New Evidence on Structural and Return Characteristics of Small and Large Firms

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Abstract [EN]

Chan and Chen (1991) propose that the size premium is not related to size but rather to distress risk inherent to firms with marginal characteristics - high leverage, low efficiency and a recent cut in dividends. Since the publication of Fama and French (1992), the research on the size effect has completely shifted, with further investigation showing this pattern vanished during the mid-1980s. After applying the same methodology as Chan and Chen (1991) for 1956 and 2020, the present thesis confirms that small stocks do not necessarily earn higher returns than large stocks. By comparing NYSE and NASDAQ firms, I also show that it is not because a firm has the marginal characteristics that their return is necessarily higher. Furthermore, after the introduction of The Fama/French 5 factors model, portfolios LEV and DIV, designed to recreate the dynamics of marginal firms, lost and kept their significance in explaining portfolios' average returns, respectively. Nevertheless, posterior cross-sectional analysis showed that the loading on DIV is not significant in explaining the difference in returns between small and large firms. The loadings on the VWNYS and LEV were the factors with the highest explaining power, which contradicts the Fama and French statement that 'beta is dead'.

Keywords: Size-effect, Marginal Characteristics, NYSE, NASDAQ, Five-Factor Model,

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Resumo [PT]

Chan e Chen (1991) propõem que empresas pequenas têm retornos mais elevados devido às suas características marginais - elevados níveis de dívida e cortes recentes nos dividendos – e não devido à sua capitalização de mercado. No entanto, desde a publicação de Fama e French em 1992, os contornos da pesquisa que a capitalização de uma empresa tem sobre o retorno de uma ação mudaram completamente. Outras investigações indicam que esse efeito terá desaparecido a partir da década de 1980. Na presente tese, aplico a mesma metodologia de Chan e Chen (1991) para o período entre 1956 e 2020 e contradigo a teoria de que empresas menores geram retornos maiores, e empresas maiores, retornos menores. Também provo, através de uma comparação entre empresas do NYSE e NASDAQ, que não são as características marginais que definem um maior retorno. Além disso, após a introdução do modelo de 5 fatores de Fama/French, os portfólios LEV e DIV, criados para replicar a dinâmica das empresas marginais, perderam e mantiveram a sua importância na explicação dos retornos médios dos portfólios, respetivamente. No entanto, a análise transversal realizada posteriormente mostra que o beta-DIV deixou de ser significativo para explicar a diferença de retornos entre pequenas e grandes empresas, sendo o beta-VWNYS e o beta-LEV os fatores com maior poder explicativo, o que contradiz a conjetura de que 'beta está morto', de Fama e French (1992).

Palavras-Chave: Efeito do Tamanho, Características Marginais, NYSE, NASDAQ, Modelo de 5 Fatores

Título: Novas Evidências acerca das Características Estruturais e do Retorno de Pequenas e Grandes Empresas

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List of Abbreviations

AMEX – American Stock Exchange

CAPM – Capital Asset Pricing Model

CMA – Return difference between firms that invest conservatively and firms that invest aggressively

DIV – Return difference between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends.

FF5 – Fama and French Five-Factor Model

HML – Return difference between cheap and expensive stocks

LEV – Return difference between a portfolio of firms in the top leverage quintile firms and a portfolio of low leveraged smaller firms.

NASDAQ – National Association of Securities Dealers Automated Quotations

NYSE – New York Stock Exchange

Q1 – Smallest Size Quintile

Q5 – Largest Size Quintile

QDIFF – Difference in returns between Q1 and Q5

RHS – Right-hand side

RMW – Return difference between most and less profitable stocks

SMB – Size premium, Small minus Big

VWNYS – Return on the Value-Weighted NYSE Market

1. Introduction

In this thesis I am replicating the findings of Chan and Chen (1991) in their paper "Structural and Return Characteristics of Small and Large Firms". The authors of this publication show that, between 1956 and 1985, NYSE's smallest firms are typically marginal firms. This is, firms that are struggling and, therefore, are more inefficient, present higher levels of leverage, have recently cut their dividends, and probably have more difficulty in accessing financing from external sources, causing them to have a higher risk compared to larger firms. Chan and Chen show that high-leverage and marginal firms can capture the difference in returns between small and large firms. According to the authors' cross-sectional tests, the log(size) explains the difference in returns across the size portfolios with reliable explanatory power. However, the size characteristic loses its explainability after incorporating several risk exposures, including the market index, the leverage portfolio, and the dividend-decrease portfolio. This result suggests that the size premium is not related to size but to distress risk associated with the so-called marginal characteristics.

In Section 3, by applying the same methodology as Chan and Chen (1991), from 1956 to 2020 instead of 1956 to 1985, I describe how the NYSE's largest and smallest quintile firms differ regarding their entries into the top and bottom size quintiles and how they differ regarding accounting ratios, dividend policy, and financial leverage. Additionally, I also include a comparison between NYSE and NASDAQ firms that shows that NASDAQ firms considered small by NYSE standards did not possess the marginal firm characteristics, but still presented higher returns.

In Section 4, I construct two size-matched return indices. The first portfolio is designed to capture the return behaviour of distressed businesses based on a recent significant decline in their dividend payout. Dividend reductions strongly indicate that a firm is facing cash flow difficulties, whether the cause is poor profitability or a challenge securing external financing. For the first portfolio, for each year t, I compile a list of all NYSE companies that reduced their dividends by at least 50% between year t - 2 and year t - 1. Afterwards, for each of the firms, I select a matching firm that: 1) did not reduce its dividends between year t - 2 and year t – 1 and 2) was listed on the NYSE for the first time within the past five years. When multiple firms fulfil both criteria, I select the firm with the lowest, but closest, market capitalization to the marginal firm considered (market value as of the previous December). The second return portfolio measures the difference in returns of larger firms with high-leverage firms in comparison to smaller firms with low-leverage and it is constructed with the same methodology as the first portfolio: each firm within the highest leverage quintile is paired with the one in the lowest leverage quintile with the closest but smaller market capitalization. A given year's portfolio composition remains stable from January to December and is only updated in January of the following year, between 1961 to 2020. Afterwards, I run 20 time-series regressions of the excess return of 20 Size Portfolios on the excess return of DIV, LEV and VWNYS to test if such portfolios are significant in explaining returns from 1964 to 2020. Subsequently, I perform the same analysis but include the excess return of the 5-Factors Model presented by Fama and French in "A five-factor asset pricing model". After introducing the new factors, LEV and DIV lost and kept their significance in explaining portfolios' average returns, respectively.

Finally, after performing both time-series analyses, I proceed by doing cross-sectional regressions to understand which factors are significant in explaining the difference in returns between small and large firms. The results including the FF5 indicate that the loadings on VWNYS and LEV are the factors with the highest explaining power.

2. Literature Review

The first empirical study that provides proof of the size effect on U.S. stock returns may have been written by Banz (1981). Between 1936 and 1975, he examined all NYSE stocks. According to Banz, equities in the smallest size quintile generate a monthly risk-adjusted return of 0.40% greater than the other companies. Returns and market value have a negative and significant relationship, according to Fama-MacBeth regressions from 1973. There is a nonlinear size effect, which is most evident in the sample's smallest businesses. Due to a lack of knowledge, Banz hypothesizes that investors will not want to hold small stocks, resulting in higher returns. This theory resembles Merton's investor recognition hypothesis (1987).

At the same time, Reinganum (1980) used the Arbitrage Pricing Theory to assess and measure risk associated with stocks with small capitalization on the NYSE and in the AMEX during the period of 1963 to 1978. Later, in 1981, Reinganum proceeded with his investigation of the size effect by using CAPM as his measure of risk to evaluate small caps in 566 firms from NYSE and AMEX from 1963 to 1977. In his study, he discovered that the bottom decile outperformed the top decile by 1.77% monthly. Brown, Kleidon, and Marsh (1983) used the Reinganum data to re-study the effect size had on returns and found that the

10 size-based portfolio daily average returns and market capitalization logarithms are linearly correlated.

Several arguments have emerged to try to explain why small companies were able to offer investors higher returns compared to conventional asset pricing models. Amihud and Mendelson (1986) defended the idea that the difference in return of small and large stocks is compensation for liquidity risk and trading costs whereas Daniel, Hirshleifer and Subrahmanyam (2001) claimed that investors are not always fully rational, causing such anomalies in the market. On the other hand, Merton (1987) argues that the return spread is associated to a lack of information on small capitalization firms.

In the paper “Structural and Return Characteristics of Small and Large Firms”, published by Chan and Chen in 1991, the authors also try to propose a cause for the size effect by presenting their marginal firms’ theory. It is argued that firms with small market capitalization evaluated in the past are more likely to be marginal firms. As a result, firms that have lost market capitalization due to underperformance may have had efficiency problems leading to other problems, such as higher financial leverage and lower cash flows. They are marginal because their prices are more vulnerable to economic changes and less likely to survive severe economic conditions. Small market capitalization firms include a high number of marginal firms; therefore, this group of firms behaves marginally. Consequently, it is the marginal characteristics, rather than the size, that cause these firms to react differently to identical pieces of macroeconomic news compared to healthy firms. As a result, they will provide higher returns than the average.

However, one year later after Chan and Chen’s proposed hypothesis, the research on the size effect completely changed due to the article published by Fama and French in 1992. These authors investigate the size and book-to-market anomalies discovered by previous studies and argue that the empirical flaws of Sharpe and Lintner's capital asset pricing model (CAPM) are too significant to ignore. Fama and French, by collecting monthly data from NYSE, AMEX and NASDAQ firms for the years between 1963 to 1990, discovered that the top decile is outperformed by the smallest decile by 0.63% each month. They also found no relationship between beta and returns after putting firms into size decile followed by a division into ten portfolios sorted by beta. FamaMacBeth regressions also demonstrate that beta has no explanatory power for the cross-section of returns, while the size and book-to-market equity do. From the recently found fact that beta and returns had a balanced relationship, the theory that "beta is dead” emerged.

Since past evidence, namely Eleswarapu and Reinganum (1993), Dichev (1998), Dimson and Marsh (1999), Horowitz et al. (2000), Hirshleifer (2001), Amihud (2002), Schwert (2003), indicates that the size effect vanished during the mid-1980s, this thesis explores the evidence for its existence and prevalence in the cross-section of equity returns, focusing on marginality characteristics as the origin of such an effect.

3. Structural Characteristics of Small and Large Firms

3.1. The Composition Characteristics by Entry Type

In agreement with Chan and Chen (1991), this section aims to test if the different reaction of small and large firms to the same economic conditions is linked to the fact that the small firms analysed are underperforming marginal firms – firms with high-leverage, low efficiency and that have recently cut their dividends.

Over the 65-year sample period, from 1956 to 2020, firms are classified based on how and when they entered the top (largest) quintile and bottom (smallest) quintile. In order to enter a size quintile, there are three possibilities: one can fall, rise, or be listed directly into that quintile. Regarding the time of entry, it is considered since when the firm has been in that quintile: for the past two years, between two to five years, six to ten years, or for more than ten years. The newly listed NYSE firms are then divided into deciles instead of quintiles, and a size distribution by decile is made. This distribution gives information on the percentage of firms directly entered in a specific decile. The results are reported in Table I.

In the original paper, concerning the period between 1956 and 1985, considering only the companies that were in the bottom quintile for less than ten years, the results were the following: 66% of the firms fell into the bottom quintile, whereas only 14% were directly listed there. In this thesis, which also incorporates data from 1985 until 2020, the results suffered some changes. Nonetheless, the overall conclusion remains the same: 54% of the firms fell into the bottom quintile, whereas 30% were directly listed there. These results indicate that the smallest quintile contains several firms that have been underperforming, but this tendency has decreased by 12 percentual points. Additionally, the likelihood for companies to stay in the bottom quintile for more than 10 years has decreased from 20 to 16%, indicating that there are even fewer firms stuck in the bottom quintile for an extended period. These results suggest that either the firms manage to improve their performance and increase their capitalization, moving up a quintile, or they leave NYSE.

Regarding the top quintile, the percentage of firms that have gone from lower quintiles to the top quintile for the two periods analysed (1956-1985 and 1956-2020) is very similar, both around 42%. However, the number of firms directly listed in the top quintile has increased from 8% to 13% when we incorporate data until 2020. As per the percentage of firms that have been in the top quintile for more than 10 years, it suffered a reduction from 51% to 45.5%, suggesting a slight decline in the persistence of firms among large capitalizations.

Table I

Percentual Distribution of NYSE Firms in the Extreme Size Quintiles based on the Most Recent Entry Type

Data covers the period of 1956-2020. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size is retrieved from the CRSP monthly Database.

Bottom (Smallest) Quintile				
Most Recent Entry	Over Past 2 Years	2-5 Years Before	6-10 Years Before	More than 10 Years
Fallen From Higher Quintile	24.97	17.03	11.94	15.78
Newly Listed into the Quintile	12.28	10.02	7.98	
Top (Largest) Quintile				
Most Recent Entry	Over Past 2 Years	2-5 Years Before	6-10 Years Before	More than 10 Years
Gone Up From Lower Quintile	16.30	13.20	12.39	45.53
Newly Listed into the Quintile	4.08	4.06	4.43	

Percentual Size Distribution of Recently Listed NYSE Firms by Decile

Percentage of NYSE's new entries firms for each decile during the period of 1956 until 2020.

Size Distribution (in Percentage) of Newly Listed NYSE Firms by Decile (1956-2021)

(Smallest)	1	2	3	4	5	6	7	8	9	10	(Largest)
	8.8	13.2	14.4	13.8	13.6	11.5	8.8	7.5	5.1	3.3	

When looking at the size distribution of newly listed NYSE firms by decile, only about 8.8% and 3.3% have entered directly in the bottom and top decile, respectively. Most of the firms tend to enter middle-lower deciles, being most common to enter directly to the third decile (14.4%). The two periods analysed report equivalent results.

3.2. Small and Large Firms Characteristics regarding Accounting Ratios

Returns on assets are likely to be lower for marginal firms. A high degree of financial leverage further compounded their problems, which may also result in lower interest expense coverage. According to Chan and Chen (1991), within each industry, marginal firms tend to have lower market capitalization. This way, the return on assets (interest expense) for the average smaller firms within an industry should be lower (higher) than for the average larger firms in that same industry.

Table II

Average Return to Assets and Interest Expense Ratios for NYSE Firms in the Extreme Size Quintiles

Data covers the period of 1966-2020. The ratios are the averages of the annual median ratios for firms in the industry and size group. Ql represents the quintile with the smallest market capitalization and Q5 represents the quintile with the highest market capitalization. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size is retrieved from the CRSP monthly Database. The data to compute the ratios is retrieved from COMPUSTAT.

	Return to Asset Ratio (%)		Interest Expense Ratio (%)	
Industry Group	Q1	Q5	Q1	Q5
Mining	12.52	14.20	13.27	9.20
Construction	9.54	10.98	23.80	10.29
Manufacturing	13.50	15.67	11.87	8.45
Transportation & Public Utilities	11.73	11.82	22.83	18.06
Wholesale Trader	12.47	11.54	15.25	9.26
Retail Trader	13.15	18.34	12.87	8.64
Finance, Insurance & Real Estate	4.96	3.17	25.53	11.49
Services	11.79	13.62	16.85	8.60
Average	11.21	12.42	17.78	10.50

In the original paper, the authors classified the NYSE firms into 19 different industries according to a no longer existing classification. Thus, for this thesis, the firms were divided based on the 1987 Standard Industrial Classification (SIC) System. Within each industry, only the ratios of the firms in the bottom and top quintiles will be considered. The data to compute the ratios was retrieved from COMPUSTAT. The return to asset ratio refers to the quotient between operating income before depreciation and total assets, whereas the interest expense ratio is the interest expense over operating income before depreciation. However, it should be noted that there may be a discrepancy between accounting and economic figures. Results are reported in Table II.

There are only two industries (Wholesale Trader and Finance, Insurance & Real Estate) whose return-to-asset ratios differ from what I expect.

Table III presents two one-tailed binomial tests performed to verify if: 1) the Return to Asset Ratio for firms in Q5 were statistically higher than the same ratio for Q1; 2) the Interest Expense Ratio for firms in Q5 were statistically lower than the same ratio for Q1. Each industry corresponds to one observation. For the period considered by Chan and Chen (1991), the Return to Asset Ratio and the Interest Expense Ratio for Q5 were significantly higher and lower, respectively, than the respective ratio for Q1. However, when data until 2020 is included, the Return to Asset Ratio for Q5 is not statistically higher than for Q1 – which could be partly explained by a smaller number of industries considered (8 versus 19).

Table III

Binomial Tests performed on the ratios of NYSE's extreme quintiles

Data covers the periods of 1966-1985 and 1966-2020. Each observation corresponds to one industry. A firm's size is determined by its market capitalization at the end of the previous year. The data to compute the ratios is retrieved from COMPUSTAT.

Binomial Test						
		Category	**Successes**	**Trials**	**Test Proportion**	**Significance (1-tailed)**
Return To Asset Ratio	Group 1	Q5 bigger	17	19	0.5	0.00
(1966-1985)	Group 2	Q5 smaller	2			
Interest Expense Ratio	Group 1	Q1 bigger	18	19	0.5	0.00
(1966-1985)	Group 2	Q1 smaller	1			
Return To Asset Ratio	Group 1	Q5 bigger	6	8	0.5	0.15
(1956-2020)	Group 2	Q5 smaller	2			
Interest Expense Ratio	Group 1	Q1 bigger	8	8	0.5	0.00
(1956-2020)	Group 2	Q1 smaller	0			

3.3. Firm Size, Leverage and Dividend Changes

This section aims to examine other indicators more capable of capturing the differences between marginal and healthy firms, namely dividend policy and financial leverage.

Historically, firms have been unwilling to cut dividends, meaning that when they do, they are likely to be underperforming and facing a very uncertain future. The reduction of dividends may also indicate that management anticipates lower future cash flow or increased difficulty obtaining external financing in the future. As a result, dividend policy provides a clear indication of a firm's health. Data on dividends was obtained from CRSP Database.

It is also known that firms of all sizes are subject to financial leverage, but there is a greater likelihood of it being felt more profoundly among firms experiencing financial difficulties. Nevertheless, some firms can optimally choose high-leverage levels if they have high-quality assets or low operational risk; therefore, high leverage is not necessarily associated with financial distress. The latter could raise some concerns, but, as I am trying to replicate Chan and Chen (1991), which selected financial leverage as a criterion to evaluate a company's riskiness, I do the same in the present thesis. An organization's financial leverage is comprised of the sum of its current liabilities, long-term debt, and preferred stock over its market capitalization, being this data retrieved from COMPUSTAT.

The frequency distribution is shown in Table IV based on (i) size/dividend change and (ii) size/leverage.

In Chan and Chen (1991), 60% of companies that reduced their dividends by half or more the year prior were in the bottom quintile. When data until 2020 is included, this percentage decreases to 26%. Although this percentage has declined steeply, it is still the highest of the quintiles: 21%, 19%, 18%, and 16% of companies had their dividends cut by more than half in quintiles two, three, four, and five, respectively. In addition, 30% of companies that increased dividends belong to the top quintile, while only 11% belong to the bottom quintile - against 24% and 14 % for the period between 1956 and 1985. These results indicate that more and bigger companies are increasing dividends, in contrast to fewer smaller ones.

Table IV

Frequency Distribution of NYSE Firms allocated to Size/Leverage and Size/Dividend-Change

Data covers the period of 1956-2020. For each year t, the dividend change is calculated as the percentual dividend change of the stock from year t - 2 to year t - 1. The dividend change information is updated yearly from 1956 to 2020. If a stock did not pay any dividends in year t – 2, it is excluded. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size and data on dividends is retrieved from the CRSP monthly Database. The value of current liabilities, long-term debt, and preferred stock is retrieved from COMPUSTAT.

Panel A. Size / Dividend Change						
	Dividend Change					
	-100%	**(-100%, -50%)**	**(-50%, 0%)**	**0%**	**(0%, 50%)**	**More than 50%**
Smallest	476	797	4494	651	3700	1027
Size 2	356	667	5012	539	5886	1080
Size 3	260	671	4453	294	7239	1077
Size 4	219	645	4484	124	9138	986
Size 5	115	645	4681	88	12066	867
Total	1426	3425	23124	1696	38029	5037

Panel B. Size / Leverage					
	Leverage				
	Low	**2**	**3**	**4**	**High**
Smallest	738	834	1137	1503	3396
Size 2	1626	1635	1894	2219	2935
Size 3	2501	2446	2686	2856	2497
Size 4	3266	3138	3284	2925	2058
Size 5	4179	4220	3271	2770	1413
Average	0.17	0.44	0.78	1.33	6.4

Regarding leverage, for both periods, there is a higher percentage of highly leveraged firms in the smallest size quintile as well as a higher percentage of low-leverage firms in the largest size quintile. Between 1956 and 1985, of the low-leveraged firms, only 10% belong to the bottom quintile against 36% that belong to the top quintile. Regarding the period until 2020, there are even fewer low-leveraged firms in the first quintile - 6% - but also fewer firms with low leverage belonging to the highest quintile - 34%. As for the high-leveraged firms, until 1985, 8% and 33% of the firms belong to the top quintile and bottom quintile, respectively. When we consider the most recent years, these values have changed to 11% and 28%, meaning that there are fewer small firms with high levels of leverage but more and bigger firms with high leverage.

Concerning the average leverage by quintile, I performed a 98% winsorization - the first percentile value replaced observations in the first percentile, and the ninety-ninth percentile value replaced observations in the ninety-ninth percentile. When data until 2020 is considered, the average leverage becomes higher in the top quintile, having increased from 4.49 to 6.40. For the remaining quintiles, the average leverage decreased by 0.01, 0.05, 0.11 and 0.17 for quintiles 1, 2, 3 and 4, respectively.

3.4. NYSE against NASDAQ firms

In Chan and Chen (1991), the authors made a comparison between NYSE and NASDAQ firms to test the marginal firm hypothesis. NASDAQ companies are generally smaller in size than those listed on the NYSE, so if the companies were compared by the size quintile they belong to in their stock exchange, the analysis would not be the most accurate. Thus, the quintile limits for the NASDAQ firms are the same as the NYSE ones, which are redefined yearly.

According to Chan and Chen (1991), a significant portion of small companies listed on the NYSE has lost market value, which makes them riskier, but the same does not happen in NASDAQ. Therefore, they found significant risk and return differences between the NYSE's small firms and NASDAQ's similar-sized firms. In Chan and Chen (1991), this analysis was conducted from 1973 (instead of 1956) to 1985 since NASDAQ was only founded in 1971. As NASDAQ firms considered small by NYSE standards did not possess the marginal firm characteristics, the authors have found enough evidence to support the marginal firm thesis:

1- NASDAQ small firms (by the NYSE standards) present a lower likelihood to be "fallen angels" (16.70% versus 66%),
2- The likelihood of NASDAQ small firms drastically reducing their dividends (more than 50%) is half as high compared to NYSE small firms (7.15% versus 14.40%),
3- NASDAQ small firms present, at the same time, higher Return to Asset Ratio and lower Interest Expense Ratio (13.5% vs 12.5% and 11.5% vs 28.4%, respectively),
4- The average equally weighted monthly return is smaller for NASDAQ firms for all quintiles than NYSE firms of equivalent size, even though being statistically smaller for the first, second and third quintiles.

Overall, small NYSE companies are more risky and present higher average returns than similar-sized NASDAQ companies for the period between 1973 and 1985. However, when I cover data until 2020, the previous results become:

1- NASDAQ small firms (by the NYSE standards) are still less likely to be "fallen angels" (21% versus 54%), but this difference between the two periods analysed has decreased by 16.3 percentual points. The NASDAQ frequency distribution in the bottom quintile is as shown in Table V.

Table V

Percentual Distribution of NASDAQ Firms in the Bottom Size Quintile based on the Most Recent Entry Type

Data covers the period of 1974-2020. A firm’s size is determined by its market capitalization at the end of the previous year. Data on firm size is retrieved from the CRSP monthly Database.

Bottom (Smallest) Quintile				
Most Recent Entry	Over Past 2 Years	2-5 Years Before	6-10 Years Before	More than 10 Years
Fallen from Higher Quintile	10.10	6.53	4.20	17.08
Newly Listed into the Quintile	24.55	21.81	15.73	

2- The likelihood of NASDAQ small firms having previously reduced their dividends is half as high compared to NYSE small firms (51.8% versus 24.3%). However, this difference reduces when we consider a cut in dividends by 50% or more (7.5% versus 11.4%). Results are reported in Table VI.
3- NASDAQ small firms now present a lower Return to Asset Ratio comparatively to small NYSE firms (8.2% versus 11.2%) but still a lower (more favourable) Interest Expense Ratio (10.80% versus 17.78%), as presented in Table VII.
4- The average equally weighted monthly return is smaller for NASDAQ firms for all the middle quintiles. For the extreme quintiles, the average return is higher than NYSE. Nevertheless, the only result statistically different is the one for the bottom quintile, as presented in Table VIII.

Table VI

Frequency Distribution of NASDAQ Firms allocated to Size/Leverage and Size/Dividend-Change

Data covers the period of 1974-2020. For each year t, the dividend change is calculated as the percentual dividend change of the stock from year t - 2 to year t - 1. The dividend change information is updated yearly from 1974 to 2020. If a stock did not pay any dividends in year t – 2, it is excluded. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size and data on dividends is retrieved from the CRSP monthly Database monthly file.

	Dividend Change					
	-100%	**(-100%, -50%)**	**(-50%,0%)**	**0%**	**(0%, 50%)**	**More than 50%**
Smallest	206	1645	4156	5947	9405	3374
Size 2	14	309	1665	2104	4358	951
Size 3	14	213	1223	1113	3219	560
Size 4	11	111	713	713	1821	295
Size 5	7	70	325	325	1098	196
Total	252	2348	8082	10202	19901	5376

Table VII

Average Return to Asset and Interest Expense Ratios for NASDAQ Firms in the Extreme Size Quintiles

Data covers the period of 1974-2020. The ratios are the averages of the annual median ratios for firms in the industry and size group. Ql represents the quintile with the smallest market capitalization and Q5 represents the quintile with the highest market capitalization. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size is retrieved from the CRSP monthly Database. The data to compute the ratios is retrieved from COMPUSTAT.

	Return to Asset Ratio (%)		**Interest Expense Ratio (%)**	
Industry Group	**Q1**	**Q5**	**Q1**	**Q5**
Mining	9.49	14.72	7.12	2.84
Construction	6.83	22.07	14.53	2.65
Manufacturing	5.08	18.37	5.02	8.48
Transportation & Public Utilities	10.57	13.28	19.09	25.08
Wholesale Trader	9.52	17.65	12.03	3.67
Retail Trader	11.42	17.81	13.95	4.94
Finance, Insurance & Real Estate	3.12	6.62	10.18	3.59
Services	9.43	20.30	4.50	1.35
Average	8.18	16.35	10.80	6.57

Table VIII

NYSE's and NASDAQ'S Average Monthly Return by Quintile, its difference and associated significance

Data covers the period of 1974-2020. The results correspond to the difference in average monthly compounded equally weighted portfolio return for each size quintile between NYSE and NASDAQ. Ql represents the quintile with the smallest market capitalization and Q5 represents the quintile with the highest market capitalization. A firm's size is determined by its market capitalization at the end of the previous year. Data on firm size and on returns is retrieved from the CRSP monthly Database.

NYSE's Average Monthly Return by Quintile (%)				
Smallest	Size 2	Size 3	Size 4	Size 5
1.66	1.19	1.21	1.19	1.11
NASDAQ's Average Monthly Return by Quintile (%)				
Smallest	Size 2	Size 3	Size 4	Size 5
2.39	1.16	1.07	1.10	1.16
Average Monthly Return Difference between NYSE and NASDAQ firms by Quintile (pp)				
Smallest	Size 2	Size 3	Size 4	Size 5
-0.73	0.03	0.14	0.09	-0.05
Significance of the Return Difference (P-Value)				
0.026	0.474	0.346	0.403	0.436

4. Return Characteristics of Small and Large Firms

4.1. Creation of Size-Matched Return Indices

The key objective of this section is to design two portfolios: the first one should be able to capture the return behaviour of marginal firms which have drastically cut their dividends; the second one is intended to capture the performance of firms with a considerable level of financial leverage. To prevent including any factor that is size related in the portfolio construction, the return indexes are created by subtracting the return between firms that have decreased their dividends, or have high leverage, and their corresponding smaller firms.

Following the same methodology as Chan and Chen (1991), for each year t, I compile a list of all NYSE companies that reduced their dividends by at least 50% between year t - 2 and year t - 1. Afterwards, for each of the firms, I select a matching firm that:

1- did not reduce its dividends between year t - 2 and year t - 1,

2- was listed on the NYSE for the first time within the past five years.

After controlling for the above criteria, I choose the firm with the lowest, but closest, market capitalization (market value as of the previous December). This way, it is being chosen a matching firm that has a smaller market capitalization, has not cut its dividends and is most likely to be performing well. The portfolio's composition is kept constant throughout the year, being updated by subtracting the return between the portfolio that decreased its dividends and its paired portfolio yearly from 1961 to 2020. The dividend portfolio DIV is constructed by subtracting the return between the portfolio that has decreased its dividends and the corresponding smaller firms matching portfolios return.

Similar procedures are followed in the construction of the leverage effect portfolio LEV. Thus, every firm within the highest leverage quintile is paired with the one in the lowest leverage quintile with the closest but smaller market capitalization. A given year's composition remains stable from January to December and is only updated in January of the following year, between 1961 to 2020.

4.2. Creation of Size Portfolios

Through this section, I construct twenty size equally weighted portfolios so that an analysis of small and large firms' return characteristics can be performed. Data on firm size and on returns is retrieved from the CRSP monthly Database. Each year from 1961 to 2020, NYSE firms are divided into twenty portfolios according to their market capitalization at the end of the previous year. Portfolio one (P1) includes the 5% smallest firms whereas portfolio twenty (P20) has the 5% largest firms. The returns on the smallest size quintile, the largest size quintile, and their difference are referred to as Q1, Q5, and QDIFF (Q1-Q5).

Table IX

Returns Correlation Matrix

Data covers the period of 1961-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile firms and a portfolio of low leveraged smaller firms. QDIFF is the difference in returns between Q1 and Q5. VWNYS corresponds to the return on the Value-Weighted NYSE Market.

	LEV	**QDIFF**	**VWNYS**
DIV	0.2310	0.2302	0.3950
LEV		0.2604	0.2618
QDIFF			0.0426

In this section, as shown in table IX, a correlation matrix is calculated between the two-size matched portfolios (DIV and LEV), the value-weighted NYSE (VWNYS) and QDIFF.

Comparing these results to the ones referent from 1956 to 1985, the relationship between the portfolios analysed is generally less strong, but all still move in the same direction. The biggest conclusion taken from this analysis is linked to the positive correlations between DIV and QDIFF (Q1-Q5) and between LEV and QDIFF (Q1-Q5). The portfolios DIV and LEV refer to the difference between a larger firm and a smaller firm, whereas QDIFF (Q1-Q5) subtracts the return of bigger stocks to smaller stocks.

4.3. Portfolios Average Return

This part presents the average monthly returns of the VWNYS, the portfolio of stocks with drastic dividend decreases, the portfolio containing stocks in the top leverage quintile and the latter two portfolios subtracted by the VWNYS. It also includes the components' returns needed to calculate DIV and LEV. The results are reported in Table X, including the average returns as well just for the month of January.

Table X

Portfolios Average Return

Data covers the period of 1961-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms.

	Mean	**January**	**% Difference**
VWNYS	0.95%	1.07%	12%
Stocks with dividend decrease (50% or more)	1.42%	4.87%	242%
Stocks with high leverage	1.58%	4.96%	214%
Stocks with dividend decrease - VWNYS	0.47%**	3.80%***	705%
Stocks with high leverage - VWNYS	0.63%**	3.90%***	517%
Size-matched series and their components			
DIV	0.12%	1.17%***	861%
(a) dividend decrease	1.41%	4.57%	225%
(b) matching portfolio	1.23%	3.40%	165%
LEV	0.32%	1.43%***	352%
(a) high leverage	1.54%	4.80%	211%
(b) matching portfolio	1.23%	3.36%	174%

**denotes significance at the 5% level for one-tail t-tests

***denotes significance at the 1% level for one-tail t-tests

It should be noted that the portfolio of stocks with drastic dividend decreases and the portfolio containing stocks in the top leverage quintile have a different value from the components used in designing DIV and LEV, respectively, because some firms were too small to match them with an even smaller firm.

In line with expectations, DIV and LEV present positive returns for the mean average, like for just the month of January. In Chan and Chen (1991), the portfolio LEV earned a lower return than DIV (0.19% versus 0.16%). However, the results changed between 1961 and 2020, presenting LEV a higher return than DIV (0.32% versus 0.12%). Additionally, when comparing DIV and LEV to the portfolios where VWNYS is subtracted instead of the matching firms, the first two report lower returns.

All the portfolios show a strong January effect, as the returns for this month are, in all cases, significantly higher than the rest of the year. Nevertheless, this pattern is more strongly felt among the so-called marginal firms rather than in the matching firms or in the VWNYS.

4.4. Portfolio Classification based on Multiple Betas

From this section on, the indicator used to quantify each stock or portfolio risk relates to the sensitivity to returns in three different portfolios: VWNYS, DIV and LEV. These sensitivities, also called betas, are obtained by regressing the excess returns of a stock or portfolio on VWNYS, DIV and LEV excess returns and retrieving its associated coefficients. The regression is as follows:

$$r_t - RF_t = \alpha + \hat{\beta}_{VWNYS}(VWNYS_t - RF_t) + \hat{\beta}_{LEV} LEV_t + \hat{\beta}_{DIV} DIV_t + \epsilon_t$$

Once again, from 1961 to 2020, NYSE firms are divided into five size quintiles, according to their market value of equity at the end of the previous year. Following this and using monthly historical data from the past five years, the regression described above is run for each firm in each of the five size quintiles. After obtaining all three betas for every NYSE firm, firms are divided into three portfolios according to their coefficients within each quintile. The division is made as follows:

1- For each year, for each quintile, I calculate the median beta-LEV and the median beta-DIV, 2- Then, I create portfolio H by including all the stocks that present both a higher beta-LEV and beta-DIV higher than their respective median values (by year, by quintile),

3- For portfolio L, I include all the stocks that present both a lower beta-LEV and beta-DIV lower than their respective median values (by year, by quintile),

4- In Portfolio M, I include all the remaining stocks from that size quintile for a given year,

5- Finally, a fourth portfolio is designed from the difference between portfolio H and portfolio L - portfolio H-L.

The results are displayed in Table XI.

Although in Chan and Chen (1991) show evidence of a direct relationship between size and returns, it changed from 1961 to 2020 when considering all months. Focusing on the monthly mean returns of portfolio H (all months), the middle quintile presents the higher return, followed by Q2, Q4, Q5 and finally, Q1. However, when only the month of January is considered, the sequence has more to do with size, as it becomes Q1, Q3, Q2, Q4, and Q5. Curiously, the difference between January portfolio H and Mean portfolio H is only statistically significant for Q1 and Q3 (10% level).

Regarding portfolio L, for all months, the order is as follows: Q1, Q2, Q4, Q5, and Q3. Interestingly, Q3 earned the highest return for portfolio H, while Q3 earned the lowest return for portfolio L. Once again, when the analysis only includes January, there is more linearity between size and return as the sequence is Q1, Q2, Q3, Q4 and Q5. Similar to what happens with portfolio H, the difference between January portfolio L and the remaining year is statistically relevant for Q1, Q3 but also for Q2.

Regarding portfolio H-L, its return is positive for all size quintiles both for all months and only January, despite these differences not being statistically different from zero. Neither of the cases analysed presents a linearity between size and return. Comparing portfolio H-L from January to the portfolio H-L referring to all months, its difference is statistically different from zero in the extreme quintiles.

As per the January effect, it is felt more profoundly in the portfolio H-L, the portfolio created to mimic the return behaviour of marginal firms. The portfolio L is the one less affected by this pattern, actually being counteracted in the largest quintile, which makes sense as it represents relatively safer companies.

Table XI

Return Characteristics of Portfolios Classified based on Multiple Betas

Data covers the period of 1961-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. Quintiles are based on the stocks size as December of the previous year. H contains all the stocks that have, at the same time, beta-LEV and beta-DIV above the median in each year and each quintile. L contains all the stocks that have, at the same time, beta-LEV and beta-DIV below the median in each year and each quintile. H-L corresponds to the difference between H and L for each year and each quintile.

	Mean	January	% Difference
Smallest Quintile			
H	1.04%	7.17%	589%***
L	1.29%	5.43%	320%***
H-L	0.10%	1.91%	1827%*
Quintile Two			
H	1.36%	2.58%	89%
L	1.18%	2.35%	99%*
H-L	0.05%	1.24%	2587%
Quintile Three			
H	1.42%	3.62%	155%***
L	0.90%	1.81%	101%*
H-L	0.42%	1.41%	239%
Quintile Four			
H	1.20%	1.94%	62%
L	1.16%	1.33%	14%
H-L	0.03%	0.61%	1679%
Largest Quintile			
H	1.11%	1.44%	30%
L	1.05%	0.79%	-24%
H-L	0.06%	0.65%	914%*

*denotes significance at the 10% level for two-tailed t-tests
**denotes significance at the 5% level for two-tailed t-tests
***denotes significance at the 1% level for two-tailed t-tests

4.5. Size Portfolios' Betas and Return

In this section, I regress the excess return of the twenty size equally weighted portfolios created in section 4.2. on the excess returns of portfolio VWNYS, LEV and DIV, resulting in an alpha and three coefficients: beta-VWNYS, beta-LEV, and beta-DIV, respectively. The regression is as follows:

$$r_t - RF_t = \alpha + \hat{\beta}_{VWNYS}(VWNYS_t - RF_t) + \hat{\beta}_{LEV} LEV_t + \hat{\beta}_{DIV} DIV_t + \epsilon_t$$

The average monthly returns and the average log of the equity value of the 20 size portfolios are also computed. This analysis is performed for three different samples: the Original Sample, which corresponds to the period between 1964 and 1985; the After Sample, which englobes the years from 1985 to 2020; and the Full Sample, which includes the period from 1964 to 2020. The results for the Original Sample, After Sample and Full Sample can be found in Table XII, Table A (appendix) and Table B (appendix), respectively.

Table XII

Portfolios' Betas and Returns – Original Sample (1964 – 1985)

Data covers the period of 1964-1985. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. Vigintiles are based on the stocks size as December of the previous year. Estimated betas are multiple regression coefficients of the portfolios in of excess T-bill and VWNYS, LEV and DIV.

Portfolio	SR (%)	Average Monthly ER (%)	Average Log(size)	α	VWNYS-β	LEV-β	DIV-β	R^2 (%)
1	54.51	1.39	11.31	0.008**	1.30***	0.93***	0.40***	54.60
2	53.00	1.14	11.02	0.006**	1.25***	0.72***	0.30***	65.30
3	56.12	1.09	11.23	0.006***	1.21***	0.57***	0.23***	69.90
4	46.51	0.91	12.27	0.004**	1.23***	0.52***	0.25***	72.00
5	46.78	0.88	12.56	0.004**	1.23***	0.45***	0.19***	74.40
6	44.47	0.82	12.10	0.004**	1.21***	0.44***	0.18***	74.70
7	41.70	0.73	11.92	0.003**	1.19***	0.33***	0.18***	78.70
8	48.53	0.84	12.81	0.004***	1.21***	0.28***	0.11**	80.20
9	41.79	0.71	12.10	0.003**	1.18***	0.24***	0.13***	80.40
10	38.42	0.62	12.92	0.002*	1.14***	0.27***	0.13***	82.90
11	46.45	0.74	13.08	0.004***	1.13***	0.27***	0.14***	82.60
12	34.82	0.55	11.74	0.002	1.13***	0.23***	0.10***	84.50
13	37.32	0.58	12.53	0.002*	1.16***	0.16**	0.06*	87.00
14	36.71	0.57	12.74	0.002*	1.17***	0.12	0.05	89.20
15	36.47	0.55	12.50	0.002*	1.14***	0.12*	0.02	89.90
16	32.77	0.48	13.03	0.001	1.12***	0.17*	0.02	90.00
17	27.95	0.40	13.40	0.000	1.11***	0.15***	0.01	92.10
18	27.61	0.37	13.70	0.000	1.05***	0.11***	-0.01	93.10
19	21.97	0.29	13.83	0.000	1.02***	0.05*	-0.01	94.40
20	12.32	0.15	15.02	-0.001**	0.98***	-0.12***	-0.05**	95.30

*denotes significance at the 10% level for two-tailed t-tests

**denotes significance at the 5% level for two-tailed t-tests

***denotes significance at the 1% level for two-tailed t-test

In the Original Sample, beta-VWNYS is always statistically significant at less than one percent, and beta-LEV is only not significant in one out of the twenty regressions performed (for portfolio 14) for different significance levels. As for beta-DIV, there are six scenarios where this coefficient is insignificant in explaining portfolios' return. Nevertheless, from this analysis and for this sample period, it is possible to conclude that, overall, all three factors are essential in estimating the return of a given portfolio

Interestingly, all three coefficients show a common pattern: they change almost monotonically, as when size increases, the betas tend to decrease. As betas are higher for portfolios of smaller stocks, they have a greater effect on portfolios with lower market capitalizations. Another important aspect to consider is that, in this sample, generally, when size increases, the excess return decreases, meaning there is a negative relationship between these two variables. Contrarily, the model's explanatory power tends to increase with size meaning that these models can explain a bigger portion of the portfolios' return for portfolios of larger size. Finally, when it comes to Sharpe Ratios, the portfolios with smaller stocks tend to have higher Sharpe Ratios, despite this relationship not being linear.

Alpha is significantly positive in 14 portfolios and negative in only 1 portfolio, the one containing the 5% largest stocks. A positive (negative) alpha indicates that a "mean-variance" investor with access to VWNYS, LEV and DIV would also want to have some positive (negative) weight on the size portfolio.

In the After Sample – Table A (appendix) - beta-VWNYS is still always statistically significant at less than one percent, and beta-LEV remains being significant in all but one case – portfolio 20. As for beta-DIV, this coefficient is only insignificant in explaining portfolios' return in the two largest portfolios. This way, all three factors kept being important in explaining time-series variation in the portfolios' return.

In this period, beta-LEV, beta-DIV, and beta-VWNYS have changed almost monotonically, despite beta-LEV and beta-DIV decreasing with size and beta-VWNYS increasing with size. The latter indicates that LEV and DIV greatly influence portfolios of smaller stocks, whereas VWNYS has more influence in portfolios with higher market capitalizations.

In the After Sample, there is no longer a clear relationship between size and excess return: the smallest portfolio presents the highest excess return, but the highest portfolio doesn't offer the lowest excess return. As per the Sharpe Ratio, the portfolios with the highest value for this indicator are the ones with higher market capitalizations – which completely shifted from the Original Sample. In this sample, alpha is never significantly different from zero, meaning that the size portfolios do not add anything to the factors in the RHS. Therefore, investing (long or short) in the size portfolios would not increase the Sharpe ratio.

Another remark to make is that the average size for companies in NYSE from the period analysed in the Original to the period observed in the After sample has significantly increased.

Finally, in the Full Sample – Table B (appendix) – all three factors, are almost always consistently significant in explaining portfolios' return.

Once again, betas change monotonically with size: beta-LEV and beta-DIV decreasing with size and beta-VWNYS increasing with size, similarly to what happens in the After Sample. Nevertheless, the behaviour of this sample Sharpe Ratio and excess return resembles more the Original Sample, as both decrease with size. As per alpha, it is only significantly positive for the portfolio containing the 5% smallest stocks – meaning that, out of the 20 size portfolios, that portfolio is the only one on which investors would want to have weight in (positive, as alpha is bigger than 0).

4.6. Cross Sectional Analysis

This part is intended to study whether the regression coefficients in the previous three samples can explain the return difference between small and large firms in a multiple cross-sectional regression and therefore to determine if investors demand risk premium against DIV, LEV and VWNYS. To study the size-effect, I also include the factor Log(Size). The cross-section results for the three samples are as follows:

Original Sample

$$r_i\ (\%) = -0.99 + 0.00\ \text{Log(size)} + 1.28\ \hat{\beta}_{VWNYS_i} + 0.52\ \hat{\beta}_{LEV_i} + 0.64\ \hat{\beta}_{DIV_i} + \epsilon_i$$

After Sample

$$r_i\ (\%) = -1.01 + 0.08\ \text{Log(size)} + 0.41\ \hat{\beta}_{VWNYS_i} + 0.20\ \hat{\beta}_{LEV_i} + 1.27\ \hat{\beta}_{DIV_i} + \epsilon_i$$

Full Sample

$$r_i\ (\%) = -1.63 + 0.06\ \text{Log(size)} + 1.10\ \hat{\beta}_{VWNYS_i} + 1.19\ \hat{\beta}_{LEV_i} + 0.87\ \hat{\beta}_{DIV_i} + \epsilon_i$$

The results for the latter regressions, associated p-Values and R-squared can be found in Table XIII.

Table XIII

Cross Sectional Analysis – 3 Samples

Cross sectional regressions across the three different samples and associated p-Values and R-squared. Original Sample, After Sample and Full Sample correspond to the periods between 1964-1985, 1985-2020 and 1964-2020, respectively. The coefficients are in percentage.

	Original Sample	After Sample	Full Sample
Intercept	-0.99	-1.01	-1.63
p-Value (=0)	0.23	0.30	0.05
γ-Log(size)	0.00	0.08	0.06
p-Value (=0)	0.94	0.04	0.03
γ-VWNYS	1.28	0.41	1.10
p-Value (=0)	0.21	0.44	0.03
γ-LEV	0.52	0.20	1.19
p-Value (=0)	0.07	0.78	0.04
γ-DIV	0.64	1.27	0.87
p-Value (=0)	0.27	0.00	0.07
R-squared (%)	96.40	64.90	87.20

In the Original Sample, only γ-LEV is significantly different from zero, and therefore beta-LEV can significantly explain the cross-sectional average returns differences at the level of 10%. The latter indicates that one unit increase in LEV requires an additional 0.52% premium.

When it comes to the After Sample, beta-LEV stopped being significant in capturing the return differences, while Log(size) and beta-DIV have explanatory power. This way, per each unit increase in DIV and Log(size), investors demand an extra 1.27% and 0.08% premium, respectively.

Finally, regarding the Full Sample, all multiple-risk exposures significantly explain the difference in returns between small and large firms: one unit increase in VWNYS, LEV, DIV, and Log(size) requires an extra 1.10%, 1.19%, 0.87% or 0.06% premium, respectively. The portfolios designed to mimic marginal firms, in this sample, can actually explain the difference in returns of small and large firms. Furthermore, beta-VWNYS, is also important, contradicting FamaMacBeth regressions that argue that beta is not relevant in explaining the cross-section of returns.

As the alpha in the Full Sample is significantly different from zero at the 5% level, these multiple risk exposures are not enough to explain the test assets, contrarily to what happens in the other two samples.

All three Samples contradict the findings in Chan and Chen (1991), as between 1956 and 1985, the authors concluded that none of the risk exposures could significantly explain the average returns differential.

4.7. Alpha-LEV and Alpha-DIV Estimation – CAPM

In this section, for the three samples, I regress the excess return of portfolio LEV on the excess returns of portfolio VWNYS, as well as the excess return of portfolio DIV on the excess returns of portfolio VWNYS, as presented below:

$$r_{LEV,t} - RF_t = \alpha + \hat{\beta}_{VWNYS}(VWNYS_t - RF_t) + \epsilon_t$$

$$r_{DIV,t} - RF_t = \alpha + \hat{\beta}_{VWNYS}(VWNYS_t - RF_t) + \epsilon_t$$

As presented in Table XIV, alpha-LEV is significantly positive in the Original and Full Sample, suggesting that investors holding the market should also allocate part of their wealth on LEV (with positive weight).

Regarding alpha-DIV, as these values are not statistically different from zero, VWNYS can explain the totality of portfolio DIV.

Table XIV

Alpha-LEV and Alpha-DIV Analysis– 3 Samples

Alpha-DIV and Alpha-LEV estimation across the three different samples and associated p-Values. Original Sample, After Sample and Full Sample correspond to the periods between 1964-1985, 1985-2020 and 1964-2020, respectively.

	Original Sample	After Sample	Full Sample
α-LEV	0.002	0.001	0.002
p-Value (=0)	0.10	0.24	0.03
α-DIV	-0.001	-0.001	-0.001
p-Value (=0)	0.66	0.70	0.72

4.8. Size Portfolio's with Fama and French 5 Betas

After the publication of Chan and Chen (1991), several factor models were introduced in the field of Finance. Therefore, this part of the analysis will introduce three of the Fama and French 5-Factors Model: RMW, CMA and HML. SMB and Mkt-Rf were excluded due to collinearity with Log(size) - that is, once again, introduced in section 4.9 - and VWNYS, respectively. In this section, I regress the excess return of the twenty size equally weighted portfolios created in section 4.2. on the excess returns of portfolio VWNYS, LEV, DIV, RMW, CMA and HML, resulting in an alpha and six coefficients: beta-VWNYS, beta-LEV, beta-DIV, beta-RMW, beta-CMA and beta-HML, respectively. The regression is as follows:

$$\mathrm{r_t} - \mathrm{RF_t} = \alpha + \hat{\beta}_{VWNYS}(\mathrm{VWNYS_t} - \mathrm{RF_t}) + \hat{\beta}_{LEV}\,\mathrm{LEV_t} + \hat{\beta}_{DIV}\,\mathrm{DIV_t} - \hat{\beta}_{RMW}\,\mathrm{RMW_t} + \hat{\beta}_{CMA}\,\mathrm{CMA_t} + \hat{\beta}_{HML}\,\mathrm{HML_t} + \epsilon_t$$

The results for the Original Sample, After Sample and Full Sample can be found in Table XV, Table C (appendix) and Table D (appendix), respectively.

In the Original Sample, beta-LEV is hardly ever significant in explaining portfolios' average return. As for beta-DIV and beta-HML, they are only significant in roughly 65% of the cases. Despite the new factors included, beta-VWNYS remained significant in explaining portfolios' returns, together now with beta-RMW and beta- CMA.

It is also possible to find monotonicity in these betas' analysis, as the old factors (beta-VWNYS, beta-LEV and beta-DIV) and beta-HML decrease with size, whereas the new factors (except for beta-HML) increase with size. Nevertheless, as the absolute value of all betas is higher in smaller stocks, all the factors analysed greatly influence the return of portfolios containing smaller stocks, despite only beta-VWNYS, beta-DIV, beta-RMW, beta-CMA and beta-HML being significant.

Overall, these alphas are similar to the ones obtained in Table XII. In the first sixteen portfolios, the alphas are statistically different from zero, taking positive values. On the other hand, portfolio 20 has a negative alpha. This way, to increase the Sharpe ratio, a 'mean-variance' investor with access to the RHS factors should also invest long in Portfolio 1 to 16 (positive alpha) or short Portfolio 20 (negative alpha).

Table XV

Portfolios' Betas – Original Sample (1964 – 1985)

Data covers the period of 1964-1985. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. HML corresponds to the return spread between companies with high book-to-market value ratio and companies with a low book-to-market value ratio. RMW corresponds to the return spread between the two robust operating profitability portfolios and the two weak ones. CMA corresponds to the return spread between the two conservative investment portfolios minus the two aggressive ones. 5-Factors Model data was retrieved from the Kenneth French website.

Portfolio	α	VWNYS-β	LEV-β	DIV-β	RMW-β	CMA-β	HML-β	R^2 (%)
1	0.008**	1.33***	0.45*	0.34***	-0.76**	-0.82**	0.86**	58.60
2	0.006**	1.26***	0.37*	0.26***	-0.51**	-0.90***	0.81***	69.20
3	0.007***	1.21***	0.24*	0.19***	-0.58***	-0.74***	0.64***	73.60
4	0.005**	1.24***	0.22	0.22***	-0.50***	-0.56**	0.55**	74.80
5	0.005**	1.23***	0.19	0.16***	-0.50***	-0.65***	0.53***	77.20
6	0.004**	1.21***	0.21*	0.15***	-0.45**	-0.61***	0.48**	77.10
7	0.004**	1.18***	0.12	0.15***	-0.49***	-0.54***	0.40**	81.00
8	0.005***	1.20***	0.11	0.08*	-0.38***	-0.41**	0.31*	81.60
9	0.004**	1.17***	0.08	0.11**	-0.38***	-0.42***	0.31**	81.90
10	0.003**	1.14***	0.11	0.11**	-0.40***	-0.37***	0.27**	84.40
11	0.005***	1.11***	0.15*	0.12***	-0.42***	-0.38**	0.20	84.00
12	0.003*	1.12***	0.09	0.08**	-0.40***	-0.36***	0.22*	85.90
13	0.003**	1.13***	0.07	0.04	-0.39***	-0.32***	0.13	88.00
14	0.003**	1.16***	0.02	0.03	-0.35***	-0.24**	0.13	90.10
15	0.003**	1.13***	0.02	0.00	-0.32***	-0.27***	0.16**	90.80
16	0.002*	1.11***	0.06	0.00	-0.40***	-0.27***	0.13*	91.20
17	0.001	1.10***	0.07	-0.01	-0.34***	-0.18**	0.06	92.90
18	0.001	1.06***	0.04	-0.02	-0.19***	0.01	0.02	93.50
19	0.000	1.01***	0.03	-0.02	-0.21***	-0.01	-0.06	94.70
20	-0.001*	0.98***	-0.06*	-0.04**	0.09*	0.11*	-0.11	95.60

*denotes significance at the 10% level for two-tailed t-tests
**denotes significance at the 5% level for two-tailed t-tests
***denotes significance at the 1% level for two-tailed t-tests

In the After Sample – Table C (appendix) - beta-LEV is significant in explaining portfolios' average return in more regressions than in the Original Sample, around 60% of the cases. Beta-DIV has also become significant in more cases, being left out in the two largest portfolios. Nevertheless, beta-CMA lost explanatory power, being only significant in one case, whereas beta-RMW is now only significant in 70% of the portfolios analysed (compared to the previous 100%). Beta-VWNYS remains being significant in 100% of the cases and beta-HML in 70%.

All betas, except for HML, kept showing a monotonical pattern. Still, beta-VWNYS increases with size in this sample, contrary to the Original, and, therefore, lost influence in explaining the returns of smaller stocks portfolios' but gained influence in the portfolios containing larger stocks.

In the After Sample, less alphas are statistically different from zero, meaning that the RHS factors completely explain the size-portfolios in more cases. Nevertheless, in the two cases where the alphas are statistically significant, as they are positive, the investors with access to the RHS factors should long the respective size portfolios.

Finally, in the Full Sample – Table D (appendix), beta-VWNYS, beta-DIV, beta-RMW and beta-HML are almost always consistently significant in explaining portfolios' return. Contrarily, beta-CMA is hardly ever significant. As per beta-LEV, this factor is significant in roughly 65% of the cases analysed.

Once again, all betas but HML, change monotonically with size: beta-LEV and beta-DIV decrease with size and beta-VWNYS, beta-RMW and beta-CMA increase with size, similarly to what happens in the After Sample.

4.9. Cross Sectional Analysis including FF5

The purpose of this part is to examine whether these factors in multiple cross-sectional regressions, as in part 4.6, can explain the difference in returns between small and large firms. Besides the factors considered in 4.8, I also include the Log(Size). For each of the three samples, the cross-sectional results are presented below:

Original Sample

$$r_i\ (\%) = -1.02 + 0.00\ \text{Log(size)} + 1.19\ \hat{\beta}_{VWNYS_i} + 0.55\ \hat{\beta}_{LEV_i} + 0.54\ \hat{\beta}_{DIV_i} - 0.11\ \hat{\beta}_{RMW_i} - 0.19\ \hat{\beta}_{CMA_i} + 0.07\ \hat{\beta}_{HML_i} + \epsilon_i$$

After Sample

$$r_i\ (\%) = -0.69 + 0.03\ \text{Log(size)} + 0.99\ \hat{\beta}_{VWNYS_i} + 0.12\ \hat{\beta}_{LEV_i} + 1.74\ \hat{\beta}_{DIV_i} - 0.23\ \hat{\beta}_{RMW_i} - 0.36\ \hat{\beta}_{CMA_i} - 1.21\ \hat{\beta}_{HML_i} + \epsilon_i$$

Full Sample

$$r_i\,(\%) = -2.01 + 0.02\,\mathrm{Log(size)} + 2.16\,\hat{\beta}_{VWNYS_i} + 1.57\,\hat{\beta}_{LEV_i} - 0.09\,\hat{\beta}_{DIV_i} - 1.32\,\hat{\beta}_{RMW_i} + 0.92\,\hat{\beta}_{CMA_i} - 0.09\,\hat{\beta}_{HML_i} + \epsilon_i$$

The results for the latter regressions and respective p-Values and R-squared can be found in Table XVI.

Table XVI

Cross Sectional Analysis – 3 Samples

Cross sectional regressions across the three different samples and associated p-Values and R-squared. Original Sample, After Sample and Full Sample correspond to the periods between 1964-1985, 1985-2020 and 1964-2020, respectively. The coefficients are in percentage.

	Original Sample	After Sample	Full Sample
Intercept	-1.02	-0.69	-2.01
p-Value (=0)	0.28	0.58	0.01
γ-Log(size)	0.00	0.03	0.02
p-Value (=0)	0.89	0.59	0.63
γ-VWNYS	1.19	0.99	2.16
p-Value (=0)	0.13	0.28	0.00
γ-LEV	0.55	0.12	1.57
p-Value (=0)	0.34	0.90	0.00
γ-DIV	0.54	1.74	-0.09
p-Value (=0)	0.45	0.01	0.86
γ-RMW	-0.11	-0.23	-1.32
p-Value (=0)	0.75	0.68	0.00
γ-CMA	-0.19	-0.36	0.92
p-Value (=0)	0.60	0.57	0.03
γ-HML	0.07	-1.21	-0.09
p-Value (=0)	0.90	0.15	0.89
R-squared (%)	96.50	71.20	94.40

In the Original Sample, none of the multiple-risk exposures is significant in explaining the return difference between small and large firms, as their associated p-Value is high. Nevertheless, it is important to note that in the time-series regression, beta-VWNYS, beta-DIV, beta-RMW, beta-CMA and beta-HML were significant in explaining a portfolio's average return.

When it comes to the After Sample, beta-DIV started being significant in capturing the return differences, while all the others have no explanatory power. This is, an investor, for each unit increase in DIV, demands a 1.74% premium.

Regarding the Full Sample, DIV stopped being significant. Beta-VWNYS, beta-LEV, beta-RMW and beta-CMA present significant power in explaining the difference in returns between small and large firms. Nevertheless, γ-VWNYS and γ-LEV have the absolute higher value, meaning that beta-VWNYS and beta-LEV are the ones that most impact the return spread – if VWNYS (LEV) increase by one unit, the investors require an extra 2.16% (1.57%) to their original return. This is meaningful as Fama and French (1992) argues that beta is dead and, in this sample, beta-VWNYS plays an important role in explaining the return spreads between small and large firms.

As the alpha in the Full Sample is significantly different from zero at the 1% level, other factors might explain the return differences besides the ones already included. Nevertheless, this Full Samples' R-squared is higher than the one in 4.6.

Finally, for the Original and After Sample, the R-squareds and p-Values associated to alpha are higher than the ones in section 4.6, it indicates that a higher proportion of the average returns is explained due to the introduction of the new factors. In other words, this model represents a better fit than the one in 4.6.

4.10. Alpha-LEV and Alpha-DIV Estimation – FF5

In this section, for the three samples, I regress the excess return of portfolio LEV on the FF5 excess returns, as well as the excess return of portfolio DIV on the FF5 excess returns, as presented below:

$$r_{LEV,t} - RF_t = \alpha + \hat{\beta}_{RMW} RMW_t + \hat{\beta}_{CMA} CMA_t + \hat{\beta}_{HML} HML_t + \hat{\beta}_{SMB} SMB_t + \hat{\beta}_{MKT} (MKT_t - RF_t) + \epsilon_t$$

$$r_{DIV,t} - RF_t = \alpha + \hat{\beta}_{RMW} RMW_t + \hat{\beta}_{CMA} CMA_t + \hat{\beta}_{HML} HML_t + \hat{\beta}_{SMB} SMB_t + \hat{\beta}_{MKT} (MKT_t - RF_t) + \epsilon_t$$

As presented in Table XVII, in every sample, both alpha-LEV and alpha-DIV are not statistically significant different from zero, and, therefore, it suggests that the factors on the right side of the equation can explain the totality of portfolio LEV and DIV.

Table XVII

Alpha-LEV and Alpha-DIV Analysis– 3 Samples

Alpha-LEV and Alpha-DIV estimation across the three different samples and associated p-Values. Original Sample, After Sample and Full Sample correspond to the periods between 1964-1985, 1985-2020 and 1964-2020, respectively.

	Original Sample	After Sample	Full Sample
α-LEV	-0.001	0.001	0.002
p-Value (=0)	0.72	0.32	0.12
α-DIV	-0.003	-0.001	-0.001
p-Value (=0)	0.27	0.57	0.30

5. Sharpe ratios

To complete the assessment of the risk of each one of the portfolios, adjusted to the returns, Sharpe ratios were computed and presented in Table XVIII.

Table XVIII

Annualized Sharpe Ratios

Data covers the period of 1964-1985; 1985-2020 and 1964-2020, respectively. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. HML corresponds to the return spread between companies with high book-to-market value ratio and companies with a low book-to-market value ratio. RMW corresponds to the return spread between the two robust operating profitability portfolios and the two weak ones. CMA corresponds to the return spread between the two conservative investment portfolios minus the two aggressive ones. SMB corresponds to the return spread between the average return on three small portfolios minus the average return on three big ones.

Original Sample (%)						
VWNYS	LEV	DIV	RMW	CMA	HML	SMB
23.34	30.40	-2.12	24.60	58.35	67.89	57.78
After Sample (%)						
VWNYS	LEV	DIV	RMW	CMA	HML	SMB
55.32	41.34	21.03	48.23	35.80	8.31	8.40
Full Sample (%)						
VWNYS	LEV	DIV	RMW	CMA	HML	SMB
41.28	38.96	12.07	38.99	45.95	29.74	27.86

There is only one case for all three samples where the Sharpe ratio is negative (Original Sample – Portfolio DIV). Therefore, the average return difference between firms with dividends cut and a matching smaller firm that did not cut dividends is negative. Nevertheless, portfolio DIV, together with portfolios VWNYS, LEV, and RMW, increased their performance from the Original Sample to the After Sample, contrary to what happened with CMA, HML and SMB. The one portfolio with the most considerable performance improvement was VWNYS, in opposition to HML (highest decline in the Sharpe ratio). For both the After and Full Sample, according to this indicator, the best portfolio to invest in is the VWNYS.

6. Conclusion

Chan and Chen (1991) concluded that the marginal characteristics of firms, which are more frequently found among small firms, caused the discrepancy in returns between small and large firms. This thesis shows, however, that this is no longer true and that the size effect is now dead. Between 1956 and 2020, despite lowest size quintile NYSE firms' presenting more the marginal characteristics than NASDAQ firms they still showed lower returns than NASDAQ. Additionally, in the After Sample, there is no longer a linear relationship between size and excess returns: there are portfolios with large sizes and high excess returns and portfolios with small sizes and low excess returns.

In the Original Sample, after the introduction of the FF5, the proposed portfolio LEV, which aimed to capture the performance of firms with a considerable level of financial leverage, stopped being significant in explaining portfolios' average return. In the After and Full Sample, LEV could only explain the average returns in 60% and 65% of the cases, respectively (compared to the almost 100% that occurred without FF5). Contrarily, DIV, the portfolio that aims to capture the return behaviour of marginal firms that have drastically cut their dividends, kept its explanatory power after the introduction of the new factors in all three samples. As per the VWNYS portfolio, with and without the FF5, and for the three samples, it was consistently significant in explaining the portfolios' average return.

As per the new factors, in all three samples, RMW and HML were essential in explaining average returns. Regarding CMA, it only presented significant explaining power in the Original Sample.

Regarding the return difference between small and large firms, before the introduction of FF5, in the Full Sample, all multiple-risk exposures (VWNYS, LEV DIV, and Log(size)) were significantly important in explaining such spread. Nevertheless, after the introduction of FF5, in the Full Sample, beta-DIV stopped being significant. Beta-VWNYS, beta-LEV, beta-RMW and beta-CMA presented significant power in explaining the difference in returns between small and large firms. More specifically, as γ-VWNYS and γ-LEV had the absolute higher value, beta-VWNYS and beta-LEV were the ones that most impacted the return spread. This is meaningful as Fama and French (1992) argues that beta is dead and, in this sample, beta-VWNYS played an integral role in explaining the return spreads between small and large firms.

Appendix

Table A

Portfolios' Betas and Returns – After Sample (1985 - 2020)

Data covers the period of 1985-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. Vigintiles are based on the stocks size as December of the previous year. Estimated betas are multiple regression coefficients of the portfolios in of excess T-bill and VWNYS, LEV and DIV.

Portfolio	SR (%)	Average Monthly ER (%)	Average Log(size)	α	VWNYS-β	LEV-β	DIV-β	R^2 (%)
1	51.09	1.14	12.21	0.004	0.67***	0.53***	0.54***	40.60
2	41.24	0.65	12.32	-0.001	0.74***	0.45***	0.22***	64.70
3	44.89	0.64	12.41	0.000	0.74***	0.40***	0.16**	71.20
4	46.31	0.68	12.80	0.000	0.78***	0.35***	0.22***	72.30
5	37.23	0.53	12.99	-0.002	0.78***	0.35***	0.21***	75.60
6	43.03	0.61	13.20	-0.001	0.82***	0.28***	0.17***	75.70
7	48.80	0.71	13.47	0.000	0.88***	0.26***	0.17***	77.90
8	46.28	0.74	13.76	-0.001	0.95***	0.28***	0.20***	77.30
9	46.91	0.75	13.79	0.000	0.93***	0.29***	0.25***	78.70
10	53.00	0.85	13.79	0.001	1.00***	0.19**	0.24***	80.20
11	47.60	0.74	14.16	0.000	0.99***	0.16***	0.23***	82.60
12	46.84	0.76	13.93	-0.001	1.07***	0.15**	0.19***	83.10
13	53.45	0.81	14.37	0.000	1.01***	0.16***	0.19***	85.40
14	54.71	0.79	14.60	0.000	1.01***	0.10**	0.14***	87.10
15	54.52	0.83	14.63	0.000	1.08***	0.10**	0.09**	88.20
16	55.55	0.80	15.06	0.000	1.04***	0.06**	0.11***	90.60
17	59.38	0.86	15.26	0.001	1.06***	0.08**	0.09***	91.00
18	58.82	0.82	15.75	0.001	1.02***	0.10***	0.08***	93.50
19	59.40	0.78	16.32	0.001	1.01***	0.06**	-0.01	94.10
20	55.06	0.71	17.56	0.000	1.03***	0.01	-0.01	97.30

*denotes significance at the 10% level for two-tailed t-tests

**denotes significance at the 5% level for two-tailed t-tests

***denotes significance at the 1% level for two-tailed t-tests

Table B

Portfolios' Betas and Returns – Full Sample (1964 - 2020)

Data covers the period of 1964-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. Vigintiles are based on the stocks size as December of the previous year. Estimated betas are multiple regression coefficients of the portfolios in of excess T-bill and VWNYS, LEV and DIV.

Portfolio	SR (%)	Average Monthly ER (%)	Average Log(size)	α	VWNYS-β	LEV-β	DIV-β	R^2 (%)
1	52.78	1.25	11.95	0.005**	0.91***	0.55***	0.45***	43.8
2	46.06	0.83	12.10	0.002	0.93***	0.42***	0.25***	61.00
3	50.01	0.82	12.11	0.002	0.92***	0.35***	0.19***	66.60
4	46.60	0.77	12.73	0.001	0.95***	0.31***	0.23***	69.00
5	41.06	0.66	12.85	0.000	0.96***	0.29***	0.19***	71.60
6	43.74	0.69	12.98	0.001	0.97***	0.25***	0.17***	72.40
7	46.15	0.72	13.13	0.001	1.00***	0.22***	0.17***	76.80
8	47.96	0.79	13.50	0.001	1.06***	0.23***	0.15***	77.50
9	45.93	0.75	13.43	0.001	1.04***	0.23***	0.19***	78.60
10	49.33	0.80	13.54	0.001	1.06***	0.19***	0.18***	80.80
11	47.74	0.75	13.86	0.001	1.04***	0.17***	0.18***	82.20
12	42.62	0.68	13.53	0.000	1.09***	0.17***	0.14***	83.40
13	47.47	0.73	14.00	0.001	1.08***	0.14***	0.12***	85.60
14	47.30	0.71	14.22	0.001	1.08***	0.08**	0.09***	87.50
15	47.63	0.72	14.24	0.001	1.11***	0.10***	0.05**	88.70
16	47.03	0.68	14.67	0.001	1.07***	0.09***	0.06***	90.10
17	46.69	0.68	14.88	0.001	1.08***	0.10***	0.05**	91.30
18	47.05	0.65	15.36	0.000	1.04***	0.11***	0.04**	93.30
19	45.20	0.59	15.90	0.000	1.02***	0.06***	-0.01	94.20
20	39.03	0.50	17.14	0.000	1.02***	-0.02	-0.03**	96.30

*denotes significance at the 10% level for two-tailed t-tests
**denotes significance at the 5% level for two-tailed t-tests
***denotes significance at the 1% level for two-tailed t-tests

Table C

Portfolios' Betas – After Sample (1985 – 2020) – FF5

Data covers the period of 1985-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. HML corresponds to the return spread between companies with high book-to-market value ratio and companies with a low book-to-market value ratio. RMW corresponds to the return spread between the two robust operating profitability portfolios and the two weak ones. CMA corresponds to the return spread between the two conservative investment portfolios minus the two aggressive ones. 5-Factors Model data was retrieved from the Kenneth French website.

Portfolio	α	VWNYS-β	LEV-β	DIV-β	RMW-β	CMA-β	HML-β	R^2 (%)
1	0.006**	0.65***	0.49***	0.45***	-0.50***	-0.12	0.20	42.60
2	0.001	0.72***	0.44***	0.17**	-0.29***	-0.11	0.09	66.20
3	0.001	0.73***	0.39***	0.12*	-0.24***	-0.04	0.07	72.30
4	0.001	0.76***	0.32***	0.17***	-0.27***	-0.10	0.17*	73.70
5	0.000	0.77***	0.31***	0.17***	-0.22***	-0.07	0.19**	76.90
6	0.000	0.83***	0.25***	0.13**	-0.20***	0.06	0.10	76.70
7	0.001	0.87***	0.22***	0.12**	-0.24***	-0.08	0.19***	79.20
8	0.000	0.95***	0.22***	0.18***	-0.17**	-0.10	0.25***	78.50
9	0.000	0.93***	0.24***	0.23***	-0.14**	-0.10	0.21**	79.50
10	0.002	0.99***	0.13	0.21***	-0.21**	-0.11	0.26***	81.60
11	0.001	0.99***	0.11**	0.19***	-0.20***	-0.10	0.22***	83.80
12	0.000	1.07***	0.10	0.17***	-0.12*	-0.14	0.27***	84.20
13	0.001	1.02***	0.11	0.17***	-0.11**	-0.03	0.20***	86.30
14	0.001	1.01***	0.06	0.13***	-0.06	-0.05	0.18***	87.90
15	0.001	1.09***	0.05	0.08**	-0.06	-0.09	0.20***	89.00
16	0.001	1.05***	0.03	0.11***	-0.03	-0.03	0.13***	91.10
17	0.001	1.07***	0.04	0.08***	-0.03	-0.01	0.13***	91.50
18	0.001*	1.02***	0.08**	0.08***	-0.05	-0.11**	0.12***	93.80
19	0.000	1.03***	0.04**	0.00	0.07**	0.03	0.06	94.60
20	0.000	1.03***	0.01	-0.02	-0.03	0.04	-0.02	97.40

*denotes significance at the 10% level for two-tailed t-tests
**denotes significance at the 5% level for two-tailed t-tests
***denotes significance at the 1% level for two-tailed t-tests

Table D

Portfolios' Betas – Full Sample (1964 – 2020) – FF5

Data covers the period of 1964-2020. DIV is the difference in return between firms that have drastically reduced their dividends and a smaller firm that has not cut its dividends. LEV is the difference between a portfolio of firms in the top leverage quintile and a portfolio of low leveraged smaller firms. HML corresponds to the return spread between companies with high book-to-market value ratio and companies with a low book-to-market value ratio. RMW corresponds to the return spread between the two robust operating profitability portfolios and the two weak ones. CMA corresponds to the return spread between the two conservative

Portfolio	α	VWNYS-β	LEV-β	DIV-β	RMW-β	CMA-β	HML-β	R^2 (%)
1	0.007**	0.92***	0.39**	0.39***	-0.55***	-0.26	0.37**	46.10
2	0.003**	0.92***	0.33***	0.21***	-0.33***	-0.30*	0.28**	62.60
3	0.003**	0.92***	0.27***	0.15***	-0.29***	-0.19	0.23**	68.00
4	0.002*	0.96***	0.21***	0.19***	-0.29***	-0.18	0.26**	70.60
5	0.001	0.97***	0.20***	0.17***	-0.23***	-0.19*	0.27***	73.10
6	0.001	0.98***	0.17**	0.14***	-0.21***	-0.10	0.20**	73.40
7	0.002*	1.01***	0.13**	0.14***	-0.23***	-0.18*	0.24***	77.90
8	0.002*	1.07***	0.14*	0.13***	-0.16**	-0.16	0.26***	78.60
9	0.001	1.05***	0.16**	0.17***	-0.14**	-0.17*	0.23***	79.40
10	0.002*	1.07***	0.10	0.15***	-0.21***	-0.16*	0.27*	82.10
11	0.002**	1.05***	0.09*	0.16***	-0.21***	-0.17**	0.23***	83.30
12	0.001	1.10***	0.08*	0.12***	-0.14**	-0.18**	0.27***	84.50
13	0.001	1.09***	0.07	0.11***	-0.11**	-0.09	0.19***	86.20
14	0.001	1.09***	0.02	0.08***	-0.08**	-0.07	0.17***	88.10
15	0.001	1.12***	0.03	0.04*	-0.08**	-0.12*	0.20***	89.30
16	0.001	1.08***	0.03	0.05**	-0.08**	-0.07	0.15***	90.60
17	0.001	1.09***	0.05	0.04**	-0.06*	-0.03	0.13***	91.70
18	0.001	1.04***	0.08**	0.03	-0.07**	-0.06	0.09***	93.50
19	0.000	1.03***	0.04**	-0.01	0.04	0.04	0.04	94.40
20	0.000	1.02***	-0.01	-0.02**	0.01	0.05	-0.06**	96.40

*denotes significance at the 10% level for two-tailed t-tests
**denotes significance at the 5% level for two-tailed t-tests
***denotes significance at the 1% level for two-tailed t-tests

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