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Common Stocks as a Hedge Against Inflation through the Shares of Tehran Stock Exchange Member Companies

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ABSTRACT

According to The Fisher (1930) hypothesis implies that broadly selected common stocks should be a hedge against inflation in the long run, in the sense that a change of expected inflation leads to a proportional change in nominal stock return. The goal of this paper was to study hedging against inflation using the shares of member companies of Tehran Stock Exchange. The statistical population includes companies listed on Tehran Stock Exchange. As a statistical sample, 18 companies were selected whose market value at the beginning of 2021 was at least 50% of the total stock market value. The research method is causal and the method of data collection in the field of theoretical literature is based on library studies and in the field of testing the research hypotheses is documentary. The empirical method used is the mixed data sampling (MIDAS) regression model. The results show that the stock prices of companies react differently to the inflation, and therefore it is possible to hedge against inflation by investing in these companies. Also the econometrics model reporting significant relation between nominal stock return and inflation. Moreover, the results show that the ability of companies to hedge against inflation is different, and the stock price changes for portfolios of companies differ in their degree of being explained with respect to inflation beta quantiles.

Keywords:

Inflation, Portfolio, Stock Market, Hedging.

1. Introduction

Economic stability is one of the most important factors affecting investment incentives in any economy. Macroeconomic factors are among the factors that determine the objectives and size of investments in capital markets in emerging, developing and developed countries. Among macroeconomic factors, the inflation rate is very important because it is closely related to the value of people's and companies' assets on the one hand, and tangible on the other. Inflation is also one of the environmental variables that has a significant impact on the financial decisions of companies and investors. One of the solutions for investors to maintain the value of their assets in the face of rising inflation is to invest assets in capital markets and grow the asset dynamically. However, as long as the investment portfolio is not hedged against inflation risk, investing in stocks may actually exacerbate the impact of inflation by reducing the intrinsic value of investor assets. Therefore, hedging investment portfolios against inflation risk and identifying stocks with the highest exposure to inflation can help preserve the value of investor assets.
Inflation reduces the purchasing power of retirement savings, redistributes wealth from lenders to borrowers, and changes the long-term goals of private sector investors (Doepke & Schneider, 2006). The theoretical framework in this area is traced back to Fisher (1930). He claimed that market interest rates include real interest rates and expected inflation. Conventional finance theory assumes that the value of stocks reflects the real value of assets rather than their nominal value and therefore should have the ability to hedge against inflation (Brière & Signori, 2012). Thus, it is of great importance to investigate whether inflation risk can be easily offset in financial markets (Bampinas & Panagiotidis, 2016).

There are several reasons to examine the ability of stocks to hedge inflation risk over the long-run. First, many institutional investors have a long-term investment horizon (Lee, 2010). In advanced economies where monetary policy is geared toward price stability, investors and business owners may be most concerned about the risk of long-term inflation (household savings for retirement, pension fund debt, etc.) and, to a lesser extent, short-term inflation. Second, the vast majority of research has focused on how stock market indices fluctuate simultaneously with inflation. Although the capital market can be a general risk hedge for inflation, companies from certain industries with specific characteristics may have a higher ability to contain inflation risk in the long-run (Alagidede & Panagiotidis, 2012). Therefore, constructing a portfolio based on stocks whose prices are highly correlated with consumer prices and inflation is much more suitable for inflation hedging than the overall market index. Third, correlation-based capital hedging techniques have significant weaknesses related to the nature of correlation as a measure of communication, such as: instability, short-term memory processes, applicability only to static variables, limitations in applying to long-run data, loss of valuable information after detrending data and making it static, and sensitivity to the presence of remote data (Alexander & Dimitriu, 2004).

Alexander (1999) argues that correlation reflects short-term changes in returns that may become unstable over time. On the other hand, long-term price increases may occur during periods when static correlation is low. Therefore, hedging methods based on cointegrated assets may be more effective in the long-run. In addition, researchers have accepted that both commodity prices and stock prices are cointegrated processes with infinite memory, so regression estimates for first-order (or higher) differences in stock prices and consumer price indices are associated with a loss of valuable data in the long-run (Anari & Kolari, 2010). Thus, using cointegration models in identifying stocks with the greatest degree of long-run correlation with inflation may be a good idea to hedge the portfolio against inflation risk. In this study, the portfolio hedging against inflation risk is investigated by measuring the long-term relationship of stocks with the consumer price index. The main question of the study is whether it is possible to hedge the investment portfolio against inflation risk in Tehran Stock Exchange or not. Therefore, the questions and hypotheses tested in this study are:

Q1: Is it possible to hedge against inflation with using stocks?

Q2: Are there companies and industries have different capabilities to hedge against inflation?

H1: It is possible to hedge against inflation using stocks.

H2: Companies and industries have different capabilities to hedge against inflation.

To answer this question, portfolios are hedged against inflation by forming portfolios ranked by the

magnitude of the long-term correlation between the companies' stock prices and inflation, and the performance of the portfolio is evaluated by its abnormal returns.

The main issue of this study is to investigate the hedge against inflation with through the shares of Tehran Stock Exchange member companies. This paper consists of five sections. Section 1, discusses the introduction, in which the background and rationale of the study is outlined. Section 2, covers the theoretical framework and review of literature. Section 3, captures the research methodology. Section 4, covers the detail of the data and empirical method employed in this study reports the findings and discussion. The final section contains the conclusions.

2. Theoretical Foundations and Research Background

2.1. Theoretical framework

The Fisher (1930) hypothesis implies that broadly selected common stocks should be a hedge against inflation in the long run, in the sense that a change of expected inflation leads to a proportional change in nominal stock return. However, empirical validity of this hypothesis has been puzzling, with many studies reporting negative relation between nominal stock return and expected inflation: see, among other, Bodie (1976), Nelson (1976), Fama and Schwert (1977), and Kaul (1990). While Fama's (1981) proxy hypothesis has emerged as an explanation to this puzzle (see Gallagher and Taylor, 2002; and Kryzanowski and Rahman, 2009), the standard methods of testing for the Fisher hypothesis may not fully capture the true nature of the relationship between the two.

Fama (1981) hypothesizes that the observed inverse relationship between real stock returns and inflation is spurious. Inflation simply acts as a proxy for real-activity variables in models that relate stock returns to inflation. Under this 'proxy hypothesis', the negative association found between stock returns and inflation is the result of two underlying relationships: (1) that between stock returns and expected economic activity; and (2) that between expected economic activity and inflation. A positive relationship between stock returns and expected economic activity is driven by the expectation of higher future dividends, while a negative relationship between expected activity and inflation follows from money demand effects arising from a rational expectations version of the quantity theory. Therefore, in regressions of stock returns on measures of inflation, a significant negative coefficient on the inflation term reflects these two underlying relationships.

2.2. Research background

Heidari and Rafah Kahriz (2018) in a study indicated that inflation rate has a positive significant effect in the high return (bull market) regime, but in the low return (bear market) regime, this effect is not statistically significant. However, inflation uncertainty has asymmetric effects on the different stock market regimes. Moreover, the stability of the low return regime is greater than that of the high return regime, and the stock market returns to its original state more quickly when it exits the low return (bear market) regime and enters the high return (bull market) regime. Darabi (2017) in a study titled "inflation determinant of financial stability in investment companies listed on the Tehran stock exchange" indicated that increasing the net profit and stock increases sustainability and increasing assets reduces the financial sustainability of investment companies in the stock market. Rezazadeh (2016) conducted a study to investigate the effects of macroeconomic variables on the instability of stock returns. His results indicated that among macroeconomic variables, inflation has a positive but nonsignificant effect on stock returns. Abu Nouri et al. (2013), studying the relationship between inflation and stock returns, found that there is an asymmetric relationship between these variables and the negative components of the stock market and inflation are not related in the long-run, and their positive components are not significantly related. Azizi et al. (2011) concluded that the Fisher hypothesis that real stock returns are independent of inflation and ordinary stocks are the full shield against inflation has been rejected in the short-run, and Tehran stock market is a weak shield against inflation. The application of Fama's rationale for rejecting Fisher hypothesis has shown that Fama's rationale cannot explain this phenomenon and the negative relationship between inflation and real stock returns in the short-run is related to the temporary part of inflation. In the long-run, however, the stock index was a inflation hedger.

In overseas research, Mumtaz & Theodoridis (2020) examined the relationship between monetary policy and stock prices in the United States. The results of

this study show that after 1980 the response of stock prices to the post-1980 shock became negative. In contrast, endogenous growth mechanisms appear to be weaker in the post-1980 period with positive fiscal shocks pushing down consumption and TFP and causing inflation and the real interest rate to rise. Boons et al. (2020) conducted a study to examine the time-varying relationship between inflation and stock returns. The results of this study showed that inflation risk is priced because inflation predicts real consumption growth. The historical changes in this predictability and in stocks' inflation betas can account for the size, variability, predictability, and sign reversals in inflation risk premia. Farooq & Ahmed (2018) conducted a study to investigate the impact of inflation on investment sensitivity to stock prices in emerging markets. The paper used data from 37 emerging markets and showed that investment of firms headquartered in countries with higher inflation was significantly less sensitive to their stock prices than that of firms headquartered in countries with lower inflation. They argued that stock prices are less informative in countries with high inflation. Antonakakis et al. (2017) studied the changing correlation between inflation and stock prices in the United States in recent years. In this study, they examined the dynamic conditional correlations of stock prices and inflation in the United States over the period of 1791–2015 under a time-varying framework. The results of their empirical analysis indicated that correlations between the inflation and stock prices in the United States evolved heterogeneously overtime. In particular, the correlations were significantly positive in the 1840s, 1860s, 1930s and 2011, and significantly negative otherwise. Fouejieu (2017) conducted a study titled "inflation targeting and financial stability in emerging markets". This paper aimed at investigating whether emerging market inflation targeters were more financially vulnerable than their non-targeting counterparts. It further assessed the extent to which targeting central banks were less responsive to financial imbalances, compared to those implementing alternative policy strategies. Based on a sample of 26 emerging countries, including 13 targeters, the analysis suggested that monetary policy in targeting countries was relatively more sensitive to financial risks. Their conclusion therefore challenged the view that central banks, through their policy interest rates, can guarantee the stability of the financial system. It rather suggested that the control of inflation should remain the primary monetary policy objective, while a (macro) prudential authority would be in charge of the financial stability objective. Bampinas & Panagiotidis (2016) conducted a study titled "hedging inflation with individual US stocks: a long-run portfolio analysis". This paper examined whether individual stocks could act as inflation hedgers. They focused on longer investment horizons and construct in- and out-of-sample portfolios based on the long-run relationship (cointegration) of stock prices with respect to consumer prices. Empirical evidence suggested that investors are better off by holding a portfolio of stocks with higher long-run betas as part of asset selection and allocation strategy. Tripathi & Kumar (2015) conducted a study on inflation and the stock return. They examined short-run causal relationship between inflation and stock return in emerging BRICS markets. The regression results showed a significant positive relationship between changes in inflation and stock returns only in case of Brazil. But, Granger causality results indicated unidirectional causality from stock return to changes in inflation in Russia, India and South Africa and bidirectional causality in China.

The innovation of this study compared to previous papers is in examining the relationship between the inflation and the stock portfolio and the performance of different companies in terms of the financial index against inflation. For this purpose, an econometric model based on mixed data sampling has been used.

3. Research Methodology

This study is applied in terms of purpose, and it is descriptive based on regression analysis where the mixed data sampling (MIDAS) regression model was used. The data were collected from the Seo[1] website and the World Bank database. The research data was analyzed using R software version 4.1.0 at 95% level of significance.

The statistical population of this study includes all companies listed and active in Tehran Stock Exchange over the period 2020Q2-2021Q1, whose stock value was at least 50% of the total value of companies in Tehran Stock Exchange on March 19, 2021 (the last trading day in 1399 AH). Restricting the statistical community to this group of companies has the

[1]. Securities and Exchange Organization

advantage of portfolio hedging to the companies with the greatest impact on the overall stock market index, where investments are in most cases more interesting for investors than in other companies. Due to the heterogeneity of some members of the community, they were systematically deleted. For this purpose, the following constraints were considered to select the target sample:

- Companies whose stock transactions took place in Tehran Stock Exchange with a trading halt of less than one month;
- Pre-1399 AH companies listed on Tehran Stock Exchange (from 2020Q2 onwards);
- The fiscal year of the companies should end on March 20 of each year;
- Companies for which the data are available.

By applying these restrictions, 18 companies were analyzed, including: Persian Gulf Petrochemical Industries Company (PGPIC), Mobarakeh Steel Company (MSC), National Iranian Copper Industries Co. (NICICO), Golgohar Mining and Industries Company (GEG), Chadormalu Mining and Industries Company (PJS), Isfahan Oil Refinery (EORC), Tamin Oil, Gas and Petrochemical Company (Tappico), Pars Petrochemical Company (PARSPC), Parsian Oil and Gas Development Company (POGDC), Bandar Abbas Oil Refining co. (NIORDC), Khouzestan Steel Company (KSC), Iran Khodro (IKCO), Mining and Metals Development Investment Company (MMDIC), Tehran Oil Refining Company (TORC), MAPNA Group (MAPNA), Jam company (JP), Pardis Petrochemical Company (PPC), Telecommunication Company of Iran (TCI).

In order to hedge a portfolio against inflation risk, the concept of portfolio hedgeability is used as inflation beta. In this context, firstly, the long-term beta of each of the stocks is estimated according to the research of Bampinas & Panagiotidis (2016) through the following regression relationship and for monthly stock price data:

Equation1

$$S_{i,t} = \alpha_1 + \beta_1 CPI_t + \varepsilon_{i,t}$$

Where $S_{i,t}$ is equal to the natural logarithm of stock price *i* at the end of period *t*, CPI_t is equal to the consumer price index at the end of period *t* compared to the previous period, and $\varepsilon_{i,t}$ the model error component. The regression coefficient β_1 in this model indicates the ability of the stock contribution to hedge inflation risk in the long-run and is called the long-run beta (LR beta).

After estimating the β_1 coefficients in the model, stocks that do not exhibit a cointegration relationship with the inflation rate (companies whose stocks cannot hedge against inflation) are first excluded from the analysis process, in line with the methodology of Bampinas & Panagiotidis (2016). Then the remaining stocks in the analysis are ranked by the size of the inflation beta. A company with a higher inflation beta has a higher ability to hedge against inflation. Based on the values of this coefficient, the companies are then classified into 4 different portfolios. Thus, the first portfolio contains stocks with the highest value of β_1 (first quarter of companies with respect to β_1) and the fourth portfolio contains stocks with the lowest value of β_1 (fourth quarter of companies with respect to β_1). In order to identify the portfolio with the highest and lowest hedge against long-term inflation, the following regression model is used to fit and estimate the inflation beta coefficient for the portfolios:

Equation 2

$$\Delta S_{p,t} = \alpha_2 + \beta_2 \Delta CPI_t + \varepsilon_{p,t}$$

In this model, the variables are defined as follows:
$\Delta S_{p,t}$: Price changes for companies in the portfolio in period *t* compared to the previous period;
ΔCPI_t: Changes in the consumer price index in period *t* compared to the previous period;
$\varepsilon_{p,t}$: Model error component.

The significance of the β_2 coefficient in this model for each of the 4 portfolios under study shows that inflation affects the stock prices of the companies in the portfolio in the long-run, and therefore it is possible to hedge against inflation through these portfolios.

4. Emperical results

A summary of the status of the descriptive statistics on the research variables can be found in Table (1).

From the indicators presented in Table (1), the average stock price of the companies under study was 30661.16 rials. The average monthly return of the stocks of these companies was estimated to be

0.03295,3 and the consumer price index had an average monthly value of 252.5667.

Levin-Lin-Chu tests were used to evaluate the significance of the research variables. The results of this test are provided in Table (2).

As Table (2) shows, the significance levels of all the mentioned tests are smaller than the first type error of 0.05 and, consequently, the null statistical hypothesis of the test that there is a unit root is rejected and it can be assumed that the series studied in this error level are stationary and, therefore, the behavior of the values of the variables will not have trending changes over time.

In order to test the H1, the inflation beta per share was estimated by fitting the regression model 1 for the monthly data on the stock price and the consumer price index. The estimate of the regression coefficient β_1 in this model corresponds to the inflation beta or the long-run stock beta against inflation risk. Table (3) shows the results of fitting this model for the 18 companies under study.

Table (1): Descriptive statistics of the research variables

Variable	Average	Median	Maximum	Minimum	Standard deviation
Stock price	30661.19	18275	161650	1420	33749.39
Return	0.032953	-0.02717	7.151408	-0.58909	0.565
Consumer price index	252.5667	252.9	298.1	204.8	32.58049

Source: Research finding

Table (2): Stationarity Test Result for Model variables

Variable	LLC statistic	Significance level
Stock price	-12.3865	0.000
Return	-31.6433	0.000
Consumer Price Index	-24.2855	0.000

Source: Research Findings

Table (3): Results of the estimation of inflation beta model coefficients

Acronym	Fixed parameter evaluation indicators (α_1)		Inflation Beta Evaluation Indicators (β_1)		Model fit indicators		
	Estimate	Significance	Estimate	Significance	F-Statistic	Significance	R^2
PGPIC	228185.09	0.0262	-761.740	0.0339	28.004	0.03339	0.9333
MSC	60273.51	0.0004	-163.581	0.0012	149.429	0.0012	0.9803
NICICO	97703.02	0.0544	-261.485	0.097	8.834	0.0970	0.8154
GEG	45782.41	0.1436	-89.308	0.379	1.255	0.3790	0.3857
PJS	35360.95	0.2790	-59.278	0.5516	0.7222	0.5516	0.4193
EORC	136926.63	0.000	-435.602	0.000	3355.231	0.0000	0.9985
Tappico	57893.62	0.0001	-153.428	0.0003	139.374	0.0003	0.9721
PARSPC	128671.65	0.0015	115.224	0.0665	7.977	0.0665	0.7267
POGDC	80579.29	0.0074	-202.359	0.0265	16.685	0.0265	0.8476
NIORDC	160482.75	0.000	-471.666	0.0000	496.393	0.000	0.99
KSC	129275.46	0.2065	-328.006	0.3275	1.651	0.3275	0.4523
IKCO	39130.15	0.0018	-134.547	0.0064	27.365	0.0064	0.8725
MMDIC	44107.25	0.0204	-105.604	0.0442	21.147	0.0442	0.9136
TORC	138009.29	0.000	-450.480	0.0001	232.608	0.0001	0.9831
MAPNA	187908.51	0.0809	-634.838	0.1238	4.506	0.1238	0.6003
JP	90089.32	0.0104	-161.868	0.0753	7.164	0.753	0.7048
PPC	191908.09	0.1220	-314.499	0.2757	4.678	0.2757	0.8239
TCI	78674.19	0.0006	-227.642	0.0017	56.627	0.0017	0.9340

Source: Research Findings

From the results of Table 3, which shows the results of fitting 18 different regression models, it can be seen that the stock price of acronyms of NICICO (p-value = 0.0970), GEG (p-value = 0.3790), PJS (p-value = 0.5516), PARSPC (p-value = 0.0665), KSC (p-value = 0.3275), MAPNA (p-value = 0.1238), JP (p-value = 0.0753) and PPC (p-value = 0.2757) do not have significant sensitivity to the consumer price index and therefore there is no cointegration between the stock beta of the these acronyms and the consumer price index. Yet, the significant values of inflation beta coefficient for other companies under study are below 0.05 and show that there is a possibility of hedging against inflation in these acronyms. Hence, considering the significance of the β_1-coefficient in 10 of the 18 studied acronyms, it can be assumed that there is a possibility of hedging against inflation through stocks, which confirms the H1. Table (4) shows the test results of the initial regression assumptions for these models.

Considering the significance levels of the Breusch-Pagan-Godfrey tests, which are above the error value of 0.05, it can be assumed that the assumption of variance homogeneity of the error components of the models has been confirmed. In addition, significant values of the Breusch-Godfrey test greater than the 0.05 error were obtained, indicating the absence of autocorrelation between the error components of the model. The Jarque–Bera test was performed to test the normality of the experimental distribution of the models' error values and, with significance levels greater than 0.05, indicates confirmation of the normality of the experimental distribution of the models' errors. Therefore, the initial regression assumptions were confirmed in all 18 regression models of the study.

In order to test the H2, the ability of different companies to hedge against inflation was examined based on the estimated inflation betas. Using the estimated inflation betas, each company's hedging against inflation based on the absolute value of the regression beta coefficient can be ranked as follows:
1) MMDIC, 2) IKCO, 3) Tappico, 4) MSC, 5) POGDC, 6) TCI, 7) EORC, 8) TORC, 9) NIORDC, 10) PGPIC.

Thus, it appears that companies and industries have different abilities to hedge against inflation. To test this assertion, different portfolios were formed with respect to the of stock inflation beta. Estimated inflation beta quantiles were used to form these portfolios, estimated as described in Table (5).

The results in Table (5) indicate that 25% of the estimated inflation betas are smaller than -408.7038. 50% of the values are -215.0009, 75% of the values are -139.2674 and all values are less than 115.2249. This classification has led to the formation of four different portfolios. After removing companies that did not have a significant inflation beta, the first portfolio included companies with an inflation beta below -408.7038. The second portfolio included companies with an inflation beta between -408.7038 and -215.0009. The third portfolio contained companies with inflation beta between -215.0009 to -139.2674, and the fourth portfolio contained companies with inflation beta with values between -139.2674 to 115.2249. In order to test the H2, the regression model 2 is fitted separately for each of these portfolios. It is noteworthy that for portfolios 2 and 4, the model was fitted without the Y-intercept parameter to obtain a statistically optimal and significant model. Table 6 shows the results of fitting this model to four research portfolios.

From the results of Table (6), the inflation beta was significant at the 0.05 error level in all four portfolios. The significance levels of the F-tests to determine the overall significance of the regression models are also below the error level of 0.05, indicating the overall significance of the regression models. The model determination coefficients also show that the first portfolio with an inflation beta of less than -408.7038 contributes the most to explaining the stock price changes in the portfolios. In other words, the stock price changes of the companies in this portfolio can be explained by the consumer price index more than those of other companies. Yet, the fourth portfolio with the lowest inflation beta of its companies has the lowest rate of explanation of stock price by the consumer price index. The presence of significant differences between the degrees of explanation of stock price changes in the different portfolios by the consumer price index suggests that the ability of companies to hedge against inflation has been different. Also, increasing the inflation beta in the portfolios (changing the status from the first portfolio to the second, third, and fourth portfolios) decreases the degrees of explanation of stock price changes. Thus, the H2 is confirmed. Table (7) shows the test

results of the initial regression assumptions for these four models.

In this table, the Breusch-Pagan-Godfrey test is performed to confirm the variance homogeneity of the model error components. The significance level of this test is greater than 0.05, which confirms the variance homogeneity of the error components of the models. The Breusch-Godfrey test was used to test the independence of the model residuals. The significance level of this test is greater than the error of 0.05, which indicates the confirmation of the statistical null hypothesis in this model, based on the independence of the error rates of the research models. The results of the Jarque–Bera test to confirm the normality of the experimental distribution of the error components with a significance level greater than 0.05 showed the normality of the error components of the models. Therefore, it can be assumed that the initial assumptions of the regression are satisfied and the results of the models can be cited in determining the effects. According to the categories formed from the inflation beta of the companies and their placement in different portfolios, the impact of the inflation-related changes in the stock prices of these companies can be summarized in Table (8).

Therefore, the first research portfolio, which includes the acronyms PGPIC, EORC, NIORDC and TORC, have the greatest potential in hedging against inflation. The second research portfolio, which contains the TCI acronym, has the highest hedging potential against inflation risk. The third research portfolio, which contains the acronyms MSC, Tappico and POGDC, ranks the third in hedging against inflation. The fourth research portfolio, which contains the acronyms for IKCO and MMDIC, has the lowest impact on the consumer price index and is thus least able to hedge against this risk.

Table (4): Test results of initial assumptions in inflation beta models

Test	Breusch-Pagan-Godfrey		Breusch-Godfrey		Jarque–Bera	
Model	**T-statistic**	**Significance**	**T-statistic**	**Significance**	**T-statistic**	**Significance**
PGPIC	0.4314	0.1940	0.4162	0.1878	0.6273	0.2692
MSC	0.2797	0.1305	0.1745	0.0835	0.3291	0.1517
NICICO	0.2146	0.1017	0.7178	0.3015	0.5585	0.2436
GEG	0.7405	0.3094	0.3171	0.1466	0.5025	0.2221
PJS	0.2644	0.1238	0.2326	0.1098	0.1739	0.0832
EORC	0.9862	0.3892	0.6582	0.2804	0.5202	0.2290
Tappico	0.5057	0.2234	0.5528	0.2415	0.3696	0.1687
PARSPC	0.3278	0.1511	0.2347	0.1107	0.5088	0.2246
POGDC	1.2193	0.4564	0.2240	0.1059	0.5785	0.2511
NIORDC	0.4207	0.1897	0.5388	0.2361	0.4242	0.1911
KSC	0.2139	0.1014	0.4961	0.2197	0.5629	0.2453
IKCO	0.4049	0.1832	0.4575	0.2044	0.1548	0.0744
MMDIC	1.0174	0.3987	0.5391	0.2362	0.5124	0.2260
TORC	0.5286	0.2322	0.6663	0.2833	0.4496	0.2013
MAPNA	0.2605	0.1221	0.3104	0.1437	0.4580	0.2046
JP	0.5618	0.2449	0.8324	0.3404	0.1890	0.0901
PPC	1.1010	0.4233	0.4496	0.2013	0.4884	0.2166
TCI	0.6913	0.2922	0.1457	0.0702	0.3160	0.1461

Source: Research Findings

Table (5): Inflation beta quantiles

Quantile	25%	50%	75%	100%
Estimate	-408.7038	-215.0009	-139.2674	115.2249

Source: Research Findings

Table (6): Results of estimating coefficients of portfolio sensitivity model

Portfolio	Fixed parameter evaluation indicators (α_1)		Inflation beta evaluation indicators (β_1)		Model fit indicators		
	Estimate	Significance	Estimate	Significance	F-statistic	Significance	R^2
1	14479.179	0.000	87.613	0.000	122.883	0.000	0.84
2	-	-	-502.108	0.007	19.625	0.0068	0.79
3	6850.411	0.000	79.876	0.000	49.398	0.000	0.75
4	-	-	-945.809	0.012	9.512	0.0116	0.48

Source: Research Findings

Table (7): Test results of the initial assumptions in the portfolio sensitivity models

Test	Breusch-Pagan-Godfrey		Breusch-Godfrey		Jarque–Bera	
Model	T-statistic	Significance	T-statistic	Significance	T-statistic	Significance
Portfolio 1	1.0356	0.4041	0.3047	0.1413	0.1537	0.0739
Portfolio 2	0.3495	0.1603	0.9512	0.3785	0.2486	0.1169
Portfolio 3	1.0470	0.4075	0.9289	0.3715	0.2489	0.1170
Portfolio 4	0.6269	0.2691	0.8370	0.3419	0.1990	0.0947

Source: Research Findings

Table (8): Ranking of portfolios in hedging against inflation

Portfolio	Portfolio acronyms	Rank in hedging capability
1	PGPIC, EORC, NIORDC, TORC	1
2	TCI	2
3	MSC, Tappico, POGDC	3
4	IKCO, MMDIC	4

Source: Research Findings

5. Conclusion

In the present study, hedging against inflation was evaluated using the stocks of companies listed in Tehran Stock Exchange. Having formulated the research hypotheses, in order to measure them, the theoretical model of the study was presented based on Bampinas and Panagiotidis (2016). 18 companies from the group of companies active in Tehran Stock Exchange, which had at least 50% of the total value of the stock market on March 19, 2021 (the last trading day in 1399 AH), were selected as the target sample for the study and information about the research variables was collected through the Seo website. In the analysis of the research data by R software, a descriptive study of the research data was first conducted, and in testing the significance of the variables, the research regression model was evaluated. Jarque–Bera, Breusch-Pagan, and Breusch-Pagan-Godfrey tests were also employed to test the initial regression assumptions. The results of the data analysis showed that companies' stock prices respond differently to the consumer price index, and therefore it is possible to hedge against inflation by investing in these companies. The results also showed that companies differ in their ability to hedge against inflation, and that the degree to which stock price changes explain corporate portfolios varies with respect to inflation beta quantiles.

In order to answer the questions in this study, it can be said that the answer to the first question was positive. In fact, the use of the stock asset portfolio can perform well against inflation to maintain purchasing power and value of money. Regarding the answer to the second question, the answer was positive and different companies show different performance and response to inflation according to different financial specifications.

The results of the H1 suggest that controlling inflation risk and reducing its impact on the intrinsic value of investments can be done by investing in stocks with significant inflation beta. Rising inflation, because of its impact on asset devaluation, can prevent the net value of investments from declining if the investor's portfolio matches these changes. Thus, depending on the degree of dependence of the business activity or investments of public companies on the producer price index, it is possible to find a stock that

is exposed to a price increase in line with inflation and, in this way, compensate part of the devaluation of assets. Therefore, the results of this hypothesis were expected by the researcher. Reults are rather consistent with that of Heidari & Rafah Kahriz (2018), Rezazadeh (2016), Abu Nouri et al. (2013), Azizi et al. (2011), Boons et al. (2020), Farooq and Ahmad (2018), Antonakakis et al. (2017), and Tripathi & Kumar (2015), which confirmed the relationship between inflation and stock price changes.

The results of the second hypothesis also show the degree of different dependence of companies in different industries on inflation indicators. However, in this study, the consumer price index was used to measure inflation. Since the nature and extent of commodity needs of enterprises vary and, on the other hand, the impact of inflation on all commodities is not the same, it is expected that the ability of enterprises to hedge against inflation will vary. Hence, the results of this hypothesis are not surprising. The results of this hypothesis can be considered in line with the research findings of Boons et al. (2020).

Hence, according to the results of H1, investors in the capital market are recommended to identify stocks with the ability to hedge against inflation when composing the stock portfolio, thus they reduce the risk of devaluation of their capital in the stock portfolio. And according to the results of the second hypothesis of the study, it is suggested that the weighting of stocks in the investor's portfolio is based on their sensitivity to inflation risk and their ability to hedge against inflation.

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