

RETURN AND RISK ANALYSIS OF HEALTH CARE SERVICE SECTOR IN PRE-COVID-19 PERIOD AND DURING THE OUTBREAK USING THE CAPITAL ASSET PRICING MODEL (CAPM)

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ABSTRACT

The purpose of this research was to compare the rate of return with the investment risk in health care service sector listed on the Stock Exchange of Thailand. This study was divided into 2 periods; pre-COVID-19 (2016-2018) and during the COVID-19 pandemic (2019-2021). The sample group of this study is 16 firms in health care service sector listed on the Stock Exchange of Thailand. The research tools included the calculation of return rate and investment risk. To compare the return rate and the risk from investment, this study used the capital asset pricing model (CAPM) before creating the security market line (SML). The results revealed that in the pre-COVID-19 period, there were 9 securities that were recommended to invest as they were undervalued. During the COVID-19 pandemic, there were 10 securities that were recommended to invest in as they were undervalued. Between the two periods, 5 securities: BCH, CMR, PRINC, RAM, and SKR were recommended to invest in since they were above SML, reflecting that the securities were undervalued. Thus, the actual return of these securities was more than the expected rate of return. The findings of this study can be used as a guideline for those looking to invest in health care service securities.

Keyword: Rate of Return, Risk, Health Care Service Sector, Capital Asset Pricing Model (CAPM)

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Introduction

To make an investment decision, investors need to focus on the rate of return and investment risk. The commonly used model for describing the relationship between rate of return and risk is the capital asset pricing model (CAPM) by Sharpe (1964) developed on portfolio theory by Markowitz (1952). The model emphasizes systematic risk and unsystematic risk which are the two risks in the portfolio theory. According to the CAPM, it is assumed that a return of a security is directly proportional to its systematic risk, which cannot be mitigated by diversification, such as interest rates, inflation, the economy. Moreover, the rate of return of a security is assumed to be equal to the risk-free rate plus a market risk premium or excess returns are proportional to systematic risk, which is indicated by the beta coefficient. Thus, this model is used to analyze the risk-return implications of holding securities.

The COVID-19 pandemic has been critical in several countries around the world, including Thailand. The outbreak still continues and affects the economy in all sectors. The COVID-19 pandemic is one of the major factors that have accelerated and make a huge change in the world with the ability to spread easily, and many people are unknowingly spreading the virus during the period when the infected person does not have symptoms. As a result, economic activity around the world faces stagnation. The first round of the COVID-19 pandemic in Thailand started in 2019 and continued through 2020 and 2021 throughout the year. The vast number of relief measures offered by the government to treat the majority of low-income cardholders and other groups in general has forced the State to borrow money to cover all sectors in need, and now more than 1.5 trillion baht has been spent (Chalamwong, 2021).

The Securities Exchange of Thailand (SET) index, which represents the Thai stock market, became 35% lower since the beginning of the year to its lowest point on 23 March 2020, led by petrochemicals, banks, real estate developers, hospitals, and tourism-related groups. During the same period, foreign investors had accumulated sales volumes of more than 100 billion baht. This amount was more than double the sales traded on the stock exchange in 2019 despite the COVID-19 pandemic (The Securities Exchange of Thailand, 2021). However, it is said that health care service securities are one of the industries that have gained benefit from this pandemic. Due to the public demand of getting treatments, the share price and operating performance have moved in a great direction. The clarity of vaccine allocation and COVID-19 prevention measures of the government create confidence in the ability to control the pandemic and the reduction of the infected patients after vaccination has started. The restrictions would eventually be loosened and later allow foreigners to receive treatment in Thailand. In addition, the demand for public health services in Thailand is driven by the mega-trend factors of an aging society, an increase in middle-income class, an increase in the number of patients with complex diseases, and a promotion of health tourism. The proportion of health expenditures to the gross domestic product could still grow from 3.8% to nearly the world average of 9.9% (Kritniphat, 2021). Since the beginning of 2022, securities in the health care service sector had been the most prominent. As of 17 March 2022, health care service stocks rose by 9.8%. Considering the pandemic

situation in the 2021 period, health care service sector securities were the 4th largest growth with an increase of 24.8% (Kenganantan, 2022). Therefore, it can be assumed that the securities in the health care service sector would still be attractive and are expected to grow in the future.

Hence, the researcher conducted a comparative study of the rate of return and risk of investing in health care service securities by using CAPM, which can predict the desired rate of return on investment relative to the actual rate of return regardless of the circumstances. The securities during the pre-COVID-19 period and during COVID-19 pandemic were analyzed and compared to find the ones that should be invested in and to find the ones with undervalued prices. The results of this study can be used as a guideline for those who desire to make investment decisions in health care service securities. Likewise, companies in the health care sector can also use the data to improve their future performance.

Research Objectives

To compare the rate of return and the risk from health care service sector in the pre-COVID-19 period and during the COVID-19 pandemic by using CAPM.

Literature Review

Rate of Return

The return from investment is usually expressed as a percentage relative to the beginning investment and often calculated per year, or sometimes calculated per period. This is known as “rate of return”, which is the return that investors would obtain or expected to obtain from a particular investment.

Security return refers to the realised return and expected return. Realised return arises after an event occurred, while expected return is the return that the investors expect to receive in the future. Therefore, expected return, including dividend and the capital gain, can be referred to as the return that arises before the event occurred.

The equation of rate of return from securities i is presented as follows:

$$R_i = \left(\frac{D_t + (P_t - P_{t-1})}{P_{t-1}} \right) \times 100$$

where:

| | | |
|-----------|---|---------------------------------------------------------------|
| R_i | = | Rate of return from securities “ i ” |
| D_t | = | Dividend of securities “ i ” at trading day t |
| P_t | = | Closing price of securities “ i ” at trading day t |
| P_{t-1} | = | Closing price of securities “ i ” at before trading day t |

Risk of Investment

Risk of investment refers to the opportunities of not getting the return as expected. Such risk can be divided into two types: systematic risk and unsystematic risk. Several causes make securities

result with different yields, and one of the causes is the impact of the factors that have occurred towards all the securities.

Risk can be measured by measurements that are widely used are as follows:

1) Standard deviation (σ) is the characteristic of the distribution of the return rate. σ is used to indicate the fluctuation of the expected return of investment. The high value of σ reflects the high level of risk of that particular security. The low value of σ reflects the low risk of that particular security.

The equation of standard deviation is presented as follows:

$$\sigma_i = \sqrt{\frac{\sum_{i=1}^n (R_i - \bar{R}_i)^2}{n-1}}$$

where:

σ_i = Standard deviation from securities "i"

R_i = Rate of return from securities "i"

\bar{R}_i = Average rate of return from securities "i"

n = Number of data

2) Beta coefficient (β) is the measurement of the systematic risk. The beta value refers to the change in rate of return of the security relative to the one unit change of the market return. Moreover, β indicates the relationship between the rate of return and market return. The value of beta can be interpreted in three cases as follows:

If $\beta > 1$, the change in the rate of return is higher than the change in the market return. When the relationship between the rate of return and market return is positive, the rate of return will move in the same direction as the change in the market rate of return.

If $\beta = 1$, the change in the rate of return of a security equal to the change in market return.

If $\beta < 1$, the change in the rate of return of a security is lower than the change in the market return. When the relationship between the rate of return and market return is negative, the rate of return will move in the opposite direction from the change in the market rate of return.

The equation of beta coefficient is presented as follows:

$$\beta_i = \frac{\text{COV}_{i,m}}{\sigma_m^2}$$

where:

β_i = Beta coefficient from securities "i"

$\text{COV}_{i,m}$ = Covariance between rate of return from securities "i" and market return

σ_m^2 = Variance of Market

Capital Asset Pricing Model (CAPM)

CAPM, invented by Sharpe (1964), has been widely used till the present. This model focuses on the systematic risk or beta coefficient as it is an unavoidable external risk of every business that impacts the price of all securities in the market. The equation of this model is presented as follows:

$$E(R_i) = R_f + \beta_i(R_m - R_f)$$

where:

| | | |
|-----------|---|-----------------------------------------------------------|
| $E(R)_i$ | = | Expected return of securities "i" |
| R_m | = | Market rate of return |
| R_f | = | Risk-free rate of return |
| β_i | = | Systematic risk or the beta coefficient of securities "i" |

Security market line (SML) presents the relationship between the expected rate of return and the risk of security. SML is crucial for evaluating the value of securities at equilibrium. The securities that yield at SML indicates the desired level of return by investors, which is the expected rate of return. Those lying under SML indicate a lower return rate than the market return, and reflect that the price of the security is overvalued. However, those lying above SML indicate a higher return rate than the market return, and reflect the undervalued stock price.

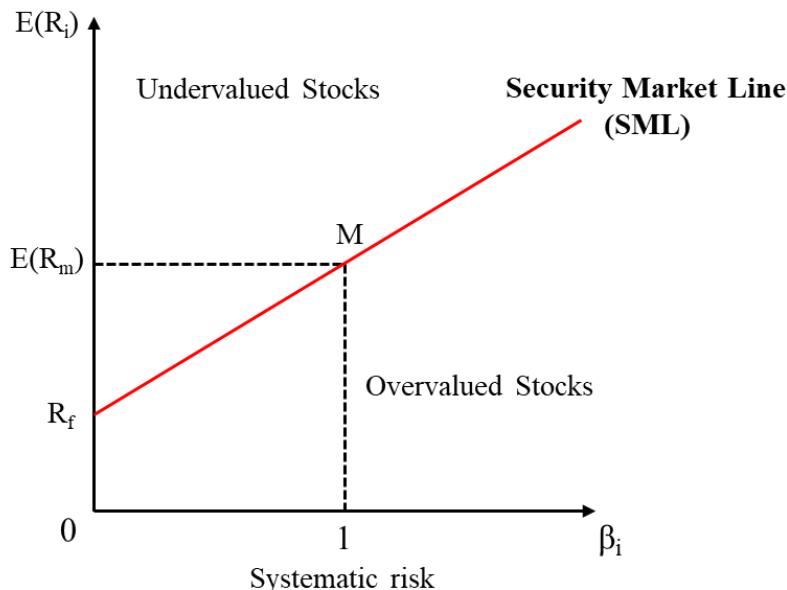


Figure 1 The relationship between the desired rate of return and the risk of security

Related Research

Usman (2022) conducted a study to compare the optimal portfolio composition with the capital asset pricing model (CAPM) of securities in the liquid-45 index (ILQ-45) before and during COVID-19 on the Indonesia Stock Exchange from May 2018 to December 2021. The results showed that in -pre-COVID-19 period, 8 stocks with a realised return were at a higher level than the expected

return. During the COVID-19 period, 14 stocks with a realised return were at a higher level than the expected return.

Khampheng and Pastpipatkul (2019) conducted a study on the estimation of capital asset pricing model of health care services sector in the Stock Exchange of Thailand from January 2009 to December 2014, which was combined with a market uptrend (bullish state) and a market downturn (bearish state). The instruments used in their study were Markov-Switching Model and the two-regime Markov-switching model. According to the result presented with the securities market line (SML), the expected returns of BDMS, BH, SVH, RAM, and BCH securities were over the SML when the market was up-trending, reflecting undervalued securities. Only the expected return of RAM stocks was found to be over the SML when the market was down-turning.

Chanthong (2015) analysed the rate of return and risk of health care service securities listed on the Stock Exchange of Thailand by using the capital asset pricing model (CAPM) in the period January 2006 to December 2015. The results showed that the healthcare sector held 15 stocks: ACH, BH, BCH, CHG, CMR, KDH, NEW, NTV, RAM, SRK, SVH, VIBHA, and VIH. The return was above the equilibrium level, and the stocks were undervalued.

Research Methodology

Population and Sample Group

The securities in the health care service sector listed on the Stock Exchange of Thailand (SET) were used in this study. The study periods were the pre-Covid 19 (2016-2018) and during the COVID-19 pandemic (2019-2021). In total, there were 16 securities with complete information presented in both periods.

Data Collection

The variables in this study were collected from SET database and Aspen database. For example, the monthly closing prices of securities were collected to calculate the rate of return (R_i), the data on SET TRI Index were used to calculate the market rate of return (R_m), and the rate of return of the 10-year government bonds from the Thai Bond Market Association (ThaiBMA) were used as the risk-free rate of return (R_f).

Methods

1. Calculate the rate of return, realised return, standard deviation, and beta coefficient of the securities in the health care service sector,
2. Calculate the expected rate of return of the securities in the health care service sector by using the CAPM, and
3. Compare the expected rate of return and the realised return of the securities obtained from the calculation and draw security market line (SML).

Results

Table 1 Analysis rate of return from securities in health care service sector

| Securities | Average Annual Rate of Return (R _i) (Percent) | |
|---------------|-----------------------------------------------------------|---------------------|
| | pre-COVID-19 | during the COVID-19 |
| AHC | -21.31 | 1.24 |
| BCH | 29.12 | 13.60 |
| BDMS | 7.69 | 4.14 |
| BH | -1.66 | -2.43 |
| CHG | -2.76 | 24.82 |
| CMR | 24.98 | 18.31 |
| KDH | 7.90 | -1.05 |
| LPH | 1.23 | 11.27 |
| NEW | 1.93 | 6.72 |
| NTV | 15.69 | -8.77 |
| PRINC | 15.31 | 10.57 |
| RAM | 13.04 | 20.66 |
| SKR | 7.85 | 43.80 |
| SVH | 17.61 | 0.43 |
| VIBHA | 2.55 | 16.05 |
| VIH | 10.32 | 24.75 |
| SET TRI INDEX | 10.17 | 5.70 |

Table 1 presents the analysis of the return rate in health care service sector. In the pre-COVID-19 period, the average annual market rate of return was 10.17%, and there were 7 securities: BCH, CMR, NTV, PRINC, RAM, SVH, and VIH that had higher return than average market return. The security with the highest rate of return was BCH with 29.12%, while ACH was the security with the lowest rate of return of -21.31%.

During the COVID-19 pandemic, the average annual market return was 5.70% and there were 10 securities that yield higher than the average market return, including BCH, CHG, CMR, LPH, NEW, PRINC, RAM, SKR, VIBHA, and VIH. The security with the highest rate of return was SKR with 43.80%, while NTV was the security with the lowest rate of return of -8.77%.

Table 2 Total risk and systematic risk of securities in health care service sector

| Securities | Total Risk (σ) | | Systematic Risk (β) | |
|---------------|-------------------------|---------------------|-----------------------------|---------------------|
| | pre-COVID-19 | during the COVID-19 | pre-COVID-19 | during the COVID-19 |
| AHC | 4.04 | 5.58 | 0.28 | 0.35 |
| BCH | 7.70 | 9.18 | 1.23 | 0.55 |
| BDMS | 5.91 | 6.89 | 0.46 | 0.94 |
| BH | 6.54 | 9.20 | 0.55 | 1.03 |
| CHG | 8.44 | 7.60 | 0.91 | 0.38 |
| CMR | 15.51 | 12.24 | 0.96 | 0.77 |
| KDH | 6.75 | 7.08 | 0.49 | 0.63 |
| LPH | 6.39 | 9.36 | 0.70 | 0.92 |
| NEW | 7.44 | 12.10 | 0.04 | 0.31 |
| NTV | 5.22 | 4.12 | 0.94 | 0.50 |
| PRINC | 9.27 | 12.08 | 0.63 | 1.18 |
| RAM | 7.28 | 5.64 | 0.40 | 0.31 |
| SKR | 6.33 | 5.71 | 0.38 | 0.50 |
| SVH | 5.23 | 3.32 | 0.30 | 0.38 |
| VIBHA | 6.72 | 9.49 | 1.43 | 0.63 |
| VIH | 10.22 | 10.28 | 1.37 | 0.66 |
| SET TRI INDEX | 3.12 | 6.19 | 1.00 | 1.00 |

Table 2 presents the total risk analysis (σ). In the pre-COVID-19 period, it was found that the total risk of the market was at 3.12%. All of the 16 securities in the health care service sector had a higher risk than the market risk. CMR was the security with the highest total risk of 15.51%, and AHC was the security with the lowest total risk of 4.04%. During the COVID-19 pandemic, the total risk of the market was at 6.19%, and the total risk of 11 securities: BCH, BDMS, BH, CHG, CMR, KDH, LPH, NEW, PRINC, VIBHA and VIH, was higher than the market average. CMR was presented as the security with the highest total risk of 12.24%, while SVH was presented as the security with the lowest total risk of 3.32%.

According to the analysis of systematic risk or beta coefficient (β), all of the 16 securities were found to be positive. This reflects the same direction of change in return rate as the change of the market. In the pre-COVID-19 period, there were 3 securities: BCH, VIBHA and VIH with the $\beta > 1$. VIBHA was the security with the highest beta coefficient at 1.43. During the COVID-19 pandemic, BH and PRINC were the two securities with the $\beta > 1$. PRINC was the security with the highest beta coefficient at 1.18. This reflects the higher return from the security investment over the market return.

Table 3 Comparison of realised return and expected return of securities in health care service sector

| Securities | Pre-COVID-19 | | | During the COVID-19 | | |
|------------|---------------------------------|--------------------------------|-------------|---------------------------------|--------------------------------|-------------|
| | Realised Return (R_i) | Expected Return $E(R_i)$ | Decision | Realised Return (R_i) | Expected Return $E(R_i)$ | Decision |
| | | | | | | |
| AHC | -21.31 | 4.20 | Overvalued | 1.24 | 3.23 | Overvalued |
| BCH | 29.12 | 12.08 | Undervalued | 13.60 | 3.97 | Undervalued |
| BDMS | 7.69 | 5.67 | Undervalued | 4.14 | 5.48 | Overvalued |
| BH | -1.66 | 6.43 | Overvalued | -2.43 | 5.80 | Overvalued |
| CHG | -2.76 | 9.39 | Overvalued | 24.82 | 3.33 | Undervalued |
| CMR | 24.98 | 9.81 | Undervalued | 18.31 | 4.81 | Undervalued |
| KDH | 7.90 | 5.96 | Undervalued | -1.05 | 4.29 | Overvalued |
| LPH | 1.23 | 7.71 | Overvalued | 11.27 | 5.39 | Undervalued |
| NEW | 1.93 | 2.20 | Overvalued | 6.72 | 3.09 | Undervalued |
| NTV | 15.69 | 9.63 | Undervalued | -8.77 | 3.78 | Overvalued |
| PRINC | 15.31 | 7.10 | Undervalued | 10.57 | 6.40 | Undervalued |
| RAM | 13.04 | 5.24 | Undervalued | 20.66 | 3.06 | Undervalued |
| SKR | 7.85 | 5.07 | Undervalued | 43.80 | 3.81 | Undervalued |
| SVH | 17.61 | 4.35 | Undervalued | 0.43 | 3.33 | Overvalued |
| VIBHA | 2.55 | 13.73 | Overvalued | 16.05 | 4.29 | Undervalued |
| VIH | 10.32 | 13.21 | Overvalued | 24.75 | 4.39 | Undervalued |

In Table 3, when the CAPM was taken into consideration, the realised return (R_i) of the invested securities must be higher than the expected return $E(R_i)$. In pre-COVID-19 period, 9 securities: BCH, BDMS, CMR, KDH, NTV, PRINC, RAM, SKR, and SVH, had higher realised return over the expected return, which reflects undervalued stock price. During the COVID-19 pandemic, there were 10 securities: BCH, CHG, CMR, LPH, NEW, PRINC, RAM, SKR, VIBHA, and VIH, with higher realised return over the expected return, which reflects undervalued stock price.

The securities in the pre-COVID-19 period and during the COVID-19 pandemic were compared, and 5 securities: BCH, CMR, PRINC, RAM, and SKR were found to be undervalued when compared with their expected return at the same level of risk. Since the price of these 5 securities tended to increase both in pre-COVID-19 period or during the outbreak, it was suggested to invest in the securities.

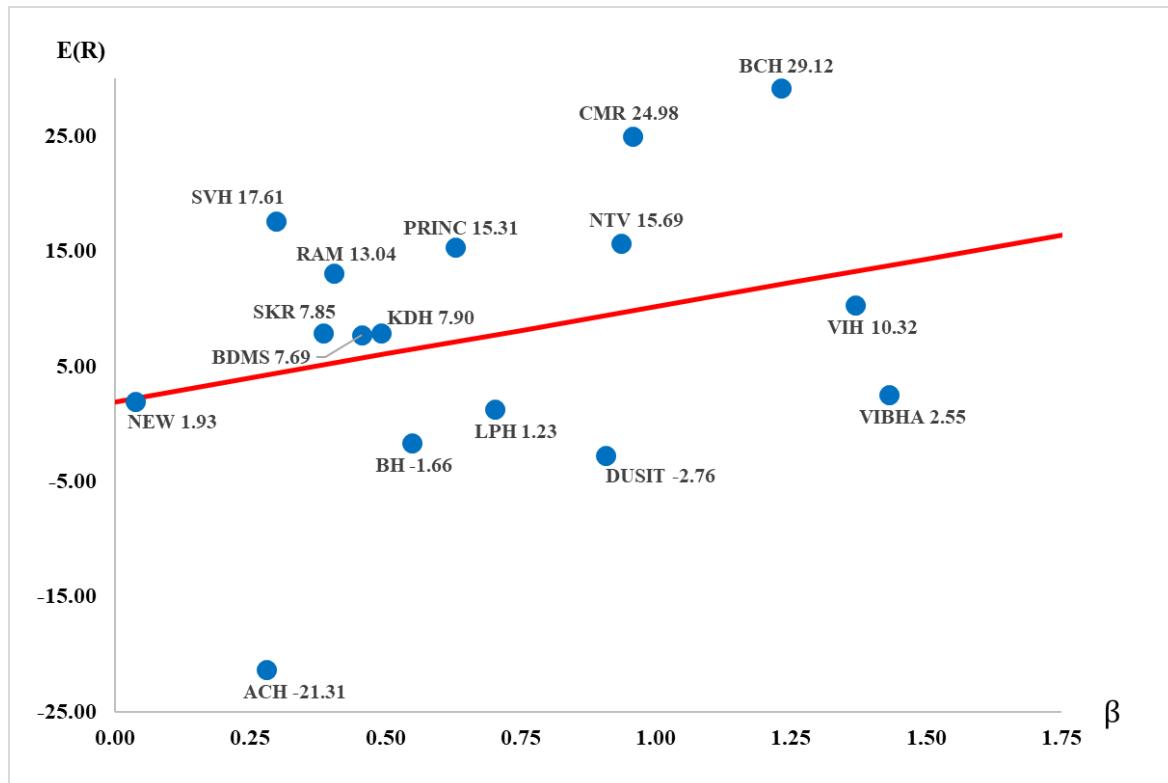


Figure 2 Investment decisions of securities in health care service sector by using security market line (SML) in pre-COVID-19 (2016-2018)

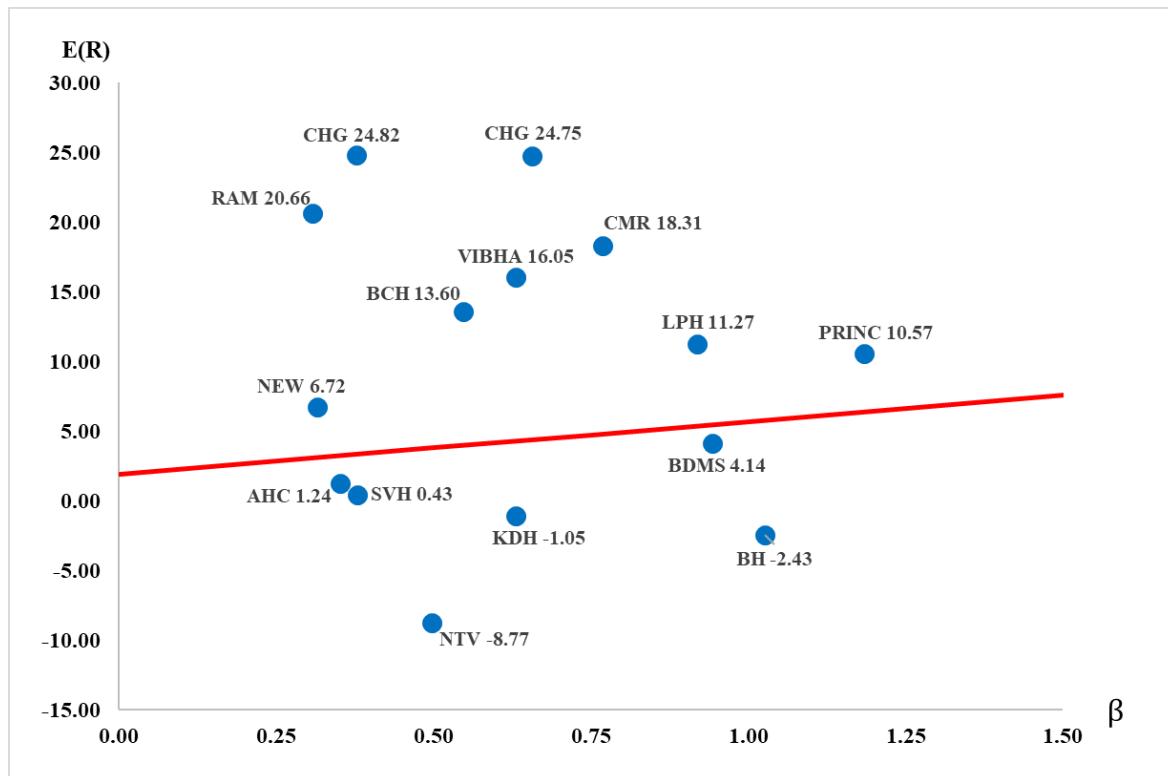


Figure 3 Investment decisions of securities in health care service sector by using security market line (SML) during the COVID-19 (2019-2021)

Security Market Line (SML)

In the pre-COVID-19 period, the positions of the 9 securities: BCH, BDMS, CMR, KDH, NTV, PRINC, RAM, SKR, and SVH were above the SML as shown in Figure 2.

During the COVID-19 pandemic, the positions of the 10 securities: CMR, LPH, NEW, PRINC, RAM, SKR, VIBHA and VIH were above the SML as shown in Figure 3.

When the securities in the pre-COVID-19 period and during the COVID-19 pandemic period were compared, 5 securities: BCH, CMR, PRINC, RAM and SKR yielded above the SML. It indicates that these securities yield a higher return than the expected return and can be considered as undervalued shares. When comparing the expected return with the same level of risk, these shares were suggested for investment. The reason is that the price of these shares would gradually increase in both pre-COVID-19 period and during the COVID-19 pandemic.

Summary and Discussion

For the rate of return during the pre-COVID-19, BCH was presented as the security with the highest annual rate of return, while AHC was presented as the lowest. 7 securities: BCH, CMR, NTV, PRINC, RAM, SVH, and VIH demonstrated a higher annual rate of return than the market rate of return. During the COVID-19 pandemic, SKR was the security with the highest annual rate of return, while NTV was the lowest. During this period, 10 securities: BCH, CHG, CMR, LPH, NEW, PRINC, RAM, SKR, VIBHA, and VIH, demonstrated a higher annual rate of return than the market rate of return.

For the total risk of investment during the pre-COVID-19 period, there were 16 securities with higher levels of risk than the market level, and CMR was the security with the highest level of risk. During the COVID-19 pandemic, 11 securities: BCH, BDMS, BH, CHG, CMR, KDH, LPH, NEW, PRINC, VIBHA, and VIH, had a higher level of risk than the market level, and CMR was still the security with the highest level of risk. Obviously, CMR was the security with the highest total return in the two periods. However, based on the CAPM, CMR was the security with the higher rate of realised return than the expected return, reflecting that the price was undervalued. Therefore, it was suggested to invest in CMR.

The systematic risk or beta coefficient was positive for the 16 securities. During the pre-COVID-19 period, it was found that BCH, VIBHA, and VIH were the 3 securities with $\beta > 1$. VIBHA was presented as the security with the highest beta coefficient. During the COVID-19 pandemic, BH and PRINC were the only two securities with $\beta > 1$. PRINC was the security with the highest beta coefficient. Moreover, all the health care service sector had a positive beta coefficient, indicating that health care service sector had changed in the same direction as the change of market according to Pupusson (2009), and Chanthong (2015).

In terms of the realised return and the expected return during the pre-COVID-19 period, it was recommended to invest in these 9 securities: BCH, BDMS, CMR, KDH, NTV, PRINC, RAM, SKR, and SVH. During the COVID-19 period, it was suggested to invest in these 10 securities: BCH, CHG,

CMR, LPH, NEW, PRINC, RAM, SKR, VIBHA, and VIH. The result of this study is in accordance with Usman (2022), who found that there were a number of stocks with a higher realised return than the expected return during the COVID-19 period. However, disregarding the COVID-19, there were 5 securities: BCH, CMR, PRINC, RAM, and SKR with higher realised returns than the expected return, and were located above SML. In other words, the securities were undervalued compared with the expected return at the same level of risk. Therefore, it was suggested to invest in these securities since their prices were expected to increase. The result of this study is in accordance with Khampheng and Pastpipatkul (2019), who stated that the price of RAM was undervalued. Furthermore, the result also supports the findings of Chanthong (2015), who stated that the prices of BCH, CMR, RAM, and SKR were undervalued and considered as aggressive stocks since the return from the investment of these securities were higher than the market return.

Recommendations

Recommendations from the study

This study presents the efficient ways to make an investment decision, which would benefit analysts working relevant to return and risk of stocks, as well as investment on securities in health care service sector. Furthermore, the number of undervalued stocks during the COVID-19 pandemic are more than pre-Covid period. This fact would benefit the investors whose favourite stocks are in health care service sector. Moreover, this can be used to analyse the risk-return implications of holding securities since beta represents systemic risk while the graphical analysis and regressions were used to provide evidence for a sloped SML on the SET in this study.

Recommendations for future research

1. This study focused on the change of market in the pre-COVID-19 and during the outbreak, and only used the information for making investment decisions in the medical securities. The study on securities in other business sectors on the Stock Exchange of Thailand should also be conducted to provide a guideline for making an investment decision, diversifying investments into other sectors, and providing alternatives for investors.

2. This study only used the CAPM to determine the return and risk of investment. For future studies, it is suggested to consider other factors, such as economic conditions and government policies by using technical analysis, qualitative analysis, and the Fama-French 3 Factor Model or 5 Factor Model in order to obtain more efficient investment guidelines.

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