THE OPTIMAL DIVIDEND YIELD RANGE: THE CASE OF EUROPE AND SPAIN DURING THE PERIOD 2000-2009

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ABSTRACT

Using monthly data during the period 2000-2009 for 163 European and Spanish companies we show a clear non-linear relationship between dividend yields and the total stock returns earned by stockholders. This is an inverted U-shape relationship in the sense that stocks within a specific range of DY have superior returns and are the only ones with positive average returns overall our sample period. We also find that stocks within a portfolio with superior and positive returns are the ones showing lower risk when risk is measured by the average standard deviation of the portfolio. The relationship between DY and risk exhibit a U-shape. Our results contradict the semi-strong form of the Efficient Market Hypothesis and point out at the existence of an optimal dividend yield policy. These relationships persist when relating current DY, with returns and risk one, three, six months, and one year ahead, especially in the Spanish companies' case. The ten years sample includes a period with financial markets downturns and recoveries and this fact helps to reduce biases in the results related to bull or bear markets. Besides, the nonlinear relationship between DY and risk, and DY and returns cannot be explained by different market capitalization.

KEY WORDS: Dividend Policy, Portfolio Management, Trading Strategies
JEL classification: *G11, G15*

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1 Introduction

Since Miller and Modigliani (1961) and Black (1976) published their seminal papers, dividends have been a very fruitful field of studies. The irrelevance theorem of MM indicates that all dividend policies are equally optimal, and that investment policy alone determines stockholder wealth in frictionless markets. Black and Scholes (1974), following MM, consider the irrelevance of dividend policies even including transaction costs and taxes, in spite of the fact that taxes offer a different treatment between dividends and capital gains. Modigliani and Miller (1961) also support the thesis that the quantity of the dividend does not influence the price absence of fiscal effects.

But companies' daily life show that dividend' policies matters and researchers have been tirelessly looking for the reason in order to solve the puzzle that arises between theory and practice. In an interesting work DeAngelo and DeAngelo (2006) refute the MM proposition and show that dividend policy matters and that stockholders wealth is affected by it and not only determined by the investment policy. Payout policy is optimized when the present value of distributions equal the present value of project cash flows. Blau and Fuller (2008) extend the proposition of De Angelo and De Angelo´s (2006) optimal payout in terms of flexibility dividend hypothesis and found that dividend payments are negatively correlated with stock prices, and investors value dividends more when prices are lower.

On financial markets, dividends are one of the types of corporate information that have been studied by a major number of authors. The literature documents substantial empirical evidence about the forecasting power of dividend yields on future stock return, which also contradicts the semi strong form of the Efficient Market Hypothesis (EMH)[1]. Recent studies (Visscher and Filbeck (2003), Graham J.R. and Kumer A. (2006)) reveal a strong preference of the investors for high dividend yield stocks, because it is believed that these stocks offer the highest returns and it is seen as an undervaluing of the market. Many stock market investors are interested in the use of fundamental indicators like dividend yields as tools for investment strategy.

Using monthly data during a period of ten years for a set of European and Spanish companies, this paper shows a clear relationship between dividend yields and the total returns earned by stockholders, although this is not a linear relationship. It points at the existence of an optimal level of dividend yields.

Relationship between dividends and stock returns has been previously analyzed by a great number of studies. Just to mention some, Rozeff (1984), Hodrick (1992), Kothari and Shanken (1992) among others, support the predictive power of dividends in relation to stock returns. Other studies like Keim (1985), Morgan and Thomas (1998), Goetzmann and Jorion (1993) find opposite evidence.

[1] See Fama (1970).

Generally the studies find that the predictability ability of dividends is weak (i.e. Aowo and Iwaisako, 2010, Ang and Bekaert, 2011[2]), but better for long-term periods than for short-terms ones (Fama and French (1989)). Wolf (2000), Wu and Wang (2000), Cochrane (2006), Valkanov (2003) and some others, find that the power of dividend yields increases with the return horizon and support a long-term investment strategy based on dividend yields.

Our work shows a clear short-term relationship between dividend yields (DY) and stock returns, since we calculate monthly DY using dividend data from the previous twelve months and relate it to the total return earned in the current month of study. We find an inverted U-shaped contemporaneous relationship between return and DY. In the case of the Spanish companies, this relationship persists when relating current DY with returns one, three, six months and one year ahead. A related finding, although different to ours, has been already documented in the literature. Gombola and Liu (1993) sort stocks each month into portfolios ranked by dividend yield and results show that average monthly stock returns are positively related to dividend yields during bear markets and negatively related during bull markets. This different behavior depending on the situation of the markets produce the U-shaped relationship between return and yield, in which the highest return is produced by firms with either zero dividends or very high yields[3]. Morgan and Thomas (1998) also offer some evidence in favor of the non-linear relationship. Litzenberger and Ramaswamy (1979) find a non-linear association between common stock returns and dividend yields attributing the effect of dividend yield on common stock returns to taxes or to some omitted variables.

Recently, Fuller and Golstein (2011) conclude that higher dividend yields produce lower returns in advanced markets, whereas on the declining markets, results indicate a larger difference between the non-dividend paying and low dividend-yield portfolios than among the dividend-yield paying portfolios themselves.

In the present work, on average, portfolios yielding from 0% to 4% (but not portfolios with cero DY or with higher DY) have superior returns and are the only ones with positive average returns overall our sample period, for both samples the European and the Spanish one. Interestingly enough we also find that these portfolios are the ones with lower risk when risk is measured by the average standard deviation of the portfolio. The relationship between risk and DY is a U-shape relationship. These results are statistically significant. Portfolios with cero dividend yield and portfolios with dividend yield above 4% have higher risk than portfolios in between. We find this same pattern when relating dividend yields with the risk of portfolios one, three, six and one year later. This is a very robust result for both samples.

Using multiple comparison post-hoc tests and a contingency test we find that we can reject the hypothesis of independence between dividend yields and returns, and dividend yields and sigma. The results evidence the differences

[2] They confirm this evidence applying the study to 3 countries: United Kingdom, France and Germany, finding that the dividend yield's predictive power to forecast future dividend growth is not robust across sample periods or countries.
[3] This relationship between yield and return was reported in earlier studies by Blume (1980), Litzenberger and Ramaswamy (1979) and Keim (1985).

between the constructed portfolios ranked according to DY and confirm the use of this variable as a very valuable piece of information. We control for capitalization and find that, in the European case there is no relation between DY and capitalization, however in the Spanish case there is a statistically significant relationship. Portfolios with lower DY also have lower capitalization.

This is to our knowledge the first paper to document empirically the existence of such an optimal level of dividend yields with a ten years sample for two different markets and to find that the return achieved at this optimal level is inversely related with the risk profile of the portfolios when measured by sigma. These results contradict the semi-strong form of the Efficient Market Hypothesis which implies that all public information is calculated into a stock's current share price. Here, we find a fundamental variable, DY, which can be used to identify portfolios achieving superior gains with lower risk, contrary to classical finance theory.

The cases of the European[4] and Spanish[5] markets are particularly interesting for the study of dividend yield and dividend strategies because there is little research on either dividends or investors behavior in response to the release of new information contained in the dividends. Existing studies in the Spanish and European stock market focused mainly on the dividend policy rather than on dividends as a tool for investment strategy.

Even more, other published papers focus mainly on the relation between DY and profitability, leaving the analysis of the relation with other interesting variables that we take account in our work, such as the risk.

Our findings demonstrate the importance of dividends as one of the most significant items of fundamental information about stock markets and have important implications for investors regarding their investment strategy choices. Part of our conclusions is congruent with Morgan and Thomas (1998), whose results find a non-linear relationship between dividend yields and stock returns. In our study, the independence and post-hoc comparisons tests show evidence of significant differences between portfolios ranked according to DY.

The results that we obtain for these two samples are probably transferable to other countries, particularly those where firms tend to pay regular dividends, where this model can serve as an important reference when setting out portfolios based upon DY.

The plan of the paper is as follows. In section 2 we present the data, the model and the method that are used. Section 3 provides the main empirical results. In section 4 some short-term predictive relationships are described, and in section 5 the paper concludes. References follow and some tables and figures can be found in the Appendix at the end of the paper.

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[4] García-Borbolla and Larran (2005) study the factors affecting why firms pay dividends and conclude, except for Spain and U.K., that where company size has a positive influence upon the volume of dividends distribution, dividends are more useful to reduce information asymmetries about future company earnings, than to reduce agency costs.

[5] González Rodríguez (1995) analyzes the effect of dividend announcement on stock market value of firms trading at Madrid´s Stock Exchange and observes that the price reaction is larger for stocks with high dividend yields. Fonseca (1997) show a positive relation between dividend taxation and the share price response of announcements of changes in dividends and Espitia and Ruiz (1996) point out that, in the Spanish Equity Market, ex dividend-prices, on average, fall less than the dividend amount.

2 Description of the data and portfolio methodology

2.1 Description of data from individual assets.

In this paper we analyze two companies' samples[6] coming from the European and the Spanish markets. The time period of study covers ten years, from January 2000 until December 2009. This ten years[7] sample includes a period with financial markets downturns (i.e., years 2000, 2001, 2002, 2008) and recoveries (i.e. years 2003, 2004, 2005, 2006) and this fact helps to reduce biases in the results related to bull or bear markets. During this time period we calculate monthly company dividend yields (DY), returns, total risk (standard deviation of returns, or sigma) and capitalization.

The European sample is composed by the 50 firms in the Eurostoxx50 Price EUR index. This sample captures approximately 60% of the free float market capitalization of the EURO STOXX Total Market Index (TMI), which in turn covers approximately 95% of the free float market capitalization of the represented countries.

Using p_t, the adjusted closing price of a stock at the end of month *t*, we construct the series of monthly total returns in the following way:

$$r_t=\log(p_t/p_{t-1})$$

where t=1,…120. For every company, except five, we have 120 return (r_t) observations. Note that for five companies we do not have a complete dataset because they entered Eurostoxx50 after January 2000. Monthly total returns have been calculated with adjusted closing prices, taking into account any sort of distribution like cash dividends, stock dividends and stock splits.

As a robustness check we also study the Spanish stock market during the same time period and using the same methodology. We have data from 113 companies traded on the Spanish continuous market, although the dataset is complete for 91 companies.

The study of the monthly stock returns (r_t) of our sample reveals the non-normal behavior of these data. In Table A.1 we report the summary statistics of our sample and the Kolmogorov-Smirnoff test of normality. We reject normality for the European and Spanish return data.

Also we have estimated at the end of each month a risk measure for every company, σ_t. σ_t reflects the total risk of a company at month t and it has been calculated as the standard deviation of the company daily returns during the previous three months. DY_t, at the end of month *t*, have been calculated using the sum of dividends paid during the previous twelve months (t, t-1,.........., t-11) and dividing this amount by the current month end closing price (p_t). We also have at the end of each month market capitalization data for every stock (see descriptive for capitalization analysis in Table A.1).

[6] The European and Spanish data has been obtained from Bloomberg and Infobolsa databases.
[7] A ten years sample is usually considered in the literature as a long-term sample.

We present the descriptive statistics for the DY_t of our sample in Table A.2 in the appendix. In figure 1 and in figure 2 we reproduce the histograms of European firm's and Spanish firm´s DY with and without the portfolios composed by firms paying DY=0.

Figure 1. Histograms of European firm's dividend yields with and without the class DY=0. Period of study 2000-2009[8]. The total number of observations in the first histogram is 5,746. The second histogram excludes the observations with DY=0 and the number of observations is 5,484. DY data is in percentages.

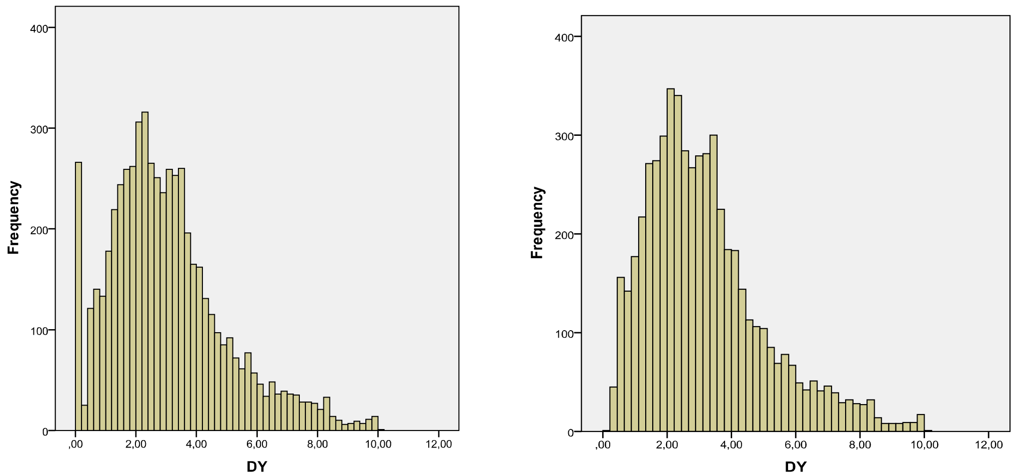
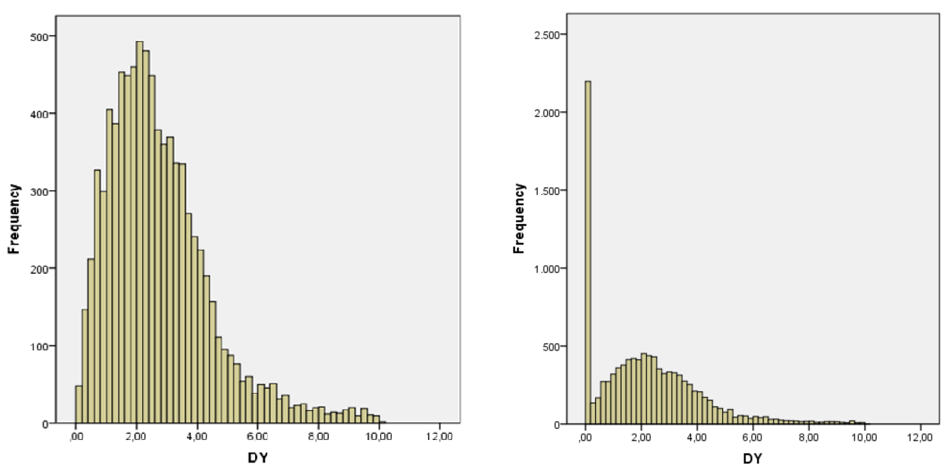


Figure 2. Histograms of Spanish firm's DY with and without the class DY=0. Sample period: 2000-2009. The total number of observations in the first histogram is 10,984. The second histogram excludes the observations with DY=0 and the number of observations is 8,356. DY data is in percentages.



2.2 Portfolios

The principal aim of this research is to study further the relationship between the DY and the return and risk characteristics of stocks. To accomplish this we construct a series of portfolios. All our monthly observations are ranked according to DY.

[8] DY greater than ten are not shown in this table. The number of observations greater than ten is 114 in the European sample and 156 in the Spanish sample.

After sorting all assets according to their DY we eliminate the assets which DYs are over ten percent[9] and with the remaining ones six groups are done. Portfolio #1 is composed by those observations with DY equal to 0, portfolio #2 with the observations with DY in the interval (0-2%], portfolio #3 with those DY in the range (2%-4%], portfolio #4 with (4%-6%], portfolio #5 with (6%-8%] and portfolio #6 with (8%-10%]. Every month for every portfolio we calculate the following variables: average return, average volatility and average capitalization. We do the same process for both markets European and Spanish. We have a total of 720 (120×6) portfolio observations for each market. Descriptive statistics of these portfolios can be found in Table A.1.

For both samples, we can reject the hypothesis of normal behavior of stock returns in every DY interval, except in the DY interval (8%-10%]. The result in the interval (8%-10%] may be due to the scarcity of observations.

The relationship between the DY_t of a given portfolio and its return can be viewed as a predictive relation, a short-term predictive relation, since for each month *t* the DY_t is calculated with data coming from the previous twelve months (t, t-1, t-2, ..., t-11) and the total return is calculated with the current end-month *t* data. We can observe in table A.1 how the returns of portfolios 2 and 3 in both samples are the highest and these two portfolios have the lowest risk. The nonlinear relationship between DY and returns becomes evident as it does the nonlinear relation between DY and risk.

In section 4 other short term predictive relationships are studied. We will relate DY_t with r_{t+1} r_{t+3}, r_{t+6}, r_{t+12}, σ_{t+1}, σ_{t+3}, σ_{t+6}, σ_{t+12}, (return and risk at t+1, t+3, t+6 and t+12) in order to test if the predictive relation is maintained during the following year.

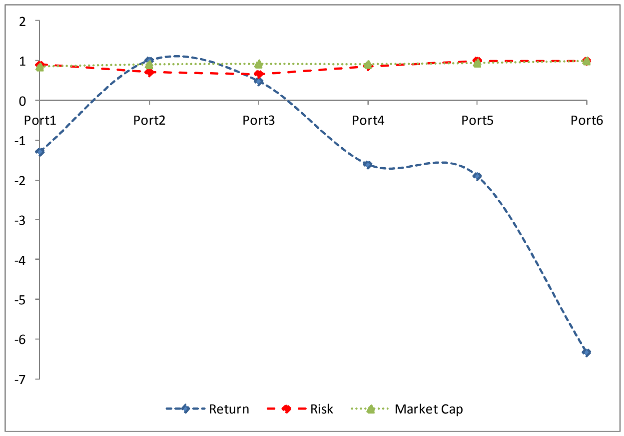
3 Empirical results of Portfolio Study

3.1 European Stock Market.

As can be seen in Table A.1 we have found different average returns for each DY interval, and we have found that the relationship between DY_t and r_t is nonlinear. It seems to follow an inverted U-shape figure. Also, it seems that the relationship between DY_t and $risk_t$ follows a U-shape relationship, meaning that the portfolios with less risk are in the middle range of DYs and are those with higher returns. In figure 3 we can graphically appreciate these relationships. We don't appreciate any difference in the portfolios according to market cap.

[9] In this way we construct 5 portfolios with a DY range of 2%, covering DYs from 0% to 10%, and one additional portfolio is composed with observations having DY=0. The number of observations with DY greater than ten is 114 for the European sample (representing the 2% of the total sample) and 156 for the Spanish sample (1.3% of the total sample).

Figure 3: European portfolios average return, risk and capitalization. Data from Table A.1. Data has been standardized for ease of comparability.



In order to test the statistical significance of these relationships we proceed to test the means equality for the six portfolios. Before we compare means we calculate the Levene's test and the Brown-Forsythe test. Both tests are used to test if the six portfolios have equal variances[10]. Table 1 shows the estimation results and the corresponding p-values. With these results we can reject the null hypothesis of homogeneity of variances in the case of portfolios' return and portfolios' sigma, but not in the capitalization case. In the capitalization case we can accept means equality for the six portfolios indicating that there is statistical independence between DY and capitalization.

Table 1. European portfolios' test.

	Portfolios' Returns		Portfolios' Sigmas		Portfolios' Capitalization	
	Statistic	P-value	Statistic	P-value	Statistic	P-value
Test for the equality of group variances						
Levene test	26.715	0.000	18.165	0.000	0.257	0.937
Brown Forsythe test	6.622	0.000	12.735	0.000		
Test for the equality of group means						
Welch t test	7.405	0.000	17.102	0.000		
Anova test					1.346	0.242

In the previous table we can also see the results for Welch's t test. The results allow us to reject the null hypothesis of means equality. Welch's t test is an adaptation of Student's t-test intended for use with two samples having possibly unequal variances.

Since the previous test do not specifically indicate which pairs of groups are significantly different, we conduct some post-hoc tests in order to determine such pairs. Results of the Games Howell test are shown in table A.3 in the appendix. This test is used when group variances are unequal and it also takes into account unequal group sizes. The

[10] The Levene's test is less sensitive than the Bartlett test to departures from normality. Since our data show a strong non-normal behavior we have used this test. Besides, the Brown-Forsythe test uses the median instead of the mean; the definition based on the median is recommended as the choice that provides good robustness against many types of non-normal data while retaining good statistical power.

results of this test suggest reclassifying the observations into 3 groups: 1-4-5, 2-3 and 6[11]. We can group the six portfolios into three buckets with the same risk-returns profiles within them, but different profiles among them. Portfolio with DY above 8% is the one with higher risk and lower returns. Portfolio with DY between 0% and 4% is the optimal one with higher returns and lower risk; and portfolios with cero DY and DY between 4% and 8%, are the ones with medium returns and risk profiles.

Finally, to find further assessment about the relationship between DY and returns, DY and sigma and DY and capitalization we construct three contingency tables and find that we can reject the hypothesis of independence between these variables. A contingency table is a type of table in a matrix format that displays the multivariate frequency distribution of the variables (see table A.4). The degree of association between the two variables is assessed by a chi-squared test for independence. The null hypothesis states that knowing the level of one variable (i.e. DY) does not help you predict the level of the other variable (i.e. returns, sigma's, market cap). In two cases (returns and sigma) we find a p-value of the chi-squared test being cero (see table 2 below) and we can reject the null hypothesis. So DY is not independent of the total return earned or of the risk borne by stockholders. However it is independent of the market capitalization.

Table 2: Chi-Square Test for Independence. European' sample.

Test for Independence between DY and Returns			
	Statistic	P-value	N
Chi-squared Test	135.6	0.000	5746

Test for Independence between DY and Sigma			
	Statistic	P-value	N
Chi-squared Test	238.1	0.000	5690

Test for Independence between DY and Market Capitalization			
	Statistic	P-value	N
Chi-squared Test	16.7	0.337	5243

After this analysis we can conclude that the knowledge of the portfolio DY will help us predict the risk-return characteristics of the portfolio. With these results we can reject the hypothesis of independence between DYs, returns and risk.

[11] Tamhane test, Dunett' T3 and Dunnett' C were also computed and lead to the same conclusions. Results are available upon request.

3.2 Spanish Stock Market.

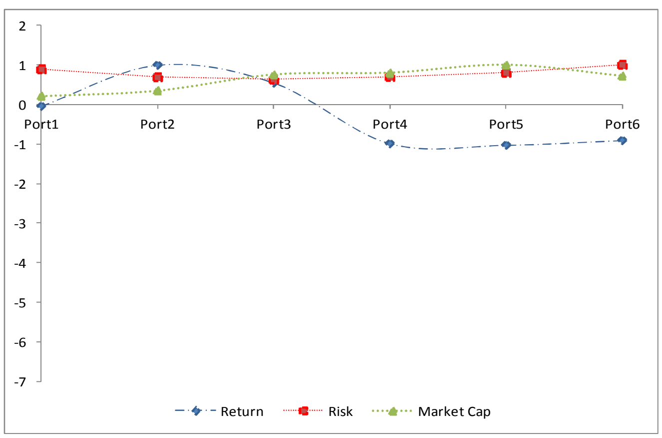
As a robustness check of the previous results, we have performed the same study using a sample of 113 Spanish firms. We have first proceed to check the means and variances equality for the six portfolios composed by Spanish firms (see Table A.1 cont'd) and found that we can reject in every case the null hypothesis of homogeneity of variances and of means equality.

Table 3: Spanish portfolios' test.

	Portfolios' Returns		Portfolios' Sigmas		Portfolios' Capitalization	
	Statistic	P-value	Statistic	P-value	Statistic	P-value
Test for the equality of group variances						
Levene test	33.453	0.000	56.837	0.000	171.600	0.000
Brown Forsythe test	11.94	0.000	123.448	0.000	53.618	0.000
Test for the equality of group means						
Welch t test	13.725	0.000	102.808	0.000	74.464	0.000

The six Spanish portfolios don't have the same average returns, average sigma and average market cap. Newly we observe that portfolios #2 and #3, with DY within (0%-4%] have positive average monthly returns while the other portfolios don't. We observe how the total risk of these portfolios is the lowest one (see Table A.1 cont'd).

Figure 4: Spanish portfolios average return, risk and capitalization. Data from Table A.1.cont'd. Data has been standardized for ease of comparability.



Again the inverted U-shaped relation between DY and total returns emerges, and again the U-shaped relation between DY and risk shows up. Portfolio#6, with DY above 8% is for both samples the portfolio with higher risk. This is also a portfolio with bad return results.

In this sample differences can be observed in relation to market cap. Portfolios with stocks not paying DY are the ones with lower market cap. Also we see that the average market cap increases with DY in a linear way (with the exception of portfolio #6, with the highest DY). The Spanish sample shows more variety among firms market cap. The European sample is composed by 50 big cap firms, and so it seems coherent to find that there is no difference between the market cap of portfolios. However we face a wider range in the case of the Spanish sample, where we have not only the Ibex-35 big cap firms, but other companies with lower market caps. In this case we don't find a relationship between market cap and returns and risk, but we find that as the market cap of portfolios increases the tendency toward paying dividends also increases. Attending to the risk-return profile of portfolios, post-hoc tests (see table A.3 cont'd) suggest reclassifying the observations into two groups: 2-3 and 1-4-5-6. These two groups have significant differences among them.

The contingency tables (see table A.4 cont'd) and the chi-squared test (see table 4 below) lead us to reject the hypothesis of independence between DY and returns, DY and sigma and DY and market cap.

Table 4: Chi-Square Test for Independence. Spanish sample.

Test for Independence between DY and Returns			
	Statistic	P-value	N
Chi-squared Test	212.21	0.000	10984

Test for Independence between DY and Sigma			
	Statistic	P-value	N
Chi-squared Test	658.45	0.000	10583

Test for Independence between DY and Market Capitalization			
	Statistic	P-value	N
Chi-squared Test	1441.00	0.000	10358

According to these results we can say that DY provide information about the risk-returns characteristics of stocks and that DY constitute a very valuable piece of information.

3.3 A closer look at the optimal DY range.

We take here a closer look at the optimal interval that has emerged from our previous analysis. It looks that investors should pick stocks with DY in the range (0%-4%] and should maintain their investments away from stocks with other DY. But this is a wide range, so let us divide it into four portfolios with a variation of 1% DY and see if we can narrow our selection.

Table 5: Average Return and Standard Deviation for the European and Spanish Samples considering the DY range (0%-4%].

European sample	Port #1 DY(0%-1%]	Port #2 DY(1%-2%]	Port #3 DY(2%-3%]	Port #4 DY(3%-4%]
N	420	1162	1373	1133
Average Return	0.0053	**0.0058**	0.0032	0.0027
N	420	1155	1350	1088
Average Standard Dev	0.3772	0.2981	**0.2842**	0.3200
Average Market Cap	48353	38616	36813	41010
Spanish Sample				
N	1,026	2,135	2,136	1,534
Average Return	**0.0161**	0.0113	0.0085	0.0051
N	1,022	2,138	2,139	1,518
Average Standard Dev	0.3166	0.2977	**0.2797**	0.2861
Average Market Cap	2806	3502	5261	9471

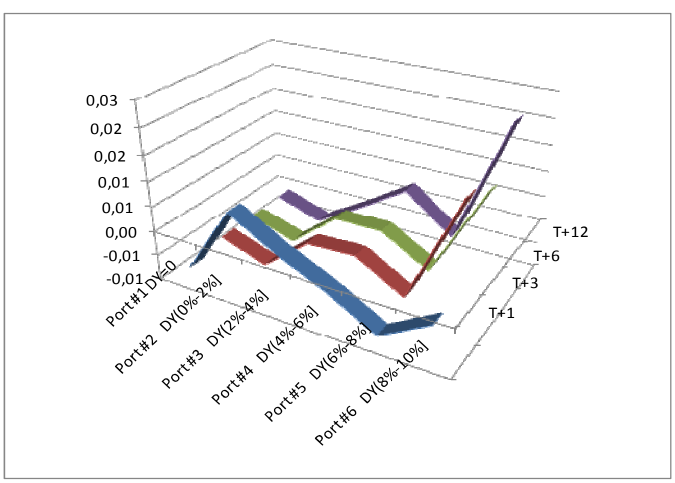
We can appreciate that the four portfolios have positive average returns and also that they maintain the low risk profile, always lower than the risk profile of the other portfolios. Portfolios composed by stocks in the DY (2%-3%] range are, for both samples, the ones with lower risk, while the range with higher returns is the DY (0%-2%] again for both markets. The independence tests (Table A.5) show that, although the results for the 4 portfolios are very similar, we can reject the hypothesis of equality of group variances and group means. In the case of the risk study, we can reject the hypothesis of independence between DY and risk, for both samples, so the results for the interval (2%-3%] look very consistent.

Nevertheless, in the return study, we can accept the hypothesis of independence between DY and returns, so the average returns are very similar across the (0%-4%] interval.

4 Other short term predictive relationships

It is now interesting to see if these results maintain predictive power in the short-term. We check this by comparing DY_t with r_{t+1} r_{t+3}, r_{t+6}, r_{t+12}, σ_{t+1}, σ_{t+3}, σ_{t+6}, σ_{t+12},. Results for Europe are described first.

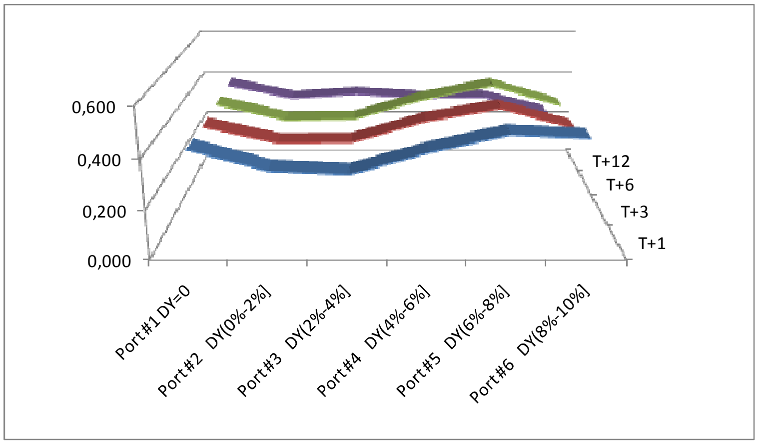
Figure 5: Return results for Europe. (Data in Table A.6)



We observe that the effects of DY on return keep the inverted U-shape during the following month but afterwards rapidly disappear. The relationship between DY_t and r_{t+3}, r_{t+6}, r_{t+12} resembles the already documented, (in the same line with the findings of Gombola and Liu (1993) and Morgan and Thomas (1998)) U-shape relation, with returns being higher, and almost the only positive ones, for portfolios with the highest DY[12].

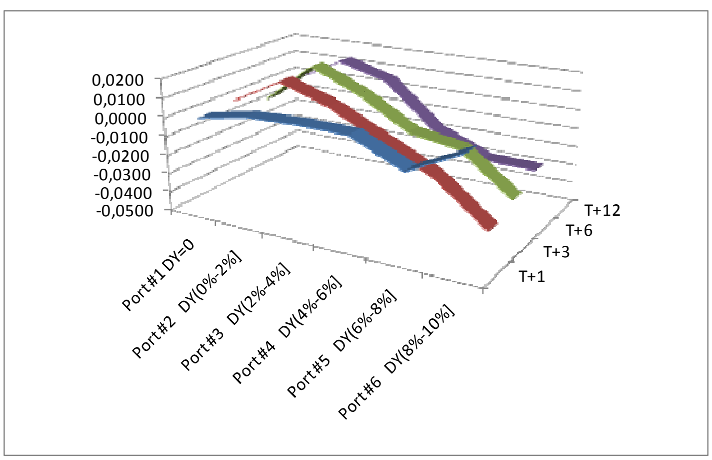
However the risk effects are kept much longer. We can see downwards that the two portfolios with lower risk are still those with DY in the range (0%-4%] up to six month later. These results look very persistent.

Figure 6: Risk results for Europe. (Data in Table A.6)



When looking at the short-term predictive relationship obtained for the Spanish sample, we observe that the return characteristics are maintained in time, and the two portfolios with positive and best returns keep being those in the range DY (0%-4%]. The inverted U-shape relationship is maintained.

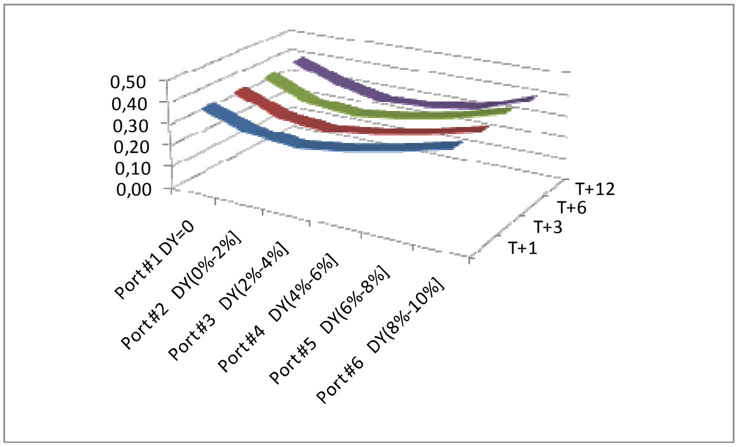
Figure 7: Return results for Spain. (Data in Table A.6 cont'd)



[12] All statistics test referring to the variance and means equality of these portfolios as well as post-hoc tests and contingency tables are not shown for space reason. For interested readers results are available upon request.

We also confirm the risk results of these two portfolios DY (0%-2%] and DY (2%-4%]. They exhibit the lower risk' levels all during the following year.

Figure 8: Risk results for Spain. (Data in Table A.6 cont'd)



The results for risk are very robust, while the returns results keep their power during the following month disappearing quickly after in the European case, and lasting up to one year later in the Spanish case.

Clearly, all the showed evidence is not in favor of a linear short-term relationship between DY and returns, nor is it of a linear relation between DY and risk. Besides it supports the existence of an optimal range of DY and its use as a tool for investment strategies. Stocks within that range obtain the best risk-reward profile, contradicting the efficient market hypothesis.

5 Concluding remarks.

Similar to Baker and Wurgler (2004), we conclude dividends do matter to shareholders. In this way, our results provide support for the point in DeAngelo and DeAngelo (2006) that dividends are not irrelevant, however our results show that not all dividend-paying stocks perform better than non-dividend-paying stocks. Stocks with DY in the interval 0%-4%, are the ones which exhibit more attractive risk-return profile.

For two samples, the 50 companies in the Eurostoxx50 and a sample of 113 Spanish companies, during 10 years, this work shows an inverted U-shaped relationship between DY and returns pointing at the existence of an optimal level of DY when considering shareholders' total returns. For both samples this optimal level of DY lies in the range 0%-4%. Besides, we further observe that portfolios constructed with stocks in this range have lower risks characteristics than its counterparties composed by stocks having other DYs. Risk is measured by the average portfolio' sigma.

We find an optimal range of DY in the sense that portfolios constructed with stocks paying dividends in these levels are the ones attaining superior returns. For both samples, this DY interval is (0%-4%]. It can also be observed that these portfolios do not have higher risk, so return is not the compensation for risk, most the contrary they exhibit the lowest risk levels, especially if risk is measured by sigma. Results are statistically significant and they are not specific of a declining or an advancing market since the sample period covers both.

It is clear from these findings that DY and total stock returns are not independent and that its relationship is, in the short-term, a non-linear inverted U relationship. Nor are independent risk and DY, exhibiting a U-shape relation.

We find that the U-shape contemporaneous relationship between DY and risk is maintained when relating current DY with risk one, three, six months and one year ahead availing at the short-term predictive value of DY.

The short-term predictive power of DY in relation to returns is confirmed in the Spanish case for up to one year, but in the European case is maintained only one month ahead.

These results are opposite to the semi-strong form of the Efficient Market Hypothesis and in line with the behavioral finance findings (Hodrick (1992), Jiang and Lee (2007) and Nieto (2010)).

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Appendix A

Table A.1: Summary Statistics of the European sample. Monthly observations. In bold p-values above 5% where the hypothesis of normal behavior cannot be rejected.

Descriptive for Returns Analysis							
	European sample	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	5746	262	1565	2490	940	356	133
Average Return	-0.001	-0.008	0.006	0.003	-0.010	-0.012	-0.039
Standard Dev of the mean	0.093	0.148	0.091	0.079	0.095	0.112	0.127
Median Return	0.006	0.000	0.012	0.010	-0.004	-0.001	-0.017
Skewness	-0.863	-1.409	-0.577	-0.918	-0.636	-0.129	-0.377
Kurtosis	6.241	7.446	4.975	4.468	3.986	3.080	2.321
Z Kolmogorov- Smirnoff	6.092	2.699	2.584	3.580	2.404	1.794	3.580
p-value	0.000	0.000	0.000	0.000	0.000	0.003	**0.087**

Descriptive for Standard Deviation Analysis							
		Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	5690	265	1575	2438	924	356	132
Average Standard Dev	0.338	0.406	0.319	0.301	0.391	0.455	0.451
Standard Dev of the mean	0.421	0.251	0.157	0.357	0.675	0.738	0.291
Median Standard Dev.	0.263	0.349	0.274	0.243	0.271	0.311	0.373

Descriptive for Capitalization Analysis (data in million €)							
		Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	5243.000	239	1445	2278	853	313	115
Average Capitalization	39431.04	36540.74	39006.16	39712.34	39329.81	40731.43	43110.68
Standard Dev of the mean	25961.69	25723.83	27035.33	25116.75	25395.34	26548.28	30852.81
Median	34448.83	30257.43	33806.84	34840.55	34631.87	36625.09	38911.58

Table A.1 cont'd: Summary Statistics of the Spanish sample. Monthly observations. In bold p-values above 5% where the hypothesis of normal behavior cannot be rejected.

Descriptive for Returns Analysis							
	Spanish sample	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	10984	2628	3161	3670	1071	311	143
Average Return	0.004	-0.001	0.013	0.007	-0.013	-0.013	-0.012
Standard Dev of the mean	0.106	0.136	0.104	0.081	0.100	0.114	0.129
Median Return	0.006	0.000	0.010	0.009	-0.002	0.000	-0.002
Skewness	0.858	2.087	0.007	-0.339	-0.886	-0.863	0.516
Kurtosis	34.947	41.474	27.752	5.067	6809	3.502	1.526
Z Kolmogorov- Smirnoff	10.034	6.125	5.202	4.507	3.311	1.810	1.177
p-value	0.000	0.000	0.000	0.000	0.000	0.003	**0.125**

Descriptive for Standard Deviation Analysis							
		Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	10583	2358	3126	3653	1046	286	114
Average Standard Dev	0.321	0.396	0.307	0.282	0.311	0.357	0.447
Standard Dev of the mean	0.1864	0.233	0.168	0.151	0.171	0.186	0.192
Median Standard Dev.	0.277	0.350	0.270	0.242	0.258	0.310	0.420

Descriptive for Capitalization Analysis (data in million €)							
		Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Number Observations	10359	2310	3079	3565	1011	280	114
Average Capitalization	4877.36	2029.09	3283.18	7008.70	7433.89	9253.51	6721.18
Standard Dev of the mean	12138.101	8657.80	7653.13	14385.32	15701.32	17206.22	16894.24
Median	764.122	211.31	1087.74	1539.90	1098.10	801.70	943.41

Table A.2: Summary Statistics for Dividend Yields for both samples

Descriptive Statistics for Dividend Yields		
	European sample	Spanish sample
Number Observations	5746	10984
Mean DY	0.0303	0.0208
Standard Dev of the mean	0.0192	0.0189
Median DY	0.0272	0.0187
Skewness	0.911	1.069
Kurtosis	0.830	1.415

Table A.3: Results for the Games-Howell test for the six European portfolios. In bold p-values below 5%

		Returns' Analysis		Sigma's Analysis	
Portfolio (I)	Portfolio (J)	Mean difference (I-J)	P-value	Mean difference (I-J)	P-value
1	2	-0.0140	0.671	0.0869	**0.000**
1	3	-0.0108	0.851	0.1058	**0.000**
1	4	0.0019	1.000	0.0157	0.992
1	5	0.0037	0.999	-0.0491	0.852
1	6	0.0308	0.260	-0.0445	0.662
2	1	0.0140	0.671	-0.0869	**0.000**
2	3	0.0031	0.862	0.0189	0.193
2	4	0.0160	**0.001**	-0.0711	**0.021**
2	5	0.0177	**0.061**	-0.1359	**0.008**
2	6	0.0449	**0.001**	-0.1314	**0.000**
3	1	0.0108	0.851	-0.1058	**0.000**
3	2	-0.0031	0.862	-0.0189	0.193
3	4	0.0128	**0.003**	-0.0901	**0.002**
3	5	0.0146	0.169	-0.1549	**0.002**
3	6	0.0417	**0.004**	-0.1504	**0.000**
4	1	-0.0019	1.000	-0.0157	0.992
4	2	-0.0160	**0.001**	0.0711	**0.021**
4	3	-0.0128	**0.003**	0.0901	**0.002**
4	5	0.0178	1.000	-0.0648	0.702
4	6	0.0289	0.124	-0.0602	0.473
5	1	-0.0037	0.999	0.0491	0.852
5	2	-0.0177	**0.061**	0.1359	**0.008**
5	3	-0.0146	0.169	0.1549	**0.002**
5	4	-0.0178	1.000	0.0648	0.702
5	6	0.0271	0.258	0.0046	1.000
6	1	-0.0308	0.260	0.0445	0.662
6	2	-0.0449	**0.001**	0.1314	**0.000**
6	3	-0.0417	**0.004**	0.1504	**0.000**
6	4	-0.0289	0.124	0.0602	0.473
6	5	-0.0271	0.258	-0.0046	1.000

Table A.3 cont'd: Results for the Games-Howell test for the six Spanish portfolios. In bold p-values below 5%.

		Returns' Analysis		Sigma's Analysis		Market Cap's Analysis	
Portfolio (I)	Portfolio (J)	Mean difference (I-J)	P-value	Mean difference (I-J)	P-value	Mean difference (I-J)	P-value
1	2	-0.0134	**0.000**	0.0890	**0.000**	-1254.0846	**0.000**
1	3	-0.0076	0.104	0.1134	**0.000**	-4979.6124	**0.000**
1	4	0.0121	**0.034**	0.0854	**0.000**	-5404.7979	**0.000**
1	5	0.0133	0.402	0.0382	**0.020**	-7224.4234	**0.000**
1	6	0.0106	0.931	-0.0506	0.082	-4692.0892	**0.044**
2	1	0.0134	**0.000**	-0.0890	**0.000**	1254.0846	**0.000**
2	3	0.0058	0.113	0.0245	**0.000**	-3725.5278	**0.000**
2	4	0.0254	**0.000**	-0.0036	0.992	-4150.7132	**0.000**
2	5	0.0267	**0.001**	-0.0507	**0.000**	-5970.3388	**0.000**
2	6	0.0240	0.244	-0.1395	**0.000**	-3438.0045	0.263
3	1	0.0076	0.104	-0.1134	**0.000**	4979.6124	**0.000**
3	2	-0.0058	0.113	-0.0245	**0.000**	3725.5278	**0.000**
3	4	0.1968	**0.000**	-0.0280	**0.000**	-425.1854	0.972
3	5	0.0209	**0.021**	-0.0752	**0.000**	-2244.8110	0.277
3	6	0.0182	0.547	-0.1640	**0.000**	287.5232	1.000
4	1	-0.0121	**0.034**	-0.0854	**0.000**	5404.7979	**0.000**
4	2	-0.0255	**0.000**	0.0036	0.992	4150.7132	**0.000**
4	3	-0.0197	**0.000**	0.0280	**0.000**	425.1854	0.972
4	5	0.0013	1.000	-0.0472	**0.002**	-1819.6256	0.602
4	6	-0.0015	1.000	-0.1360	**0.000**	712.7087	0.998
5	1	-0.0133	0.402	-0.0383	**0.020**	7224.4234	**0.000**
5	2	-0.0267	**0.001**	0.0507	**0.000**	5970.3388	**0.000**
5	3	-0.0209	**0.021**	0.0752	**0.000**	2244.8110	0.277
5	4	-0.0013	1.000	0.0472	**0.002**	1819.6256	0.602
5	6	-0.0027	1.000	-0.8879	**0.001**	2532.3343	0.761
6	1	-0.0106	0.931	0.0506	**0.082**	4692.0892	**0.044**
6	2	-0.0240	0.244	0.1395	**0.000**	3438.0045	0.263
6	3	-0.0181	0.547	0.1640	**0.000**	-287.5232	1.000
6	4	0.0015	1.000	0.1360	**0.000**	-712.7087	0.998
6	5	0.0027	1.000	0.0888	**0.001**	-2532.3343	0.761

Table A.4: Contingency Tables. Analysis of the relation between DY_t and r_t, DY_t and $sigma_t$ and DY_t and market cap_t. Results for the European sample.

	DY						
Returns	1	2	3	4	5	6	Total
1	36	139	184	117	56	35	567
2	93	551	901	376	127	46	2094
3	99	707	1240	376	146	41	2609
4	34	168	165	71	27	11	476
Total	262	1565	2490	940	356	133	5746
Sigma							
1	2	61	238	74	20	11	406
2	78	608	1043	336	101	36	2202
3	90	538	746	274	105	22	1775
4	95	368	411	240	130	63	1307
Total	265	1575	2438	924	356	132	5690
Market Cap							
1	8	7	20	9	1	0	45
2	18	79	153	63	9	2	324
3	36	193	258	90	45	15	637
4	45	279	434	193	84	38	1073
5	51	339	602	222	87	24	1325
6	107	682	1032	267	130	53	2371
Total	265	1579	2499	944	356	132	5775

Table A.4 cont'd: Results for the Spanish sample.

	DY						
Returns	1	2	3	4	5	6	Total
1	354	260	261	148	46	33	1102
2	891	1073	1287	400	110	40	3801
3	1054	1394	1804	447	125	54	4878
4	329	425	317	84	30	17	1202
Total	2628	3153	3669	1079	311	144	10984
Sigma							
1	183	296	493	91	18	4	1085
2	709	1529	1888	542	112	20	4800
3	1136	1150	1129	339	126	70	3950
4	330	151	143	74	30	20	748
Total	2358	3126	3653	1046	286	114	10583
Market Cap							
1	224	279	263	70	9	6	851
2	474	538	699	289	73	17	2090
3	468	549	794	219	53	25	2108
4	426	549	646	151	32	19	1823
5	331	514	528	141	47	18	1579
6	470	731	727	176	72	31	2207
Total	2393	3160	3657	1046	286	116	10658

Table A.5: Tests for the interval (0%-4%].

European portfolios tests				
	Portfolios' Returns		Portfolios' Sigmas	
	Statistic	P-value	Statistic	P-value
Test for the equality of group variances				
Levene test	8.361	0.000	11.719	0.000
Brown Forsythe test	0.332	0.802	12.722	0.000
Test for the equality of group means				
Welch t test	0.347	0.791	32.130	0.000
Test for independence				
Chi-Square	18.693	0.408	170.019	0.000

Spanish portfolios tests				
	Portfolios' Returns		Portfolios' Sigmas	
	Statistic	P-value	Statistic	P-value
Test for the equality of group variances				
Levene test	22.512	0.000	12.464	0.000
Brown Forsythe test	2.951	0.031	12.751	0.000
Test for the equality of group means				
Welch t test	2.820	0.038	11.438	0.000
Test for independence				
Chi-Square	56.264	0.117	119.382	0.000

Table A.6: Return and risk characteristics at t+1, t+3, t+6, and t+12 of portfolios ranked according to DY at t. Results for the European sample are shown below.

T+1

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	263	1573	2493	928	351	128
Average Return	-0.00751	**0.00657**	**0.00107**	-0.00332	-0.00884	-0.00299
Descriptive for Standard Deviation Analysis						
Number Observations	263	1568	2429	908	350	128
Average Standard Dev	0.404	**0.319**	**0.304**	0.392	0.461	0.447

T+3

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	253	1550	2494	876	349	121
Average Return	-0.00604	-0.00936	-0.00176	-0.00137	-0.00683	**0.01503**
Descriptive for Standard Deviation Analysis						
Number Observations	253	1546	2439	856	347	121
Average Standard Dev	0.392	**0.323**	**0.325**	0.414	0.468	0.386

T+6

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	253	1527	2413	863	330	115
Average Return	-0.006	-0.009	-0.001	-0.001	-0.007	**0.012**
Descriptive for Standard Deviation Analysis						
Number Observations	253	1523	2358	843	329	115
Average Standard Dev	0.392	**0.321**	**0.326**	0.414	0.476	0.387

T+12

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	252	1549	2353	758	224	66
Average Return	-0.006	-0.009	-0.003	0.003	-0.004	**0.021**
Descriptive for Standard Deviation Analysis						
Number Observations	253	1544	2309	747	227	67
Average Standard Dev	0.393	0.331	0.350	0.331	0.336	**0.258**

Table A.6 cont'd: Return and risk characteristics at t+1, t+3, t+6, and t+12 of portfolios raked according to DY at t. Results for the Spanish sample are shown below.

T+1

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	2730	3158	3657	1064	305	142
Average Return	-0.00021	**0.00470**	**0.00571**	**0.00526**	-0.00717	**0.00696**
Descriptive for Standard Deviation Analysis						
Number Observations	2730	3158	3657	1064	305	142
Average Standard Dev	0.370	**0.303**	**0.282**	0.311	0.356	0.411

T+3

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	2640	3087	3604	1048	306	141
Average Return	**0.0014**	**0.0156**	**0.0067**	-0.0066	-0.0196	-0.0411
Descriptive for Standard Deviation Analysis						
Number Observations	2640.0000	3087.0000	3604.0000	1048.0000	306.0000	141.0000
Average Standard Dev	0.3797	**0.2984**	**0.2795**	0.3074	0.3498	0.4045

T+6

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	2515	3001	3519	1017	300	138
Average Return	-0.00504	**0.01679**	**0.00549**	-0.01020	-0.01473	-0.03574
Descriptive for Standard Deviation Analysis						
Number Observations	2515	3001	3519	1017	300	138
Average Standard Dev	0.38125	**0.29531**	**0.27776**	0.30635	0.35038	0.41267

T+12

	Port #1 DY=0	Port #2 DY(0%-2%]	Port #3 DY(2%-4%]	Port #4 DY(4%-6%]	Port #5 DY(6%-8%]	Port #6 DY(8%-10%]
Descriptive for Return Analysis						
Number Observations	2366	2959	3363	881	224	98
Average Return	-0.00046	**0.01326**	**0.00570**	-0.01754	-0.02884	-0.02952
Descriptive for Standard Deviation Analysis						
Number Observations	2366	2959	3363	881	224	98
Average Standard Dev	0.39776	0.32268	**0.27786**	**0.28851**	0.31952	0.39918