5202)	0.0703*** (3.8032)	0.0604** (2.1164)	0.0513** (2.315)	0.0247 (0.9949)
Pe	1.3932 (0.4237)	1.4754 (-1.3413)	-1.0769* (-1.9424)	3.0697 (-0.9727)	-3.7727* (-1.9026)	0.573* (1.9187)	-0.6178* (-1.96)	-3.0181** (-2.1343)
Pu	-17.3816 (-1.3464)	-51.5504 (-0.6628)	-21.4225 (-0.2241)	-23.0061 (-1.6568)	-17.5931 (-1.2597)	-23.4676 (-1.5546)	-19.7872 (-1.1208)	-22.2703 (-0.0132)
MKT	1.7852** (2.1945)	1.5145 (1.2415)	1.1333* (1.8819)	1.8534** (2.3739)	0.8358* (1.7036)	0.8753 (1.157)	1.4562** (2.477)	1.6906** (2.5682)
HML	-2.1918 (-1.5186)	-8.2602*** (-3.8165)	-1.7818* (-1.6676)	-1.7064 (-1.2319)	-2.7621*** (-3.1732)	-3.9047*** (-2.909)	-2.3671** (-2.2694)	-2.8943** (-2.4782)
SMB	2.5984 (1.4731)	11.2211*** (4.2422)	2.3058* (1.7658)	3.4952** (2.0646)	3.607*** (3.3909)	5.6383*** (3.4371)	2.8975** (2.273)	3.4917** (2.4463)
UMD	-1.2393 (-1.073)	-1.0144 (-0.5857)	-0.6584 (-0.77)	-1.6431 (-1.4823)	-0.7111 (-1.0209)	0.0256 (0.0238)	-0.7426 (-0.8896)	-1.4543 (-1.556)

For the sets control variable, the results of high-book to market ratio minus low-book to market (HML) show that six out of eight industries, such as Consumer Products, Financials, Property and Construction, Resources, Services and Technology respond significantly and negatively to high-book to market ratio minus low-book to market. The coefficients vary from -8.2602 to -1.7818. It can be summarized that stock in these industries are characteristic of growth stocks. Moreover, the results of small market capitalization minus big market capitalization (SMB) show that seven out of eight industries, such as Consumer Products, Financials, Industrials, Property and Construction, Resources, Services and Technology respond significantly and positively to small market capitalization minus big market capitalization. The coefficients vary from 2.3058 to 11.2211. It can be summarized that stock in these industries are characteristic of small capitalization.

In contrast, the results show the unexpected inflation and momentum factor have not a statistically significant on stock return.

6. Conclusion

This paper entitled Impact of Inflation on Stock Returns in Stock Exchange of Thailand has been taken to examine expected and unexpected inflation impact on stock returns depending on different industries, times and economic situation.

The analysis concluded that the most sector that impact stock returns is Agriculture. It can be seen that high inflation and high return moved into the same directions. Therefore, investors should look for an opportunity in Agriculture sector. Also, it tends to be the most beneficial sector to invest in. Similar with the following sectors that impacts on stock returns however, the rate of returns is rank as follows: Service, Resources, Property and Construction, Technology and Financial. Whereas, Consumer Products Consumption and Industrials are not impact on stock returns. Therefore, the findings can be summarized that expected inflation is significantly impact on stock returns as investors mostly consider the situation depending on analyst predictable. The power of analyst predictable is stable as they use economic indicators mismatch too little. Strong evidence come from the studies mentioned market reactions reflects the analyst forecasting after India developed Inflation Targeting in 2006 due to the stability of market prediction. Besides, unexpected inflation is not impact on stock returns in both positive and negative news. This paper divided the investigation into two periods which are high inflation and low inflation. Initially high inflation periods, there is no significant relationship with stock returns at the same time expected inflation is completely impacts stock returns during low inflation periods. The evidence shows that Agricultural and Food, Financials, Industrials, Property and Construction, Resources, Services and Technology respond significantly and positively to stock return. Lastly, only Agriculture sector is not impact on stock returns. Therefore, during stable to high economic stability there is no beneficial to rely on stock returns as there is no relationship on these two variables however, low inflation periods like recession or financial crisis the best suggestion to hedging strategy is to look for an opportunity to invest where a particular sector goes different direction with inflation.

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