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RESEARCH PAPER

The Predictability of Value Premiums in the Tehran Stock Exchange: Evidence Based on the Prior Returns of Value and Glamour Stocks

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Abstract

This paper investigates whether the prior returns of value and glamour stocks can predict future value premiums using stocks listed on the Tehran Stock Exchange. In the spirit of Eleswarapu and Reinganum (2004), we focus on the exclusive predictive power of prior returns of style portfolios. We form three sets of value and glamour portfolios based on three different definitions. While we find that value premiums are predictable in both in-sample and out-of-sample tests, this evidence is not the same when using prior returns for each style. Glamour stock returns positively predict future value premiums while value stock returns predict them with a negative coefficient. Thus, we show that the prior underperformance of current value stocks can be a good candidate for predicting value premiums. We also show that this evidence of predictability can be exploited in the form of a style rotation strategy and can beat the buy-and-hold strategy as well as the usual value investing strategies.

Keywords: Predictability, Style Timing, Value Premium, Value Investing.
JEL Classification: C53, G11, G17.

1. Introduction

For more than eighty years, the premium of value stocks over glamour stocks has been well documented in the literature (Fama and French, 1993, 2021; Graham et al., 1934; Lakonishok et al., 1994). We conduct an empirical study of value premium predictability using different definitions of value and glamour stocks. We show that value premiums are predictable in the Iranian stock market, and this predictability could be exploited to develop a rotation investment strategy between market, value, and glamour stocks.

Although the value premium is positive on average, this does not mean that value stocks always have higher returns than glamour stocks. A long-short strategy of value over glamour stocks (hereafter "value strategy") is subject to lots of fluctuations and has outperformed for years (Chan et al., 2000). Figure 1 illustrates the variations in the returns of value strategy over time, calculated under three different definitions of value and glamour stocks. In this figure, the 12-month return of value strategy has varied between -50% and 100% over the past 20 years, which is a substantial amount; So, in the short run, value investors could face some catastrophic returns. The first solution to manage this risk is style diversification. The risks could be diversified away by optimally combining different stock styles (Bender et al., 2010). The other strand in the literature is to tackle the variations of the value premiums, namely trying to predict them.

The predictability of stock returns is well documented and forms the basis of many market timing strategies (Bannigidadmath and Narayan, 2016; Cochrane, 2008; Haroon Rasheed et al., 2021; Welch and Goyal, 2008). It has been studied in the literature from two perspectives. In the first perspective, the source of predictability is market inefficiency. Long term reversal (De Bondt and Thaler, 1985) and momentum (Jegadeesh and Titman, 1993) are two well-known phenomena in the literature due to investors overreaction to short-term winners and long-term losers.

In the second view, predictability is not necessarily at odds with market efficiency, and instead, this view suggests that the risk premiums varies rationally over time according to the fluctuations of business cycles (Fama and French, 1989). Thus, during recessions investors demand higher expected returns because they are more risk averse and during booms, they are more willing to invest in risky assets and thus demand lower expected return.

In this regard, Bauer and Molenaar (2002) examine the predictability of value premiums for stocks in the S&P500 index. Following Pesaran and Timmermann (1995), they endogenize the choice of predictor variables. Model selection allows them to predict value premiums over time and to introduce a rotation strategy between value and glamour portfolios. Bauer et al. (2004) use an out-of-sample model selection procedure to test the predictability of value premiums in Japan when transaction costs are low; they confirm the predictability of the value premiums. Asness et al. (2000) consider two intuitive variables from the Gordon model: The value spread (the spread between the underlying multiples of value and glamour stocks) and the earnings growth spread (the spread between the earnings growth of value and glamour stocks). They find that these variables can predict the returns of value strategy (The extent to which value investing is attractive over time).

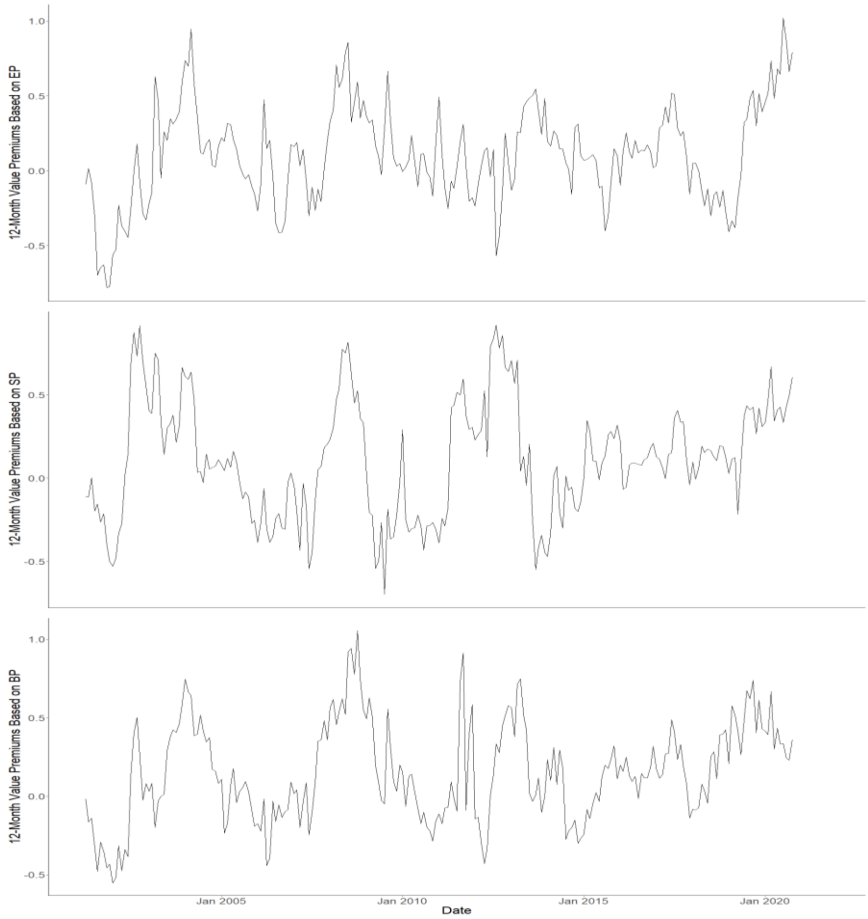

Figure 1. 12-Month Value Premiums Calculated under Three Different Definitions of Value and Glamour Stocks
Source: Research finding.

In the same vein, Eleswarapu and Reinganum (2004) find that glamour stock prior returns have unique predictive power, and we can use them to predict future aggregate stock market returns. However, they fail to find any predictive power for the prior returns of value stocks. In particular, they find that annual market excess returns are negatively correlated with prior 36-month glamour stock returns. This result contradicts the weak form of the Efficient Market Hypothesis that the current prices reveal all the information in the past prices and the impossibility of making supernormal profits using past returns. The weak form of the Efficient Market Hypothesis is well tested worldwide for different markets (Dias et al., 2020; Fattahi, 2010; Hamid et al., 2017).

We add to this debate by showing empirical evidence that market value premiums can be predicted using the past returns of glamour and value stocks in the opposite direction. Specifically, we find that the annual value premiums are positively predicted by the information exclusive to returns on the glamour stocks in the past 24-month period. However, the information exclusive to past returns on value stocks negatively predicts value premiums. We test whether the different behavior in the prior returns of value and glamour stocks could help predict future value premiums in the Tehran Stock Exchange and whether we can use this evidence of predictability to achieve higher performance in value investing. To this end, our empirical design includes four steps. First, we form value and glamour portfolios. We use three definitions to identify value and glamour stocks: 1- Book-to-price ratio 2- Earnings-to-price ratio and 3- Sales-to-price ratio.

Second, we examine in-sample predictability of value premiums by using past returns of value and glamour stocks and their difference as predictors. We test value premiums predictability using an overlapping window. The results show a significant relationship between value premiums and prior returns of value and glamour stocks.

Third, we also examine the out-of-sample predictability of value premiums using a wide range of evaluation measures. In the traditional predictability literature, Goyal and Welsh (2008) show that many predictors that exhibit significant in-sample predictability, lack significant out-of-sample predictability. Here we see that value premiums are also predictable out of sample.

Finally, we evaluate the economic significance of this predictability by proposing an investment rotation strategy. Despite the extensive evidence from the academic literature on the in-sample predictability of stock returns, the economic benefits of predictability are hard to detect in practice. The compelling statistical evidence of value premium predictability raises the question of whether a market timing strategy based on this evidence can improve the investment performance in the stock market. We find that implementing an investment strategy can generate superior returns than conventional buy-and-hold and value strategies.

The rest of the article is structured as follows: Section 2 presents the data and portfolio formation. Section 3 describes the empirical methodology. In section 4, the results will be discussed and the final section provides some concluding remarks.

2. Data and Portfolio Formation

To construct value and glamour portfolio returns, we use stocks listed on the TSE covering April 2001 to October 2021[1]. Returns are adjusted for corporate events such as stock split and dividend payments. Earnings-to-price ratios, sales-to-price ratios, book-to-price ratios, and market caps are calculated from relevant accounting and market data. We must use this data to calculate prior 24-month returns and subsequent annual returns. Therefore, the stock must trade in the month of calculation, 24 months before, and 12 months after, but not every month during

[1]. Individual historical daily data were downloaded from Bourseview Website.

the period. The risk-free rate (used to calculate Sharpe and Sortino ratios) is assumed to be the same as the interest rate of state-owned banks, which can be obtained from the website of the Central Bank of Iran.

We follow Eleswarapu and Reinganum (2004) and Lakonishok et al. (1994) to form each of our value measures using 3 ratios: 1. Earnings-to-price ratio, 2. Sales-to-price ratio, and 3. Book-to-price ratio. As of April 2001, stocks are ranked independently based on three ratios (EP, SP, and BP) and assigned to 5 portfolios. Stocks in the lowest quintiles are referred to as value stocks, and those in the highest are referred to as glamour stocks.

Table 1. Variable Definitions

Variable	**Description**
Ret_{Gla}	Return of the glamour portfolio, which is calculated value-weighted and equal-weighted.
Ret_{Val}	Return of the value portfolio, which is calculated value-weighted and equally-weighted.
Ret_{Mar}	Return of the market, which is calculated value-weighted and equally-weighted.
EP	Earnings-to-price ratio: Trailing twelve months earnings per share divided by current price.
SP	Sales-to-price ratio: Trailing twelve months revenue per share divided by current price.
BP	Book to price ratio: Last published balance sheet divided by current price.
VP	Value premium: The differential return between value and glamour portfolios in a future period.
PDR	Prior differential returns: The difference in returns between value and glamour portfolios in a prior period.
EXC_{Val}	Information exclusive to value Stocks Past Returns.
EXC_{Gla}	Information exclusive to glamour Stocks Past Returns.

To examine a primary analysis of the predictive power of past value and glamour stock returns for future value premiums we also calculate prior portfolio returns over 12, 24 and 36 months. For example, for the 24-month horizon at the end of each month t and for each portfolio, we calculate portfolio returns over the past 24 months as $Ret_{-24} = \ln\left(\frac{v_t}{v_{t-24}}\right)$ and over the future 12 months $Ret_{12} = \ln\left(\frac{v_{t+12}}{v_t}\right)$ where v_t is the value of the the portfolio at time t.

We calculate value-weighted and equal-weighted returns for value portfolios (Ret_{Val}) and glamour portfolios (Ret_{Gla}). We then, calculate “value premiums” as the difference between the following 12-month returns of value and glamour portfolios and “prior differential returns” as the difference between prior-24-month returns of value and glamour portfolios.

The descriptive statistics for value and glamour portfolios under different definitions are reported in Table 2. Annual returns and value premiums are calculated for each month on the overlapping basis. As it shown in panel A, the annual average returns of value-weighted (equally-weighted) value and glamour portfolios formed on EP ratio are 40.3% (45%) and 29.5% (36.3%), respectively. it shows that we have 10.8% (8.7%) annual value premium on average. Consistent with Eleswarapu and Reinganum (2004), the value portfolio underperforms the glamour portfolio by an average of 29% (18.8%) over the prior two years. The results under other definitions of value and glamour portfolios are also consistent with the results in Panel A.

Table 3 reports the correlations between the subsequent 12-month value premiums and the past returns of value and glamour stocks. The past returns of glamour stocks are positively correlated with the future value premiums. However, the correlation between the past returns of value stocks and value premiums of the following year is weaker and even negative (especially in the case of equally weighted portfolios). For further computations, we choose to use the returns of the prior 24 months, but the results from other periods are roughly the same.

Table 2. Descriptive Statistics

	Value weighted				Equally weighted			
Panel A: Value and glamour portfolios formed using earnings-to-price ratio								
	Mean		SD		Mean		SD	
	Value	Glamour	Value	Glamour	Value	Glamour	Value	Glamour
Ret_{12}	0.403	0.295	0.372	0.45	0.45	0.363	0.39	0.440
Ret_{-24}	0.8	1.09	0.562	0.76	0.749	0.936	0.59	0.676
VP_{12}	0.108		0.324		0.087		0.236	
PDR_{-24}	-0.29		0.522		-0.188		0.382	
Panel B: Value and glamour portfolios formed using sales-to-price ratio								
	Mean		SD		Mean		SD	
	Value	Glamour	Value	Glamour	Value	Glamour	Value	Glamour
Ret_{12}	0.404	0.295	0.493	0.372	0.506	0.345	0.429	0.408
Ret_{-24}	0.638	1.037	0.684	0.737	0.56	0.997	0.627	0.679
VP_{12}	0.109		0.348		0.16		0.226	
PDR_{-24}	-0.398		0.497		-0.437		0.36	
Panel C: Value and glamour portfolios formed using book-to-price ratio								
	Mean		SD		Mean		SD	
	Value	Glamour	Value	Glamour	Value	Glamour	Value	Glamour
Ret_{12}	0.447	0.295	0.43	0.359	0.465	0.341	0.43	0.402
Ret_{-24}	0.434	1.183	0.631	0.733	0.443	1.162	0.602	0.669
VP_{12}	0.152		0.314		0.124		0.25	
PDR_{-24}	-0.748		0.436		-0.719		0.326	

Source: Research finding.

Table 3. Correlations for 12-Month Value Premiums and 24-Month Prior Returns of Value and Glamour Stocks

	Value portfolios prior returns			Glamour portfolios prior returns		
Panel A: Value-weighted returns						
VP_{12}	$Ret_{Val_{-12}}$	$Ret_{Val_{-24}}$	$Ret_{Val_{-36}}$	$Ret_{Gla_{-12}}$	$Ret_{Gla_{-24}}$	$Ret_{Gla_{-36}}$
Based on portfolios sorted on EP	0.295	0.258	0.251	0.386	0.528	0.389
Based on portfolios sorted on SP	0.065	-0.030	0.008	0.321	0.414	0.390
Based on portfolios sorted on BP	0.167	0.148	0.118	0.290	0.311	0.296
Panel B: Equally-weighted returns						
VP_{12}	$Ret_{Val_{-12}}$	$Ret_{Val_{-24}}$	$Ret_{Val_{-36}}$	$Ret_{Gla_{-12}}$	$Ret_{Gla_{-24}}$	$Ret_{Gla_{-36}}$
Based on portfolios sorted on EP	0.039	-0.004	0.026	0.138	0.238	0.170
Based on portfolios sorted on SP	-0.072	-0.180	-0.131	0.019	0.052	0.138
Based on portfolios sorted on BP	0.067	-0.051	-0.055	0.187	0.128	0.134

Source: Research finding.

3. Empirical Methodology

3.1 In-sample Predictive Regressions

In this study, we compare the information content of value stocks with that of glamour stocks (in terms of prior 24-month returns) to predict the future value premium. In particular, to examine the predictability of value premiums, we begin by estimating these regressions:

$$VP_{12} = \alpha_{Val} + \beta_{val} . Ret_{Val_{-24}} + \varepsilon_{Val} \quad (1)$$

$$VP_{12} = \alpha_{Gla} + \beta_{Gla} . Ret_{Gla_{-24}} + \varepsilon_{Gla} \quad (2)$$

We also define two additional variables to test whether the exclusive information in the prior returns of value and glamour stocks can predict value premiums. $EXC_{Val_{24}}$ is the residual from the regression of prior 24-month returns of value stocks on the corresponding market returns. This variable reflects the exclusive information of the prior returns of value stocks as we remove the market information. The variable $EXC_{Gla_{24}}$, which captures exclusive information of the past returns of glamour stocks is defined in a similar way.

$$EXC_{Val_{-24}} = Ret_{Val_{-24}} - \left(\widehat{Alpha}_{Val} + \widehat{Beta}_{Val} . Ret_{Mar_{-24}}\right) \quad (3)$$

$$EXC_{Gla_{-24}} = Ret_{Gla_{-24}} - (\widehat{Alpha}_{Gla} + \widehat{Beta}_{Gla} . Ret_{Mar_{-24}}) \quad (4)$$

By defining these variables, we want to examine whether there is any particular predictive power in the past returns of value and glamour stocks, so we use $EXC_{Val_{24}}$ and $EXC_{Gla_{24}}$ as separate regressors in a predictive regression.

Finally, we examine the predictive ability of Prior differential returns by estimating the following regression. By Prior differential returns (PDR_{-24}) we mean the differential returns between value and glamour stocks in the prior two years.

$$VP_{12} = \alpha_{Val} + \beta_{val} . PDR_{-24} + \varepsilon \quad (5)$$

There is an econometric issue in the estimation of described regressions as the portfolios are formed monthly, and the dependent variable (VP_{12}) is estimated using overlapping returns window. Following other studies such as Bacchetta, Mertens, and Van Wincoop (2009) and Baker, Greenwood, and Wurgler (2003), we use the Newey-West standard errors to account for the overlapping windows in the forecast interval errors with a lag of 13 months.

3.1 Out-of-sample Predictability Evaluation Metrics

To investigate the out-of-sample predictability of value premiums, we compare the accuracy of the predictive regression predictions to the historical mean. We use the following 4 metrics to evaluate the out-of-sample forecasts:

Relative Root Mean Squared Error (RRMSE):

RRMSE is the root mean squared errors of the predictive regression divided by the root mean squared errors of the historical mean model.

$$RRMSE = \frac{\sqrt{\overline{(VP_t - \widehat{VP}_t)^2}}}{\sqrt{\overline{(VP_t - \overline{VP_t})^2}}} \qquad (6)$$

where $\widehat{VP}_t$ is the fitted value from the predictive regression and $\overline{VP_t}$ is the historical mean value of the value premium over the period of t_0 to $t - 12$.

Relative Mean Absolute Error (RMAE):

RMAE is the mean absolute errors of the predictive regression divided by the mean absolute errors of the historical mean model.

$$RMAE = \frac{\overline{|VP_t - \widehat{VP}_t|}}{\overline{|VP_t - \overline{VP_t}|}} \qquad (7)$$

Out of Sample R2:

Campbell and Thompson (2008) defined out-of-sample R^2 that can be compared to the in-sample R^2.

Out-of-Sample (8)

$$R^2 = 1 - \frac{\sum_{t=1}^{T}(VP_t - \widehat{VP}_t)^2}{\sum_{t=1}^{T}(VP_t - \overline{VP_t})^2}$$

Mincer-Zarnowitz R^2:

Following many works on predictability such as Narayan and Bannigidadmath (2015), we calculate the Mincer and Zarnowitz (1969) R^2 as another measure to evaluate out-of-sample predictability. Mincer-Zornowitz R^2 is the adjusted R^2 from the following regression:

$$VP_t = a + b.\ \widehat{VP}_t + \varepsilon_t \qquad (9)$$

4. Empirical Results

4.1 In-sample Predictability Tests

The results of the in-sample regressions for predicting value premiums by the three sets of value and glamour portfolios using different definitions are reported in tables 4, 5, and 6. As shown for the value-weighted portfolios in panel A of Table3, the predictive power of past 24-month returns of value stocks is not significant, as indicated by a p-value of 0.324 (Regression1), but the predictive ability of the past 24-month returns of glamour stocks is positive and strongly significant (Regression2). The coefficient is 0.221, and the predictive regression R^2 is considerably large as 27.5 percent.

The results are confirmed in Regression (3), which includes the past returns of glamour and value portfolios as predictors. There is no improvement in the adjusted R^2 in Regression(3) compared to Regression (2). The coefficient on past glamour returns is positive and significant, but the coefficient on past value portfolio returns is negative and not significant. Interestingly, when modeling the value premiums as a function of exclusive information in the prior returns of value and glamour stocks (as in Regressions 4 and 5), the slope coefficient for the exclusive information of value stocks becomes significantly negative at the 10% level. Not surprisingly, this coefficient is also positive for the glamour portfolio.

In regression 6, we also model value premiums as a function of past differential returns between value and glamour stocks (through a variable called prior differential returns (PDR)) in Regression (6). The p-value of the coefficients in this regression for value-weighted portfolios is 0.005 and the adjusted R-squared is 19.6%. This evidence suggests that the predictive ability of value and glamour stocks is different. Past returns of glamour portfolio could help in predicting value premiums. The expected value premium is lower in the next year when glamour stocks have experienced low returns in the past two years. The exclusive information in the prior returns of value portfolio predicts the market value premiums in the opposite direction and is weaker.

Panel B in Table 1 is based on equal-weighted portfolios. The results in panel B are generally consistent with those in panel A. Again, the glamour past returns can predict future value premiums, while value portfolio past returns do not show any predictive ability (Regressions 1 and 2). In Regression (3), the result is even stronger, and the coefficient on value portfolio past returns is significant at the 5% level as the coefficient on glamour portfolio past returns. The slope coefficient of the 4^{th} regression is also negatively significant at the 10% level, while the slope coefficient of the 5^{th} regression is positive and nearly significant at the 10% level. The adjusted R-squared of regression 6, 14.3%, is similar to modeling future value premiums as a function of past returns on both glamour and value stocks. This evidence shows that if we define value and glamour stocks based on their earnings-to-price ratio, the underperformance of value stocks relative to glamour stocks can predict the market’s future value premium, regardless of whether returns are calculated value-weighted or equal-weighted.

In Tables 5 and 6, the portfolios of value and glamour stocks are formed using the sales-to-price ratio and book-to-price ratio. The results are qualitatively and quantitatively the same as in Table 4. The predictive power of the prior 24-month returns of value and glamour stocks is particularly pronounced and in the opposite direction. Thus, the prior underperformance of value stocks would be a good candidate for predicting the market value premium.

Table 4. In-sample Value Premium Predictability Tests Using Value and Glamour Portfolios Sorted on Earnings-To-Price Ratio

	Panel A: In-sample tests for value-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.045 (0.647)	-0.069 (0.293)	-0.047 (0.525)	0.151 (0.020)	0.156 (0.011)	0.087 (0.067)
$Ret_{Val_{-24}}$	0.147 (0.324)		-0.089 (0.364)			
$Ret_{Gla_{-24}}$		0.221 (0.000)	0.264 (0.000)			
$EXC_{Val_{-24}}$				-0.217 (0.071)		
$EXC_{Gla_{-24}}$					0.241 (0.107)	
PDR_{-24}						-0.247 (0.005)
Adj R^2	6.2%	27.5%	28.6%	4.7%	5.1%	19.6%
	Panel B: In-sample tests for equal-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.132 (0.036)	0.067 (0.146)	0.083 (0.088)	0.129 (0.000)	0.132 (0.000)	0.096 (0.004)
$Ret_{Val_{-24}}$	-0.002 (0.985)		-0.172 (0.037)			
$Ret_{Gla_{-24}}$		0.073 (0.099)	0.192 (0.020)			
$EXC_{Val_{-24}}$				-0.336 (0.062)		
$EXC_{Gla_{-24}}$					0.297 (0.008)	
PDR_{-24}						-0.187 (0.018)
Adj R^2	-0.5%	5.2%	14.2%	9.3%	13.2%	14.3%

Source: Research finding.

Table 5. In-Sample Value Premium Predictability Tests Using Value and Glamour Portfolios Sorted on Sales-To-Price Ratio

	Panel A: In-sample tests for value-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.118	-0.090	-0.114	0.105	0.117	-0.035
	(0.258)	(0.358)	(0.167)	(0.176)	(0.135)	(0.555)
$Ret_{Val_{-24}}$	-0.015		-0.323			
	(0.915)		(0.000)			
$Ret_{Gla_{-24}}$		0.21	0.429			
		(0.000)	(0.000)			
$EXC_{Val_{-24}}$				-0.383		
				(0.000)		
$EXC_{Gla_{-24}}$					0.471	
					(0.039)	
PDR_{-24}						-0.381
						(0.000)
Adj R^2	-0.4%	16.8%	36.4%	21.4%	7.5%	33.0%
	Panel B: In-sample tests for equal-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.221	0.176	0.135	0.188	0.192	0.110
	(0.005)	(0.035)	(0.087)	(0.000)	(0.000)	(0.037)
$Ret_{Val_{-24}}$	-0.061		-0.218			
	(0.569)		(0.014)			
$Ret_{Gla_{-24}}$		0.016	0.176			
		(0.769)	(0.057)			
$EXC_{Val_{-24}}$				-0.423		
				(0.019)		
$EXC_{Gla_{-24}}$					0.264	
					(0.011)	
PDR_{-24}						-0.187
						(0.019)
Adj R^2	2.8%	-0.2%	13.6%	14.0%	9.2%	12.5%

Source: Research finding.

Table 6. In-Sample Value Premium Predictability Tests Using Value and Glamour Portfolios Sorted on Book-To-Price Ratio

	Panel A: In-sample tests for value-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.160 (0.017)	0.034 (0.703)	0.001 (0.988)	0.186 (0.004)	0.191 (0.002)	0.051 (0.564)
Ret_{Val-24}	0.079 (0.200)		-0.100 (0.197)			
Ret_{Gla-24}		0.14 (0.011)	0.202 (0.002)			
EXC_{Val-24}				-0.090 (0.410)		
EXC_{Gla-24}					0.235 (0.177)	
PDR_{-24}						-0.185 (0.006)
Adj R^2	1.7%	9.3%	10.4%	0.9%	1.9%	7.3%
	Panel B: In-sample tests for equal-weighted value and glamour portfolios					
	Dependent variable: VP_{12}					
Independent variable	1	2	3	4	5	6
Intercept	0.170 (0.051)	0.110 (0.298)	0.013 (0.912)	0.160 (0.017)	0.161 (0.012)	0.007 (0.943)
Ret_{Val-24}	-0.021 (0.692)		-0.227 (0.053)			
Ret_{Gla-24}		0.047 (0.426)	0.213 (0.080)			
EXC_{Val-24}				-0.236 (0.344)		
EXC_{Gla-24}					0.455 (0.002)	
PDR_{-24}						-0.214 (0.072)
Adj R^2	-0.2%	1.2%	9.3%	2.6%	15.0%	9.6%

Source: Research finding.

Table 7. Regressions of Long-Horizon Cumulative Overlapping Value Premium on Prior Differential Returns

	Value Weighted				Equally Weighted			
	Panel A: Value and glamour portfolios formed using earnings-to-price ratio							
Independent variable	VP_6	VP_{12}	VP_{24}	VP_{36}	VP_6	VP_{12}	VP_{24}	VP_{36}
Intercept	0.068	0.087	0.131	0.204	0.076	0.097	0.159	0.223
	(0.028)	(0.067)	(0.025)	(0.000)	(0.001)	(0.004)	(0.001)	(0.000)
PDR_{-24}	-0.128	-0.247	0.019	-0.410	-0.068	-0.187	-0.300	-0.340
	(0.053)	(0.005)	(0.000)	(0.000)	(0.372)	(0.018)	(0.000)	(0.000)
$Adj\ R^2$	9.3%	19.6%	32.7%	34.3%	3.3%	14.3%	22.2%	22.5%
	Panel B: Value and glamour portfolios formed using sales-to-price ratio							
Independent variable	VP_6	VP_{12}	VP_{24}	VP_{36}	VP_6	VP_{12}	VP_{24}	VP_{36}
Intercept	-0.035	-0.035	-0.019	-0.007	0.079	0.110	0.155	0.250
	(0.063)	(0.555)	(0.835)	(0.920)	(0.009)	(0.037)	(0.078)	(0.000)
PDR_{-24}	-0.232	-0.381	-0.443	-0.377	-0.049	-0.187	-0.346	-0.321
	(0.000)	(0.000)	(0.000)	(0.000)	(0.422)	(0.019)	(0.000)	(0.000)
$Adj\ R^2$	22.0%	33.0%	30.5%	27.6%	1.2%	12.5%	25.5%	24.0%
	Panel C: Value and glamour portfolios formed using book-to-price ratio							
Independent variable	VP_6	VP_{12}	VP_{24}	VP_{36}	VP_6	VP_{12}	VP_{24}	VP_{36}
Intercept	0.027	0.051	-0.057	-0.145	0.040	0.007	-0.054	0.064
	(0.652)	(0.564)	(0.628)	(0.416)	(0.520)	(0.944)	(0.653)	(0.479)
PDR_{-24}	-0.087	-0.185	-0.462	-0.548	-0.060	-0.214	-0.437	-0.367
	(0.146)	(0.006)	(0.000)	(0.000)	(0.425)	(0.072)	(0.001)	(0.000)
$Adj\ R^2$	2.4%	7.3%	27.5%	35.3%	1.2%	9.6%	24.5%	24.0%

Source: Research finding.

Table 8. Out-of-sample Results

	Value-weighted				**Equal-weighted**			
	RRMSE	**RMAE**	**Out-of-sample R^2**	**Mincer Zarnowitz's R^2**	**RRMSE**	**RMAE**	**Out-of-sample R^2**	**Mincer Zarnowitz's R^2**
Sorted by EP	0.838	0.848	0.298	0.379	0.932	0.997	0.131	0.321
Sorted by SP	0.866	0.854	0.25	0.403	0.863	0.904	0.256	0.083
Sorted by BP	0.953	0.974	0.093	0.005	0.918	0.993	0.157	-0.005

Source: Research finding.

In Table 7, we perform the same predictive regressions but use a different time horizon to estimate the future value premium. In this table, we regress the future 6-month, 12-month, 24-month, and 36-month value premiums on the prior 24-month differential returns. The slope coefficient is significant (at least at a 10 percent level) in the predictive regressions predicting value premiums calculated over periods longer than one year. As shown in this table, prior value stocks underperformance captures as much as 20-30% of the variations in the next two or three-year value premiums.

4.1 Out-of-sample Forecasts

Do significant in-sample predictability indicate reliable out-of-sample predictability? The answer is clearly no, and this evidence is often interpreted as spurious predictability. Kilian and Inoue (2002) argue that out-of-sample results are not as strong as in-sample results because of splitting the entire sample. However, one often wants to know whether or not the in-sample high R^2 and the significant coefficient also hold out-of-sample. In this section, we investigate the out-of-sample predictability of value premiums using prior differential return as predictor and compare the accuracy of the predictive regression predictions to the historical mean.

4.1.1 Out-of-sample Predictability Test Results

We test the out-of-sample predictability of value premiums using a rolling window. We estimate the predictive regression model over the in-sample period of 100 months (t_0 to $t_0 + 100$). In this regression, we use the future annual value premium of time $t_0 + 100$ and therefore we use some price information from time $t_0 + 112$. So, we should use this regression to forecast the annual value premium at time $t_0 + 113$. Then, we re-estimate the in-sample predictive regression over the period from $t_0 + 1$ to $t_0 + 101$ and forecast the value premium of $t_0 + 114$. In this way, we use the information available in each month to predict the value premium for the next year. This rolling regression continues until all the data are exhausted.

Our data begins in April 2001 and ends in October 2021. Therefore, we have the Prior differential returns data from April 2003. We set our out-of-sample period 100 months begins in 2012:7 and ends in 2020:10. Therefore, we cover about 50% of our available data as out of sample. Table 8 presents the results from evaluating the out-of-sample predictions by different metrics.

The related root mean squared errors of predictions range from 0.83 to 0.96 for different definitions of value and glamour stocks and regardless of whether the portfolios are value-weighted or equal-weighted. This means that for each definition of value and glamour stocks, the forecast from prior differential returns regressions is better than the historical mean model. This result is confirmed by relative root mean absolute errors and also Out-of-Sample R^2. The relative root mean absolute errors is never greater than one and the Out-of-Sample R^2 is always greater than 9%. The Mincer-Zarnowitz's R^2s show that the predictive model provides poor forecasts of the value premium for the book-to-price-based definition of value and glamour stocks. However, for two other definitions, the predictive model provides good out-of-sample results.

4.2 Style Timing Results

The evidence described in the previous sections that value premiums are predictable to some extent raises the question of whether this level of predictability can be exploited to realize superior performance than a buy-and-hold strategy. This section examines whether the cumulative return, Sharpe ratio, and Sortino ratio of a simple rotation strategy outperform those of the market and value portfolios.

The result is reported in table 9 for a rotation strategy that switches between the value portfolio, the glamour portfolio, and the market portfolio. The investor can also invest leveraged in the value (or glamour) portfolio if the predicted value premium is too high (or too low). We assume the she can borrow 20% of her wealth as a loan from the broker at a certain interest rate, which is the same as the interest rate of the state-owned banks.

The proposed investment strategy is simple: at the end of December and June of each year, we predict the value premium for the following year; if the expected value premium exceeds 10% (20%), we invest in the value portfolio (with leverage). Similarly, if the predicted value premium succeeds -10% (-20%), we invest in the glamour portfolio (with leverage). Otherwise, we invest in the market portfolio. Six months later, the entire portfolio is rebalanced. Investment decisions were made taking into account the 1.5% transaction cost (except in the value-weighted market portfolio) and the new projected value premium. The out-of-sample performance period ranges from 2012:7 to 2020:10, as we need enough out-of-sample data. Not surprisingly, given the high predicted value premium, we should invest most of the time in value stocks rather than glamour stocks in this rotation strategy.

Table 9 shows the result of this strategy in six sections, each with different definitions of value and glamour stocks and different portfolio weights. Regardless of the definition and method of weighting, the cumulative return of the rotation strategy is greater than the cumulative return of the market. This is also true for the annual Sharpe Ratio and Sortino Ratio. In calculating these ratios as well as the cumulative returns, we calculate the 6-month returns as $Ret_6 = \frac{P_{t+6}}{P_t} - 1$.

As indicated in Table 10, the best performance was obtained when we use sales-to-price ratio to form value and glamour portfolios. Assuming initial assets of 1 Rial at 2012:7, an investor would earn a net gain of 32.1 Rials if she invested in the market value-weighted portfolio. If she invested in the value and glamour portfolios, her wealth would reach 28.9 and 8.8 Rials, respectively. However, by investing in the rotation strategy, she can achieve a higher cumulative return, reaching 47.3 Rials. The annual Sharpe ratio for the market portfolio is 0.496, and for the value portfolio, the glamour portfolio and the rotation strategy it is 0.509, 0.344 and 0.518, respectively. The result is even better for the Sortino ratio. The annual Sortino ratio for the Rotation strategy is 1.256 that is 1.229 for the market portfolio, 1.02 for the Value portfolio and 0.676 for the glamour portfolio.

Table 9. Performance of the Investment Strategy

	Value-weighted			Equal-weighted		
	1 Rial invested at 2012:7	Annual Sharpe ratio	Annual Sortino ratio	1 Rial invested at 2012:7	Annual Sharpe ratio	Annual Sortino ratio
Market	33.1	0.496	1.229	105.4	0.741	1.396
Value portfolio (formed on EP)	56	0.552	1.407	153.6	0.728	1.586
Glamour portfolio (formed on EP)	9.3	0.375	0.694	45.3	0.613	1.158
Rotation strategy (formed on EP)	59.5	0.515	1.404	166.5	0.742	1.59
Value Portfolio (formed on SP)	28.9	0.509	1.02	295.9	0.851	1.635
Glamour portfolio (formed on SP)	8.8	0.344	0.676	32	0.585	1.09
Rotation strategy (formed on SP)	47.3	0.518	1.256	474.3	0.846	1.658
Value portfolio (formed on BP)	55.5	0.538	1.274	192.7	0.741	1.527
Glamour portfolio (formed on BP)	7.9	0.327	0.603	27.5	0.546	1.058
Rotation strategy (formed on BP)	70.9	0.569	1.345	207.8	0.748	1.522

Source: Research finding.

Table 10. Holding Percentage over Time in the Rotation Strategy

	Leveraged value	Value	Market	Glamour	Leveraged glamour
Value-weighted Rotation Strategy (based on EP)	24%	41%	35%	0	0
Equally-weighted Rotation Strategy (based on EP)	0	94%	6%	0	0
Value-weighted Rotation Strategy (based on SP)	18%	24%	24%	18%	18%
Equally-weighted Rotation Strategy (based on SP)	35%	59%	6%	0	0
Value-weighted Rotation Strategy (based on BP)	24%	53%	24%	0	0
Equally-weighted Rotation Strategy (based on BP)	18%	65%	18%	0	0

Source: Research finding.

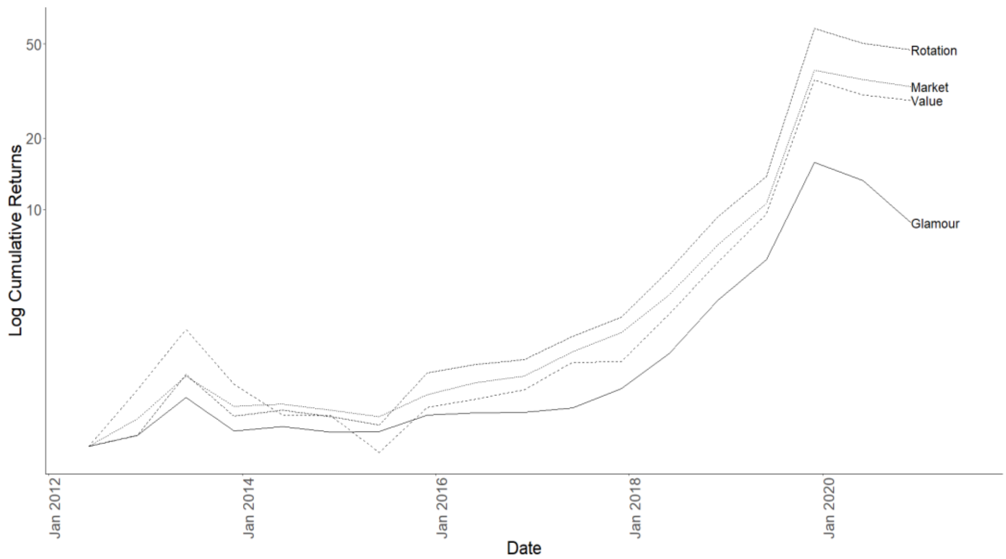

Figure 2. Cumulative Returns for Value-Weighted Portfolios Formed on Sales to Price Ratio
Source: Research finding.

Figure 2 graphically illustrates a complete perspective of the cumulative wealth level for value portfolios, sorted by sales-to-price ratio. The results in the other sections of Table 9 are consistent with the results for value-weighted portfolios formed by sales-to-price ratio. However, due to the smaller number of rotations, the results are not as strong as in the described section.

5. Conclusion

If it is argued that value premiums are predictable by prior returns of value and glamour stocks, one instantly asks why value premiums are predictable. The first answer attributes the existing evidence for the excess returns of value stocks relative to glamour stocks to excessive fundamental risks (Fama & French, 1993; Kirby, 2019; Lettau & Ludvigson, 2001; Qadan & Jacob, 2022) and time-variation of risk aversion (or appetite for risk) over the business cycles. The second answer offers a mispricing procedure and a behavioral explanation for value premiums (Ahmad & Oriani, 2022): Most investors overreact to glamour stocks (which have performed well in the past) and make them overpriced. Similarly, the out-of-favor value stocks become underpriced because of their prior poor performance. If this second explanation contains some truth, it seems reasonable to guess that the prior returns of value and glamour stocks (that determine the overreactions and under-reactions of investors) should contain some information that can be used to predict value premiums.

Given this explanation, we examine the predictability of value premiums using prior returns of value stocks, glamour stocks, and prior differential returns between value and glamour stocks. We find that the relationship between annual value premiums and past stock returns is different for value and glamour stocks. Specifically, we find that future annual value premiums are positively predicted by past 24-month returns of glamour stocks and negatively predicted by past 24-month returns of value stocks (at least for prior returns of value stocks orthogonalized by the corresponding market returns, i.e., information exclusive to value stocks). Thus, we introduce the prior differential returns between value and glamour stocks as a candidate for predicting the future value premium. Our results suggest that the predictability of value premiums is due to information exclusive to value and glamour stocks separately. While our results do not contradict a rational model, they seem consistent with some implications of behavioral models: Value stocks fall out of favor, and glamour stocks are periodically overvalued.

Our evidence, that the risk premiums are related to the prior performance of glamour stocks may also be consistent with the empirical results of Eleswarapu and Reinganum (2004). Relying on the idea of behavioral models in which overconfident and trend-chasing investors affect prices, they found a predictive power in the prior returns of glamour stocks. In contrast, they did not find any predictive power in the prior returns of value stocks and aggregate stock market returns. Furthermore, similar to Asness et al. (2000), we find evidence that suggests value premiums are predictable. While we use the differential returns between value and glamour stocks as the predictor, they use value spread and earnings growth spread.

We found that this in-sample predictability also holds out-of-sample by up to 30% out of sample R^2. Therefore, we construct a style-timing strategy that uses the differential returns between value and glamour stocks to predict future value premiums and introduce a simple rotation strategy. In the empirical section, we observed that the performance of such a style timing strategy could beat the market. Our results are similar to those of Bauer and Molenaar (2002) and Bauer et al. (2004), which show that the style timing strategy between value and glamour stocks can improve the performance of the value investing strategy.

Although the performance of value stocks is much better than glamour stocks in the long run, this does not mean that value stocks always have higher returns than glamour stocks. The results of this paper show that Iranian asset managers (especially value investors) can predict value premiums using the past returns of value and glamour stocks and improve their performance by a rotation strategy between these two styles. If the "current" value portfolio does not have performed much worse than the current glamour portfolio in the past, value investing would not be a good idea.

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