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The Behavior of Value and Growth Firms: Evidence from The Tehran Stock Exchange

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ABSTRACT

Recent studies show that the risk profile of U.S. value firms deteriorate significantly during economic downturns while growth firms show much less sensitivity under similar conditions. It is unclear whether value and growth firms behave similarly in other financial markets, particularly those representing emerging economies where growth firms are under-represented and typically unable to attract capital at favorable terms. In this paper, we investigate the risk dynamics of value and growth firms in the Tehran Stock Exchange (TSE) over multiple periods of stable and adverse economic conditions during the 1999 -2021 period. We find that during economic downturns, the risk profile of value firms deteriorates more substantially than that of growth firms in the financial market of Iran. More importantly, such differences are not dependent on the choice of the equity return model. Value firms have also delivered lower operating profits and maintained a higher degree of operating leverage than those of growth firms during both stable and adverse economic conditions. Overall, these results provide additional and more systemic support for the differential behavior of value and growth firms initially documented by earlier studies using U.S. data. The differential risk and return dynamics of value and growth firms in the Iranian financial market have important policy implications for economic development in other emerging economies exposed to dramatic social, economic, and geopolitical changes.

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1. Introduction

The well-known Fama-French (1992, 1993) three-factor equity return model underlies the observation that stocks with small market capitalization and high book to price ratios have often offered higher returns than those predicted by the traditional Capital Asset Pricing Model (CAPM) (Banz, 1981, Bhandari, 1988, Lakonishok, Shleifer and Vishny, 1994, and Fama-French, 1997, 2007).[1] The higher returns appear to be related to two additional risk factors capturing size and value premia. In spite of the model's overwhelming empirical support, researchers and portfolio managers have long struggled with explaining the factors underlying the observed value and size premia.[2] Hahn and Lee (2006) examined whether the size and book-to-market factors proxy for the risks associated with business cycle fluctuations. They found that changes in default spread and changes in term spread capture the systematic differences in average returns along the size and book-to-market measurements. They concluded that the size and value premia are compensation for higher exposure to the risks related to changing credit market conditions and interest rates. A growing literature on the financial and operating fundamentals of value and growth firms also contend that value firms offer higher returns as compensation for the higher risk of their assets in place, which are costly to scale down during economic downturns (Zhang, 2005 and Cooper, 2006). Hence, value premium may be attributable to adjustment costs resulting from investment irreversibility which may be difficult to recover by value firms during economic shocks. Petkova and Zhang (2005) and Choi (2013) examined the financial and operating fundamentals of U.S. value firms during stable and adverse economic conditions. Their results show that, during economic downturns, the asset betas and leverage of value firms increase, which lead to a sharp rise in equity betas. On the other hand, asset betas of growth firms are much less sensitive to economic conditions. This basic result supports the conventional risk-based argument for the higher observed returns on value portfolios relative to growth ones, at least in the adverse states of the world. Studies by Ozdagli (2012) and Cao (2015) show that the observed value premium is driven by the financial leverage differences between value and growth firms, partially neutralized by adjustment costs which represent the degree of investment irreversibility. Ferguson, Lotfaliei, and Trombley (2019) provide further context on the role of financial leverage in explaining equity returns. They note that conventional asset pricing tests systematically underestimate security betas because equity is a levered and risky position, and an equity-based index reflects this risk. Their results show that the Fama-French factors disappear when the true underlying market index is used. Jalilvand and Kim (2013) argue that the risk dynamics of value and growth firms may be explained by fundamental differences between value firms' innovation and financial strategies with those of growth firms. Their results show that value firms tend to entrench during adverse economic environments through accumulating cash and liquid assets to create a buffer against the risk of financial distress. On the other hand, growth firms are flexible to rebalance their investments and financial strategies in favor of new growth opportunities.

Focusing on international data, Asal and Jalilvand (2015) explored the sensitivity of value and growth firms to alternative definitions of equity market conditions across different industries in the Euro area. Their results show that the pattern, sign, size, and significance of value premium vary widely across different industries and market conditions. The value premium effect is positive and significant in industries such as Basic Materials and Financials and negative and relatively insignificant for Consumer Goods, Consumer Services, and Industrials. Further, the overall magnitude of the value premium effect is considerably larger in the bear market as was also observed for U.S. firms by Petkova and Zhang (2005) and Choi (2013).[3] More recently, Moinak and Balakrishna (2020) find that there are strong size and value effects existing in the return pattern of stocks in the Indian

1. According to a report by Dow Jones Market Data Analysis (2020), value stocks have actually lagged behind shares of fast-growing companies throughout much of the past decade. On the other hand, in 2020 alone, the Russell 1000 Value Index has been up 11% while the Russell 1000 Growth Index has edged down 0.2%.

2. Black (1993) argued that the relationship between stock returns, size and value premia was a result of data mining. A similar notion was advanced by Kothari, Shanken, and Sloan (1995) who contended that the significant book-to-market relation is due to survivorship bias.

3. Other studies have provided further support for the significance of size and value premia as well as exchange rate risk for security markets in Australia, Hong Kong, Italy, Japan, Korea, Malaysia, and the Philippines (see, for example, Chan, Hamao, and Lakonishok (1991), Halliwell et al. (1999), and Drew and Veeraraghavan (2003)).

Stock Exchange. The relationship between leverage and stock returns is, however, complex showing a significant leverage premium in small and medium size, and an insignificant one for large size stocks. On the other hand, Zia al haq, et al (2020) find significant and direct influence of operating leverage on stock returns, the book to market ratio, and systematic risk for firms operating in the Pakistan Stock Exchange. They conclude that investment activity risk appears to be a major factor that determines value premium.

More recently, Klemola (2020) show that that stocks that are considered to be more sensitive to fluctuations in investor sentiment, like financially distressed (proxied by high book-to-market ratio) stocks, should also be more affected by unexpected changes in the sentiment. Using a consumption-based asset-pricing model with hyperbolic discounting -leading to dynamically inconsistent time preferences, Hens and Schindler (2020) further show that the value premium increases non- linearly with the degree of discounting and thus affects the cross section of returns.

Using Capital Asset Pricing Model (CAPM), earlier studies on firms listed in the Tehran Stock Exchange (TSE) also find significant differences between value and growth firms' conditional asset and levered betas under adverse market conditions (see, for example, Rostami Noroozabad, Jalilvand, Fallashamss, and Saeedi (2019, 2020), Asadi and Eslami Bidgoli, 2014; Eslami Bidgoli, Fallahpour and Sabzevari, 2012; Vakilifard and Shirazi, 2014).[1]

The use of single factor equity return model, however, questions the reliability of the results of the previous studies. Put differently, whether or not the behavioral differences in the risk dynamics of value and growth firms depend on the choice of the equity return model have remained unresolved. The core purpose of our paper is to comprehensively address this issue by using the Fama and French three-factor model to examine the risk differences among the value and growth firms listed in the Tehran Stock Exchange (TSE). The financial markets of Iran, mainly represented by the Tehran Stock Exchange (TSE) is an ideal example of a stock exchange operating in a highly volatile emerging economy. Beginning modestly with only six companies listed in 1967, the TSE has evolved into a leading emerging market stock exchange among the Middle East and North African (MENA) countries. As indicated in Table (1), with a three-year (2016-2019) market cap cumulative growth rate of over 150%, it ranks 36th in the world.[2] Also, Figures 1 and 2 show respectively the market cap and total trading value, and TSE index from 2013 to 2021.

In this study, we use two alternative equity return models (Capital Asset Pricing Model (CAPM) and the Fama-French three-factor model)) to explore the risk dynamics of value and growth firms in the Tehran Stock Exchange (TSE) over multiple periods of stable and adverse market conditions during the 1999 -2021 period. The use of a multi-factor equity returns model complements and advances the methodologies used in the previous literature where a firm's risk dynamics is narrowly defined; thus, ignoring broader shifts in the market resulting from other relevant risk factors. Following Ozdagli (2012), Cao (2015), and Ferguson, Lotfaliei, and Trombley (2019), we control for leverage, profitability, and degree of operating leverage as potential drivers of value premium in examining the differences between value and growth firms.

Table 1. Tehran Stock Exchange (TSE): Market Overview, 2013-2021

Year	2013	2014	2015	2016	2017	2018	2019	2020	2021
Market Cap (Year-end) ($B)	169	109	93	98	103	67	128	256	213
Total Trading Value in Year ($B)	23	14	8	16	9	11	26	106	40
Main Index (Year-end)	87,410	68,973	61,691	79,487	95,562	161,405	377,012	1,397,797	1,397,311
Max Index (Highest)	88,191	89,501	70,844	81,537	98,358	195,480	377,012	2,078,547	1,575,762
Min Index (Lowest)	36,447	68,973	61,164	61,700	76,286	92,850	156,154	353,807	1,095,698

1. Other studies include (Ahadianpour, 2011; Banaeizadeh and Kourdloei, 2013; Pourzamani and Taghiyeh, 2013; Habibsamar, Tehrani and Ansari, 2015; Rahnamay Roudposhti, Firoozian and Mohammadi, 2012; Kourdbache, Hozoori, Malmir, 2012; Meshki Miavaghi and Pourmohammad Ziabari, 2014; Miavaghi and Dehdar, 2011); Abhyankar, Ho & Zhao, 2009; Addae-Dapaah, Webb, Kim Hin Ho & Hiang Liow, 2006; Blazenko and Fu; 2013; Athanassakos, 2009; Cronqvist, Siegel and Yu, 2015; Fama and French, 1998; Gulen, Xing & Zhang; 2011; Hahl, Vähämaa and Äijö; 2014; Hsu, Lee, Chang and Fung, 2015; Kang and Ding, 2005; Black and McMillan, 2006.

2. There are over 420 companies at the TSE representing more than 40 industries including automotive, telecommunication, agriculture, petrochemical, mining, steel, iron, copper, banking, and insurance.

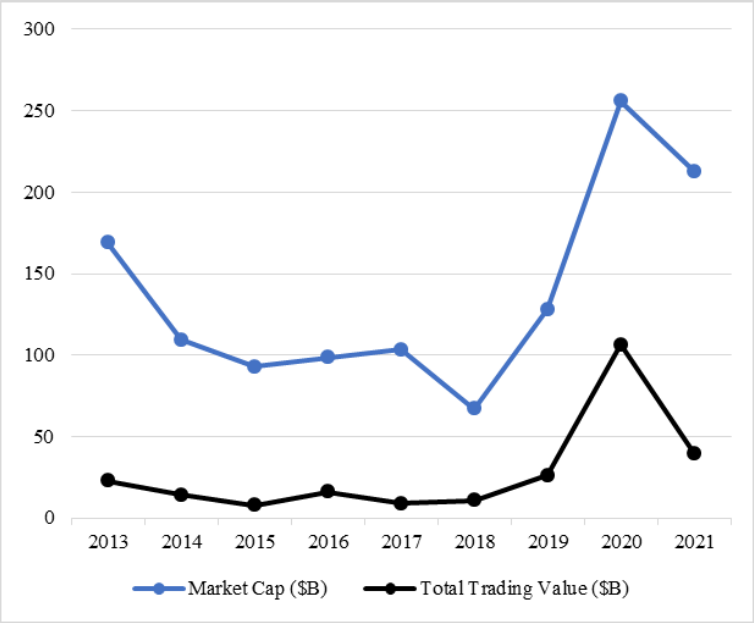

Figure 1. Market Cap, Total Trading Value in $B: 1999 to 2021

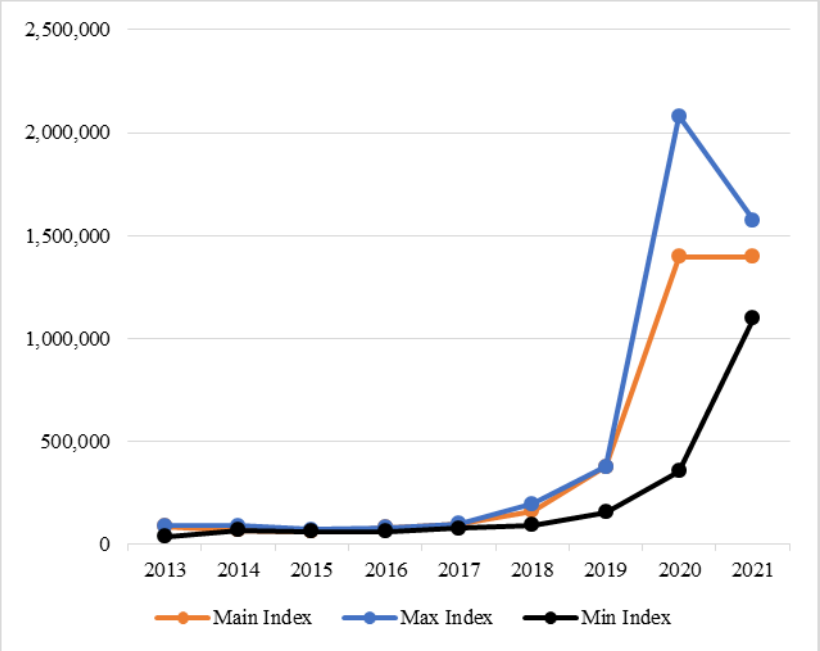

Figure 2. Main Index (Year-end), Max Index (Highest), Min Index (Lowest): 1999 to 2021

Our results for the Tehran Stock Exchange (TSE) support the overall observations from the U.S. firms indicating larger escalation of value firms' asset and levered betas relative to those of growth firms during adverse market conditions. We further show that such risk changes are more systematically rooted as evidenced by similar effects in the behavior of value and small firm premia during adverse market conditions. The behavioral differences in the risk dynamics of value and growth firms do not appear to be dependent on the choice of the equity return model. Further, the results show that value firms have delivered lower operating profits and maintained a higher degree of operating leverage than those of growth firms. The strong result on value firms' higher operating leverage provides further international support that value firms' higher returns my represent compensation for the higher risk of their assets in place, which are costly to scale down during economic downturns (Cao, 2015, Zia al haq, et al, 2020, and Moinak and Balakrishna, 2020).

From a public policy perspective, our results on the risk dynamics of value and growth firm in the financial market of Iran suggests a high level of misalignment between implied market information and the pattern of public and private sectors' capital allocational decisions.[1] In particular, growth firms and start-ups have long struggled with attracting capital at favorable terms in the financial market of Iran. Further, as shown in Table (2), public sector's recent R&D investment has represented a very small fraction of the overall capital expenditures in key industries in the Iranian economy. Following Jalilvand, Rostami Noroozabad, and Switzer (2018), we also contend that the continuing sanctions coupled with unfavorable geopolitical developments and low levels of investors financial literacy have led.

Table 2. Government Capital Expenditures: Iranian Economy (million rials)

Sector	2016	2017	2018	2019	2020
Energy	19,620,733	16,569,975	21,327,100	11,919,812	13,878,332
IT	2,811,681	1,905,949	32,669,853	30,405,590	32,091,456
Transportation	76,328,958	93,446,512	70,135,624	83,578,981	114,102,401
Industry & Mine	8,067,985	7,871,206	9,777,299	11,815,884	15,468,426
Business	987,576	1,089,902	3,621,000	4,941,500	1,026,900
Agriculture and Natural Resources	19,064,371	52,159,549	22,783,327	20,837,527	24,721,831
Water Resources	46,817,327	60,996,308	37,296,903	46,547,127	52,951,107
R&D in Economic affairs	1,421,672	1,751,690	1,102,080	1,321,480	1,665,922
Total: Select Sectors	175,122,319	235,793,108	198,715,204	211,369,920	255,908,395
Total Annual Expenditures	342,430,000	462,748,144	483,466,056	534,474,592	513,647,667

to an unstable and anemic public and private sectors' participation in the securities markets of Iran. The insufficient capital allocation to growth firms, particularly under adverse economic conditions, will continue to slow down the pace of technological and financial innovation in the Iranian economy until policy makers take concrete steps to improve investors' financial literacy and create accommodating and transparent securities market regulatory policies to remove the existing restrictive barriers in capital allocation to growth firms in Iran.

The paper is organized as follows. Data sources and empirical methodology are presented in section II. Variable definition and empirical results are discussed in section III. Conclusion and public policy discussion are presented in section IV.

2. Data and Methodology

2.1 Data

Monthly stock returns and audited financial statements for all firms listed at the Tehran Stock Exchange (TSE) for the period 1999-2021 are obtained from the data files supplied by the TSE. As a policy, the exchange has routinely made its market and microstructure data bases available to researchers examining the behavior of capital markets and investors in Iran. A final sample of 118 firms from a total of 505 firms have been selected which has meet the following three screening criteria: (i) availability of all required information for the entire period, 1999-2021; (ii) all selected firms were listed at the TSE prior to the year 1999, and (iii) banks, insurance, and other regulated firms are excluded. Overall, the data set includes 2242 firm-year observations (19 years in 118 firms).[2] Table (3) provides the detail of the sample selection.

Table 3. Sample Firms and Selection Criteria, TSE (1999-2021)

The total number of companies listed at the stock exchange in 2021	505
Selection Criteria:	
▪ The number of companies that have not been active on the exchange during the 1999-2021 period	(176)
▪ The number of companies listed after the year 1999	(193)
▪ Banks, insurance, and other regulated firms excluded	(18)
Final Number of sample companies included	118

1. By and large, growth firms are under-represented in emerging. The interest in understanding firms' behavior in emerging stock markets basically reflects the stronger regional economic growth prospects, continuing capital market development, and opportunities for global diversification (Chang and Lin, 2015; Ady et al, 2013; Luong and Ha, 2011; Athanassakos, 2009; Chandra, 2008; and Hassan al-Tamimi, 2006).

2. We did not use the daily stock returns as they exhibited abnormally high over (under) shooting of prices. Monthly returns offered a more accurate and sensible reflection of the existing and available market information.

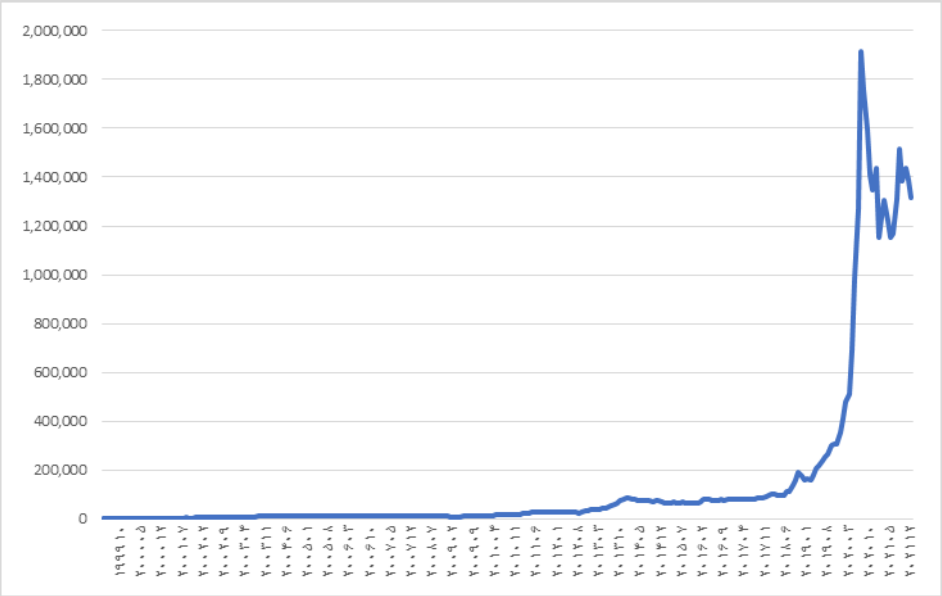

Figure 3. Monthly Values of the Tehran Stock Exchange Index (TSE): 1999 to 2021

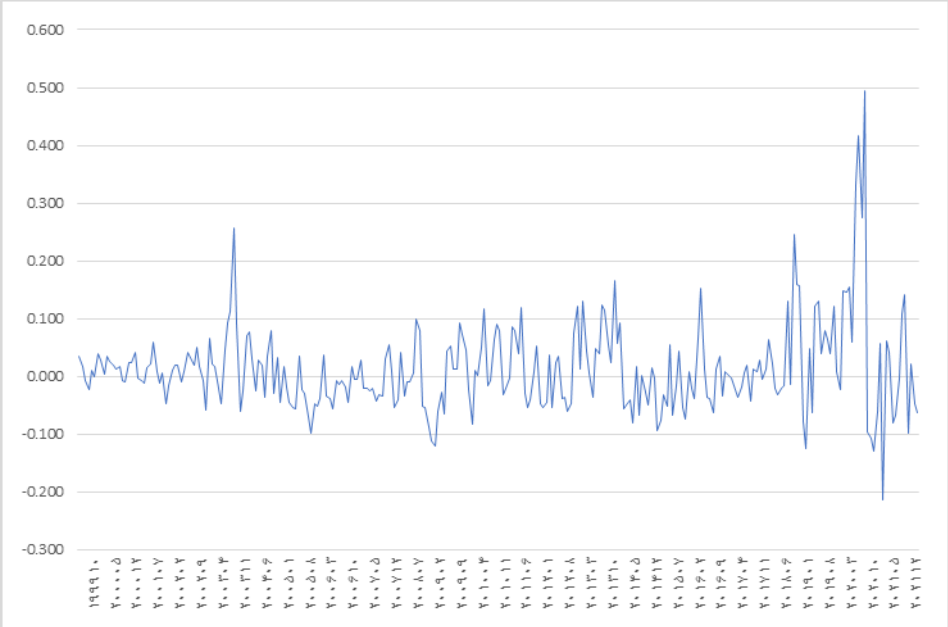

Figure 4. Monthly Standard Deviation of the TSE Index Risk Premium: 1999 to 2021

Figure (3) shows the monthly total market values (Iranian Rials) of the TSE index for the period 1999-2021. While the index value has remained very stable during the sub-period 1999-2009/3, its volatility and level have both increased dramatically after 2009, and particularly during the sub-period 2009/4-2021.[1] In Figure (4), following Fama-French (2007) and Choi (2013), market conditions (stable vs. adverse) are defined by the average size and the standard deviation of the market risk premium for the TSE index during the period 1999-2021. Table (4) shows that both average size and the standard deviation of the market risk premium during the sub-period 2009/4-2021 (0.9% and 5.72%, respectively) which are markedly larger than those for the earlier sub-period of 1999-2009/3 (-.08% and 4.75%, respectively). We also observe a period of relative stability post 2016 in which the

1. The TSE index was not meaningfully affected by the financial crisis of 2007-2009. Iran was essentially isolated from international financial systems due to severe sanctions on its banking system and other financial institutions.

average size and the standard deviation of the market risk premium fall almost in the middle of the ranges mentioned above, respectively, for the 1999-2009/3 and 2009/4-2021 sub-periods. Hence, we identify the sub-period 1999-2009/3 as representing the "*stable market condition*", while the sub-period 2009/4-2021 representing the "*adverse market condition*".

Table 4. Average and Standard Deviation of the TSE Risk Premium: Different Sub-periods

Period	Average of Risk Premium (%)	Std. Deviation (%)
1999 - 2009/3	-0.08	4.75
2009/4 - 2021	2.30	9.27

2.2 The SMB and HML Factors at the TSE

Following Fama-French (1992 and 1993), we first constructed six separate portfolios ranked both by firms' annual market caps, Big and Small (SMB), and by their ratio of book to market value, $\frac{BV}{MV}$, High minus Low (HML). The sample is further divided in three additional categories (high $\frac{BV}{MV}$ ratio, medium $\frac{BV}{MV}$ ratio, and low $\frac{BV}{MV}$ ratio). These six portfolios are indicated in table (5) below.

Table 5. Construction of SMB and HML Portfolios at the TSE

Size (MV of Equity)	Ratio $\frac{BV}{MV}$	Portfolios
Big (B)	High (H)	BH
	Medium (M)	BM
	Low (L)	BL
Small (S)	High (H)	SH
	Medium (M)	SM
	Low (L)	SL

Finally, the monthly returns for the six portfolios are calculated according equations (1) and (2) blow.

$$\text{SMB} = \frac{(\frac{S}{L}+\frac{S}{M}+\frac{S}{H})}{3} - \frac{(\frac{B}{L}+\frac{B}{M}+\frac{B}{H})}{3} \quad (1)$$

$$\text{HML} = \frac{\left(\frac{S}{H}+\frac{B}{H}\right)}{2} - \frac{\left(\frac{S}{L}+\frac{B}{L}\right)}{2} \quad (2)$$

where:

$\frac{S}{L}$ Is firms with small size and low book value to market value.

$\frac{S}{M}$ Is firms with small size and medium book value to market value.

$\frac{S}{H}$ Is firms with small size and high book value to market value.

$\frac{B}{L}$ Is firms with big size and low book value to market value.

$\frac{B}{M}$ Is firms with big size and medium book value to market value.

2.3 The Model

The Fama-French (1992 and 1993) three-factor model identifies two additional risk factors capturing size and value premia in equity returns. The "value premium" accounts for the difference in returns between high book-to-market and low book-to-market ratio portfolios "High minus Low" (HML). The "size premium" accounts for the difference in returns between small and big capitalization portfolios "Small minus Big" (SMB). Equation (3) describes the three-factor equity return model.

$$R_{it} - R_{ft} = \alpha_i + b_i\left(R_{mt} - R_{ft}\right) + s_i SMB_t + h_i HML_t + \varepsilon_{it} \quad (3)$$

Where $R_{it} - R_{ft}$ is the excess return on firm *i* at time *t*, R_{ft} is the risk free rate, the interest rate on "*Mosharekat*" bonds (Treasury bonds) issued by the Central Bank of Iran at time t, and R_{mt} is the return on the TSE index at time t.[1] As shown in the Appendix, SMB_t, the size premium, is the difference between average return on small cap and large cap portfolios at the TSE index at time t, and HML_t, the value premium, is the difference between returns of value and growth portfolios ranked based on annual book to market ratios. Following Asal and Jalilvand (2015), value and growth firms are further differentiated in the sample by selecting the top 40% of firms, representing the highest book to market ratios, and the bottom 40% of the sample, representing the lowest book to market ratios, as value and growth firm, respectively. Therefore, 48 value firms and 48 growth firms were identified in the final sample.

3. Results

3.1 Data Analysis

Results are discussed in three stages. First, Table (5), Panel (A), provides variable definition and descriptive comparisons, panel (B), of selected financial variables for value and growth firms over the sub-periods of stable (1999-2009/3) and adverse (2009/4-2021) market conditions. Specifically, following Ozdagli (2012), Cao (2015), and Ferguson, Lotfaliei, and Trombley (2019), we attempt to control for leverage, profitability, and degree of operating leverage in examining the differences between value and growth firms. Second, Table (6), Panel (A) presents the asset and levered betas of value and growth firms estimated by the Capital Asset Pricing Model during the stable and adverse economic conditions. Overall, estimated levered betas for value and growth firms are transformed to asset (unlevered) betas using the Hamada (1972) equation.[2] Panel (B) in Table (6) documents the changes in asset and levered betas for value and growth firms from stable to adverse market conditions. Finally, Table (7) reports the result of estimating the Fama-French (1992, 1993) three-factor model, separately for value and growth firm samples over periods of stable and adverse market conditions.

Table 5. Variable Definition and Descriptive Statistics

Panel (A): Variable Definition

$(TD/TA)_{it}$	The ratio of total debt to total assets for firm i at year t
$(\text{Sales Growth})_{it}$	Percentage change in sales for firm i at year t
$(\text{Return to Total Assets (RTA)})_{it}$	The ratio of Earnings Before Interest and Taxes (EBIT) to total assets for firm i at year t
$(\text{Degree of Operating Leverage})_{it}$	Elasticity of Earnings Before Interest and Taxes (EBIT) to sales firm i at year t.
$(\text{Market/Book})_{it}$	The ratio of (market value of equity + book value of total debt) to total assets firm i at year t

Panel (B): Descriptive Average Statistics for Value and Growth Firms: Stable vs. Adverse Market Conditions

	Stable Market (1999-2009/3)			Adverse Market (2009/4-2021)		
	Value	**Growth**	**2-tailed t-test of difference[a]**	**Value**	**Growth**	**2-tailed t-test of difference**
TD/TA	0.6886	0.6716	0.687 (0.495)	0.4211	0.5946	-1.064 (0.083)*
RTA	0.1737	0.2577	-2.893*** (0.006)	0.1073	0.3419	-2.968*** (0.000)
Sales Growth	0.2222	0.2374	-0.394 (0.695)	0.1382	0.3132	-1.057 (0.243)
Degree of Operating Leverage (DOL)	2.3902	0.4726	1.077 (0.287)	6.4617	3.1797	-2.046** (0.038)

[a] * Significant at 10% or better; ** Significant at 5% or better; *** Significant at 1% or better.

1. Mosharekat bonds are treasury Bills issued by the Central bank for clearing government debt to creditors (contractors, farmers, health insurance companies, electricity producers).

2. According to Hamada (1972), the relationship between a firm's levered betas (β_L) and its asset (unlevered) beta (β_U) is defined by the following equation: $\beta_L = \beta_U\{1 + (1\text{-}T_C)\}B/S$, where B/S is the firm's long-run debt to equity ratio and T_C is the corporate tax rate. Sample averages are constructed to estimate the long-run values of B/S for each firm.

As shown in Panel (B) of Table (5), there are significant differences in the selected financial characteristics of value and growth firms in Iran. While average leverage ratio (TD/TA) has remained basically the same for value and growth firms over both sub-periods, value firms' return on asset (RTA) ratio has been, on average, significantly lower (1% level or better) than that for growth firms during both stable and adverse market subperiod. The same behavior is also observed for average sales growth ratio, albeit at a lower significance level of about 10% level. Value firms have also maintained, on average, a higher degree of operating leverage (DOL) than that of growth firms during both sub-periods, but the results are only statistically significant, at 5% level or better, during the adverse market subperiod. This result is consistent with the contention that value firms offer higher returns as compensation for the higher risk of their assets in place, which are costly to scale down during economic downturns (Zhang, 2005 and Cooper, 2006, Ozdagli, 2012, and Cao, 2015). Further, the lower operating profitability of value firms relative to growth firms as captured by lower RTA ratios in both sub-periods may have further limited the value firms' ability to scale down existing assets during economic bad times. Hence, value premium may be attributable to adjustment costs resulting from investment irreversibility which may be difficult to recover by value firms during economic shocks. Finally, we don't find any noticeable difference between the average ratio of TD/TA for value and growth firms over both sub-periods. This result may not be surprising given the limited scope of the corporate bond market in Iran where capital sources supporting infrastructure investment and new growth opportunities are predominantly funded through revolving short-term bank loans instead of being supported by more stable long-term equity and bond financing.

The results in Table (6), Panel (A), show that value firms' asset and levered betas are larger than those of growth firms in both sub-periods. The differences are statistically significant for levered betas in both sub-periods (10% or better and 1% or better, respectively for stable and adverse sub-periods) while value firms' asset betas are only statistically (1% or better) higher than those of growth firms during the adverse sub-period. In particular, average asset betas of value firms are 67.10% larger than those of growth firms during the adverse sub-period. Further, in Panel B, a comparison of the behavior of asset betas from stable to adverse market conditions reveals that the average asset beta for value firms has increased substantially more than those of growth firms (1,558.78% vs. 308.81%).

Table 6. Levered and Unlevered Beta comparison: Capital Asset Pricing Model (CAPM)

Panel A

	Stable Market (1999-2009/3)			**Adverse Market (2009/4-2021)**		
	Value	**Growth**	**2-tailed t-test of difference[a]**	**Value**	**Growth**	**2-tailed t-test of difference**
Levered Beta	0.3511	0.2517	1.772* (.083)	1.0335	0.5629	3.005*** (0.018)
Unlevered Beta	0.0313	0.0760	-.617 (.540)	0.5192	0.3107	2.97** (0.030)

[a] * Significant at 10% or better; ** Significant at 5% or better; *** Significant at 1% or better.

Panel B: Changes in Levered and Unlevered Betas from Stable to Adverse Market Conditions

Levered Beta changes for value firms from stable to adverse conditions	amount	0.6824
	percentage	194.3605
Levered Beta changes for growth firms from stable to adverse conditions	amount	0.3112
	percentage	123.6392
Unlevered Beta changes for value firms from stable to adverse conditions	amount	0.4879
	percentage	1,558.78
Unlevered Beta changes for growth firms from stable to adverse conditions	amount	0.2347
	percentage	308.8157

Table 7. Fama-French Three-Factor Model Results for Value and Growth Firms during Stable and Adverse Economic Condition

	Stable Market Conditions			**Adverse Market Conditions**			**Overall Change:**
	Market	**SMB**	**HML**	**Market**	**SMB**	**HML**	**Stable to Adverse**
Value Firms	0.3661	0.0462	0.2347	1.0194	0.1367	0.4172	143.1684%
Growth Firms	0.3115	0.3452	0.1010	0.6911	0.4305	0.0381	98.3106%

In Table (7), the results of using the Fama-French (1992 and 1993) three-factor equity return model provide broader support for the differential behavior of value and growth firms. Value and size effect coefficients have been positive and statistically significant for the majority of the sample firms. The results show that value firms' overall risk profile has deteriorated more substantially than that of growth firms moving from stable to adverse market conditions. This contention is supported by comparing the sum of the estimated average coefficients of market, value, and size effects for value and growth firms from stable to adverse market conditions. For value firms the sum of the three risk premia has increased by 143.1684% vs. 98.3106% for growth firms. Overall, the results in tables (6 and 7) show that as market conditions deteriorate, market perception of value firms' overall risk premia increases more substantially than those for growth firms in the financial market of Iran.

3.2. Robustness Tests

To further confirm the validity and stability of our previous results, a boot-strapping approach is implemented re-estimating the two return generating models for ten randomly selected samples of twelve value and growth firms over both stable and adverse economic sub-periods. The CAPM and the three-factor models estimates are reported in tables (8) and (9). Initially, the results in table (8) shows that levered and unlevered betas for value firms have experienced larger increases (respectively, .5642 vs .3696; and .3296 vs .1366) than those for growth firms moving from stable to adverse sub-periods. Similarly, using the three-factor model, this contention is also supported by comparing the sum of the estimated average coefficients of market, value, and size effects for value and growth firms from stable to adverse market conditions (1.5254 vs 1.5077). Providing a more statistical test, following Marinenko and Knoerdel (1986, parts 1 &2), we also applied a "*Ruggedness Tests"* to estimated betas for value and growth firms over both stable and adverse economic sub-periods. Essentially, the purpose of a ruggedness test is to identify those factors that strongly influence the measurements provided by a specific test method and to estimate how closely those factors need to be controlled. Equations (4), (5), and (6) represent the structural process underlying the ruggedness test. The Ruggedness test results are reported in Table (10)

$$\beta_x = \frac{\sum \beta_{X_+}}{\frac{N}{2}} - \frac{\sum \beta_{X_-}}{\frac{N}{2}} \tag{4}$$

X: Levered Beta, Unlevered Beta, Market, SMB, HML

N: Number of Repetitions

$$\sigma_{\beta_x} = \frac{2\sigma}{\sqrt{N}} \tag{5}$$

$$t_{m-1} = \frac{\beta_x}{\sigma_{\beta_x}} = \frac{\beta_x}{\frac{2\sigma}{\sqrt{N}}} \tag{6}$$

According to the test procedure, the results of tables (6) and (7) would be robust if the estimate for t_{m-1} is larger than t-student distribution. The results in Table (10) clearly shows significant values for t_{m-1} supporting a high degree of robustness.

Table 8. CAPM Robustness Test

	Stable Market (1999-2009/3)				Adverse Market (2009/4-2021)			
	Levered Beta		Unlevered Beta		Levered Beta		Unlevered Beta	
	Value	Growth	Value	Growth	Value	Growth	Value	Growth
1	0.1690	0.3334	0.0560	0.0920	0.6627	0.5673	0.2398	0.1598
2	0.3045	0.3776	0.0800	0.1216	1.0678	0.7629	0.4592	0.1885
3	0.4036	0.3811	0.1001	0.1169	1.0341	0.5673	0.4706	0.1270
4	0.3858	0.1347	-0.1709	0.0321	0.8634	0.6004	0.4433	0.1409
5	0.4474	0.1864	0.0993	0.0372	0.9858	0.6044	0.3911	0.1944
6	0.3658	0.2492	0.1127	0.0745	1.0894	0.7704	0.4767	0.3936
7	0.3261	0.2335	0.1053	0.0699	1.0535	0.6852	0.5018	0.2443
8	0.4522	0.2858	0.0996	0.0723	0.6746	0.5515	0.2735	0.1516
9	0.4076	0.1412	0.1099	0.0490	0.8906	0.6174	0.4027	0.2797
10	0.2857	0.2740	0.0638	0.0854	0.8677	0.5657	0.2927	0.2367
Average	0.3548	0.2597	0.0656	0.0751	0.9190	0.6293	0.3951	0.2117
	Beta Changes from Stable to Adverse				0.5642	0.3696	0.3296	0.1366

Table 9. Three-Factor Model Robustness Test

	Stable Market (1999-2009/3)						Adverse Market (2009/4-2021)					
	Value			Growth			Value			Growth		
	Market	SMB	HML	Market	SMB	HML	Market	SMB	HML	Market	SMB	HML
1	0.2289	-0.1342	0.3330	0.2156	0.4661	-0.2244	0.6038	0.1069	0.5523	0.9359	0.5114	0.1773
2	0.5775	-0.0641	0.0553	0.3055	0.4572	-0.0547	1.2475	0.2185	0.3293	0.6492	0.1775	0.0147
3	0.2847	0.1272	0.1522	0.3069	0.0039	0.1984	0.7306	0.4151	0.6876	0.7116	0.2922	0.1268
4	0.3171	0.0468	0.2721	0.2735	0.0538	-0.0375	0.8702	0.0453	0.3523	0.9718	0.4705	0.1851
5	0.2688	0.0041	-0.0730	0.3175	0.2154	-0.0747	0.8734	0.2351	0.5689	0.6629	0.2642	0.4674
6	0.3820	0.1082	0.2782	0.3209	0.5996	-0.2653	0.6151	0.2151	0.3911	0.9366	0.6594	0.8725
7	0.4684	0.2206	0.1152	0.1983	0.1599	0.1720	1.1012	0.2293	0.4866	0.6798	0.5245	0.1522
8	0.3013	0.1098	0.0183	0.3124	0.5457	-0.0931	0.6555	0.2344	0.3672	0.7239	0.6035	-0.0202
9	0.2562	-0.1560	0.0122	0.2681	0.3232	-0.1509	0.6883	0.1432	0.3447	0.6014	0.4370	0.3993
10	0.3305	0.0884	0.1358	0.3413	0.4148	-0.2139	0.9279	0.1358	0.8819	0.9297	0.4919	0.4672
Average	0.3415	0.0351	0.1299	0.2860	0.3240	-0.0744	0.8314	0.1979	0.4962	0.7803	0.4432	0.2842
Changes from Stable to Adverse							0.4898	0.1628	0.3663	0.4943	0.1192	0.3586

Table 10. Robustness Test for CAPM and Three-Factor Models

				β_x	σ_{β_x}	t_{m-1}
CAPM	Stable Market (1999-2009/3)	Levered	Value Growth	0.4727	0.0318	14.8697
	Adverse Market (2009/4-2021)	Levered	Value Growth	1.8380	0.0936	19.6396
		Unlevered	Value Growth	0.7903	0.0564	14.0011
Three-Factor Model		Value	Market SMB HML	1.6627 0.3773 0.9924	0.1294 0.0599 0.1083	12.8469 6.3031 9.1648
		Growth	Market SMB HML	1.5606 0.7595 0.4386	0.0869 0.0732 0.1590	17.9676 10.3712 2.7583

4. Concluding Remarks

Our results for the Tehran Stock Exchange (TSE) support earlier observations from the U.S. and other international firms indicating larger escalation of value firms' asset and levered risk premia relative to those for growth firms during adverse market conditions. Specifically, we find that such risk changes are more systematically rooted and are not dependent on the choice of the equity return model in the financial market of Iran. Further, robustness tests confirm the validity and stability of our results. We also support the contention that value firms offer higher returns as compensation for the higher risk of their assets in place, captured by their higher degree of operating leverage, which are costly to scale down during economic downturns (Zhang, 2005 and Cooper, 2006, Ozdagli, 2012, and Cao, 2015).

From a public policy perspective, our results reflect a high level of misalignment between implied market information and the pattern of public and private sectors' capital allocational decisions. The uncertainty over the plight of the recent agreement between Iran and major global powers will surely further constrain Iran's ability to enhance public and private sector investments in key industries committed to innovation and technological advancement. In addition, Jalilvand, Rostami Noroozabad, and Switzer (2018) find that investors in Iran are not homogenous. The equity market is broadly represented by uninformed investors lacking the required financial knowledge and skills to properly assess risk and profitability. There is a serious need to improve financial literacy among individual investors in Iran. According to a recent global survey conducted by Standard and Poor's Rating Services on financial literacy, the overall financial literacy rate in Iran is about 20%, compared with a rate of 60% for major advanced economies. Overall, unfavorable geopolitical developments and low levels of investors literacy will not likely lead to stable and growing public and private participation in

the securities markets in Iran. Insufficient capital allocation to growth firms, particularly under adverse economic conditions, will continue to slow down the pace of technological and financial innovation in the Iranian economy until policy makers take concrete steps to improve investors' financial literacy and create accommodating and transparent securities market regulatory policies to remove the existing restrictive barriers in capital allocation to growth firms in Iran.

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