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A Note on Sector, Rating, and Maturity Effects on Risk Premia

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Abstract

Focusing on a set of investment grade corporate yields covering four industries, three maturities, and four ratings, principal components analysis is employed in order to estimate the number of common factors that account for their sample covariance structure. The empirical findings suggest that a two-factor representation is statistically acceptable, a finding consistent with previous research as well as with existing theoretical models. Furthermore, we explore the role of rating, maturity, and sector in explaining cross-sectional differences across investment grade yields' risk premia. We conclude that these factors account for a large and significant part of the observed variation. Additionally, we are able to estimate the quantitative effect of these factors on the risk premium embodied in credit spreads.

Key words: corporate yields; maturity; principal components; rating; sector

JEL classification: G13; G21

1. Introduction

In this paper we explore two issues. Firstly, we address the question of how many (latent) common factors can adequately and in a parsimonious way describe bond yields in the corporate sector. In order to do so, principal components analysis (PCA) is employed, where we assume that the yields' generating process is given by an approximate factor model. Secondly, we investigate the role of rating, maturity, and sector as determinants of the cross-sectional variation among investment grade yields. In particular, we estimate their quantitative impact on the relative risk premia embodied in the observed credit spreads.

Exact and approximate factor models have been extensively used in the empirical finance literature. For instance, they have been employed in the context of testing the empirical adequacy of a one-factor market model against multi-factor specifications (Connor and Korajczyk, 1988, 1993). Similarly, the number of factors governing the behaviour of various fixed-income instruments has also been investigated (Steeley, 1990; Litterman and Scheinkman, 1991; Knez et al., 1994;

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Drakos, 2002). Also, in the context of stock returns, the roles played by industry and country effects in portfolio diversification and risk premia have been at the centre of research recently (Heston and Rouwenhorst, 1994; Griffin and Karolyi, 1998; Kuo and Satchell, 2001).

The first part of the paper focuses on addressing the question of how many factors underlie the observed covariance structure of yields in the corporate sector. It should be noted that we do not engage in testing an explicit asset-pricing model per se but rather empirically investigate the number of common factors across corporate yields. Although factor analysis and principal components have not been employed in this particular context, theoretical models suggest that two factors should govern the dynamics of corporate yields: the level and the slope of the term structure (Merton, 1974; Cooper and Mello, 1991; Abken, 1993; Shimko et al., 1993; Leland, 1994; Longstaff and Schwartz, 1995; Collin-Dufrense et al., 2001). Empirical studies, mainly using regression analysis, provide evidence for such a case, where essentially the term structure sensitivity of corporate yields is unequivocally established (Iwanowski and Chandra, 1995; Longstaff and Schwartz, 1995; Duffie and Singleton, 1997; Duffee, 1998; Collin-Dufrense et al., 2001).

The aim of the present study is to explore empirically the number of approximate factors characterising the covariance structure of corporate yields. The analysis should be viewed as complementary to the empirical studies cited above since it essentially addresses similar questions without, however, imposing any structure on the empirical model. In other words, by using PCA the sample covariance matrix of corporate yields is decomposed into a systematic part (common to all yields) and a non-systematic part (idiosyncratic to a particular yield). Utilising the previously reported empirical evidence, our prior is that there should be two significant principal components “driving” corporate yields. Furthermore, the robustness of our findings is tested by estimating the number of common factors within sub-groups of yields that share at least one common characteristic (credit rating, maturity, or industry).

The second part of the paper focuses on investigating the role of rating, maturity, and industry in accounting for the observed cross-sectional differences across investment grade yields’ credit spreads. Given that these characteristics are the fundamental coordinates for the fair pricing of these debt instruments, one would then expect that they should also convey significant information for the premia embodied in the relevant credit spreads. In fact, Duffee (1998) explores credit spread interest rate sensitivity on a three-dimensional scale, by taking into account a corporate yield’s sector as well as maturity and rating. Further evidence for the importance of sector, rating, and maturity is provided by the findings of Longstaff and Schwartz (1995), Duffee (1998), and Collin-Dufrense et al. (2001) who report that an increase in the level of the term structure corresponds to a non-homogeneous decline in credit spreads across ratings and sectors.

The remainder of the paper is organised as follows. Section 2 discusses the statistical background. Section 3 describes the dataset used. Section 4 presents the empirical results for the PCA. Section 5 discusses the econometric methodology employed in order to assess the determination of relative risk premia and presents the relevant results. Finally, Section 6 concludes.

2. Estimating the Number of Approximate Factors: A Principal Components Analysis

We assume that corporate yields are generated by a *k*-factor linear model of the following form:

$$r_{i,t} = \mu_i + b_{i,1} f_{1,t} + b_{i,2} f_{2,t} + ... + b_{i,k} f_{k,t} + \varepsilon_{i,t}\ , \tag{1}$$

where $i = 1, 2, \ldots, m$ (the number of corporate bonds) and $t = 1, 2, \ldots, T$ (the period under consideration). The first term on the right-hand side is the expected return for asset *i*. The following terms (*f*) represent the *k* common factors that affect a bond's yield. Each coefficient $b_{i,j}$ is referred to as the loading of the *i*th corporate bond on the *j*th factor and represents the bond's sensitivity to the particular factor. Finally, the last term captures the non-systematic risk component, which is idiosyncratic to the *i*th corporate bond. In matrix notation, Equation (1) can be written (using bold symbols to denote vectors or matrices) as:

$$\mathbf{R} = \mathbf{BF} + \boldsymbol{\varepsilon}\ , \tag{2}$$

where **R** is an $m\times 1$ vector of returns, **B** is an $m\times k$ matrix of factor loadings, **F** is a $k\times 1$ vector of factors, and $\boldsymbol{\varepsilon}$ is an $m\times 1$ vector of disturbance terms. Assuming that the factors are independent and identically distributed with variance-covariance matrix:

$$\boldsymbol{\Sigma}_{\mathbf{F}} \equiv Cov(\mathbf{FF}') = \sigma_f^2 \mathbf{I}_k\ , \tag{3}$$

the covariance of the idiosyncratic components is:

$$\boldsymbol{\Sigma}_{\boldsymbol{\varepsilon}} \equiv Cov(\boldsymbol{\varepsilon\varepsilon}') = \sigma_\varepsilon^2 \mathbf{I}_m\ , \tag{4}$$

and the covariance matrix of factor loadings is:

$$\boldsymbol{\Sigma}_{\mathbf{B}} \equiv Cov(\mathbf{BB}') = \sigma_b^2 \mathbf{I}_k\ , \tag{5}$$

the implied covariance structure for the yields is of the form:

$$\boldsymbol{\Sigma}_{\mathbf{R}} = \mathbf{BB}'\sigma_f^2 + \sigma_\varepsilon^2 \mathbf{I}_m\ . \tag{6}$$

The eigenvalues, $\boldsymbol{\lambda}$, for the covariance matrix of corporate yields in Equation (6) satisfy:

$$\left|\sigma_f^2 \mathbf{BB}' + \sigma_\varepsilon^2 \mathbf{I}_m - \boldsymbol{\lambda} \mathbf{I}_m\right| = 0 \tag{7}$$

and can be derived for large m:

$$\lambda_1 = \sigma_\varepsilon^2 \left[\frac{\rho^2}{\left(1-\rho^2\right)k} \left[\left(m-1\right)\sigma_b^2 + km \right] + 1 \right], \tag{8}$$

$$\lambda_{2,\dots,k} = \sigma_\varepsilon^2 \left[\frac{\rho^2}{\left(1-\rho^2\right)k} \left[\left(m-1\right)\sigma_b^2 \right] + 1 \right], \tag{9}$$

$$\lambda_{k+1,\dots,m} = \sigma_\varepsilon^2, \tag{10}$$

where we define ρ^2 as:

$$\rho^2 \equiv \frac{k\sigma_f^2}{k\sigma_f^2 + \sigma_\varepsilon^2}, \tag{11}$$

which can be interpreted as the percentage of the variance explained by the factor model.

Principal components analysis has been extensively used in order to estimate the number of common factors across various groups of assets. Focusing on common stock returns, previous studies have addressed the question of how many factors underlie their stochastic behaviour or alternatively have attempted to empirically compare the adequacy of multi-factor models against the benchmark single-factor model (Trzcinka, 1986; Connor and Korajczyk, 1988, 1993; Brown, 1989). Another strand of the empirical literature has concentrated on the issue of common factors among returns of fixed-income instruments (Fase, 1973, 1976; Steeley, 1990; Litterman and Scheinkman, 1991a, 1991b; Knez et al., 1994; Golub and Tilman, 1997; Fase and Vlaar, 1998).

3. Data Issues

The dataset consists of annualised yields-to-maturity sampled at monthly intervals for the period December 1991 to December 1999. Yields were collected for the following sectors: Banking & Finance, Telecommunications, Utilities, and Industrials. For each sector, we collected data for maturities of 2, 5, and 10 years. Finally, to ensure homogeneity, investment grade bonds of the following rating were considered: Banking & Finance (AAA, AA2, A2, BBB2), Telecommunications (AA3, A1, A2, A3, BBB1, BBB2, BBB3), Utilities (AA2, AA3, A1, A2, BBB1, BBB2, BBB3) and Industrials (AAA, AA2, A2, BBB2). The corporate yields were collected from Bloomberg's database and correspond to Moody's ratings. Additionally, for the same time period we collected yields for the US Treasury Bill (constant maturity) with 2, 5, and 10 years to maturity. The Federal Reserve Bank of New York kindly provided the US government yields.

The sample consists of 68 corporate yields resulting in a 68×68 sample covariance matrix to be decomposed in a systematic and unsystematic part, the eigenvalues of which are used to establish the number of common factors. The sample means and standard deviations for the yields in our dataset are reported in Table 1.

Table 1. Sample Means for Corporate Yields across Sectors, Ratings, and Maturities for the Period December 1991 to December 1999

Industrials									
Maturity	**Rating**								
Years	**AAA**	**AA2**	**AA3**	**A1**	**A2**	**A3**	**BBB1**	**BBB2**	**BBB3**
2	5.743	5.807	—	—	5.963	—	—	6.245	—
	(0.828)	(0.827)			(0.781)			(0.716)	
5	6.306	6.352	—	—	6.577	—	—	6.830	—
	(0.705)	(0.715)			(0.669)			(0.672)	
10	6.676	6.746	—	—	6.988	—	—	7.254	—
	(0.711)	(0.724)			(0.698)			(0.679)	
Banking/Finance									
Maturity	**Rating**								
Years	**AAA**	**AA2**	**AA3**	**A1**	**A2**	**A3**	**BBB1**	**BBB2**	**BBB3**
2	5.786	5.863	—	—	6.033	—	—	6.302	—
	(0.816)	(0.820)			(0.789)			(0.802)	
5	6.394	6.483	—	—	6.651	—	—	6.917	—
	(0.702)	(0.716)			(0.716)			(0.747)	
10	6.829	6.909	—	—	7.099	—	—	7.353	—
	(0.704)	(0.708)			(0.722)			(0.748)	
Telecommunications									
Maturity	**Rating**								
Years	**AAA**	**AA2**	**AA3**	**A1**	**A2**	**A3**	**BBB1**	**BBB2**	**BBB3**
2	—	—	5.844	5.923	5.977	6.036	6.124	6.136	6.288
			(0.837)	(0.810)	(0.804)	(0.791)	(0.787)	(0.797)	(0.794)
5	—	—	6.402	6.465	6.501	6.571	6.659	6.683	6.899
			(0.705)	(0.716)	(0.718)	(0.709)	(0.700)	(0.711)	(0.743)
10	—	—	6.828	6.880	6.915	6.974	7.079	7.121	7.380
			(0.698)	(0.717)	(0.717)	(0.704)	(0.696)	(0.716)	(0.784)
Utilities									
Maturity	**Rating**								
Years	**AAA**	**AA2**	**AA3**	**A1**	**A2**	**A3**	**BBB1**	**BBB2**	**BBB3**
2	—	—	5.861	5.916	5.956	—	6.109	6.182	6.322
			(0.821)	(0.828)	(0.829)		(0.793)	(0.787)	(0.850)
5	—	6.354	6.412	6.474	6.524	—	6.656	6.731	6.942
		(0.697)	(0.704)	(0.718)	(0.726)		(0.698)	(0.701)	(0.769)
10	—	6.801	6.844	6.901	6.945	—	7.107	7.216	7.428
		(0.712)	(0.703)	(0.715)	(0.712)		(0.674)	(0.701)	(0.742)

Note: Numbers in parentheses denote the sample standard deviation of yields.

Inspection of the summary statistics reveals some stylized facts regarding the behaviour of corporate yields. The absolute level of a corporate yield tends to increase monotonically as credit rating deteriorates. Additionally, yields tend to increase with the maturity of the asset. Regarding variability, typically debt instruments of higher maturity are less volatile. In terms of credit rating there is not a clear pattern as far as variability is concerned.

4. Principal Components Analysis: Empirical Results

Applying the PCA on the sample covariance matrix of the 68 corporate yields produces the results reported in Table 2.

Table 2. Principal Components Analysis (All Corporate Yields)

Factors	Eigenvalue	Percentage of Variance Explained
1	63.24*	93.00
2	2.11*	3.09
3	0.39	0.57
4	0.28	0.40
5	0.23	0.33
6	0.20	0.29
7	0.16	0.22
8	0.14	0.20
9	0.11	0.16

Note: The asterisk denotes significance according to the Kaiser (1960) criterion.

As expected, the first principal component dominates the covariance structure of the corporate yields, explaining 93% of their variance. The second principal component accounts for about 3.1% of the sample variance in the data. The remaining 66 principal components explain only a small fraction of the variance, which typically is less than 0.6% for individual components. According to Kaiser (1960), a principal component is statistically significant if the associated eigenvalue is greater than unity. Using this criterion, we conclude that only the first two principal components are statistically different from zero. Thus, the empirical findings seem to support the hypothesis that a two-factor process adequately describes the correlation structure of yields in the corporate sector.

To shed more light on the issue and also serve as sensitivity analysis, we repeat the analysis on various subsets of the sample yields. In particular, we group yields that share at least one characteristic (maturity, rating, or sector). These results are summarised in Table 3.

The findings show that when one considers yields of either the same rating or sector, the explanatory power of the first two factors remains largely unaffected (about 93% and 3% respectively), although the second factor is always insignificant. However, when yields are grouped by maturity, the first factor seems to be more important, accounting almost for 97% of the common variation among yields. In other words, if we adopt the identification discussed earlier, corporate yields of the same maturity, irrespective of sector or credit rating profile, are relatively more sensitive to changes in the level of the term structure than to changes in its slope.

Table 3. Principal Components Analysis by Maturity, Rating, and Sector

	Factor 1		Factor 2	
	Eigenvalue	**Percentage of Variance Explained**	**Eigenvalue**	**Percentage of Variance Explained**
		Maturity		
2 years	21.19*	96.34	0.17	0.77
5 years	22.29*	96.93	0.15	0.65
10 years	22.01*	95.71	0.21	0.88
		Rating		
Triple A	5.62*	93.68	0.24	3.89
Double A	13.06*	93.30	0.49	3.45
Single A	22.37*	93.23	0.81	3.34
Triple B	22.17*	92.37	0.76	3.15
		Sector		
Industrials	11.29*	94.15	0.40	3.32
Utilities	19.76*	94.12	0.75	3.56
Banking/ Finance	13.84*	92.31	0.56	3.68
Telecoms	18.58*	92.92	0.70	3.49

Note: The asterisk denotes significance according to the Kaiser (1960) criterion.

5. The Role of Maturity, Sector, and Rating in the Determination of (Relative) Risk Premia

5.1 The models

Credit spread, the difference between a corporate bond's yield and that of a government bond of the same maturity, conveys significant information about the riskiness of the corporate issue. In fact, the credit spread reflects the pricing of the risk embedded in a corporate bond which is uniquely identified by three fundamental characteristics: sector (*S*), maturity (*M*), and rating (*R*). Consider a corporate yield (*Y*) and a government yield (Y_g) of the same maturity. The credit spread (*CS*) can be decomposed into:

$$CS(S,M,R)_t = Y(S,M,R)_t - Y_g(M)_t \,. \qquad (12)$$

The credit spread is a reflection of the market's required risk premium for the inherent risk of the corporate bond. In particular, there are three types of risk that are encapsulated in the spread: industry risk, maturity risk, and default risk. The rating of the bond quantifies the probability of default and therefore is related to default risk. The sector to which the bond belongs should also be priced since different sectors exhibit differential sensitivity to business cycles and macroeconomic shocks (Duffee, 1998). Finally, the maturity of the contract is important since it identifies the term structure (or liquidity) risk. Obviously, a degree of interaction between these three factors is to be expected, however, it would be extremely difficult to measure. A major problem is that we expect this interaction to attain a non-linear form. If we assume that these risks can be linearly decomposed, then a credit spread should be the sum of the three as follows:

$$CS(S,M,R)_t = E_t(P_S) + E_t(P_M) + E_t(P_R)\,, \tag{13}$$

where $E_t(\cdot)$ is the conditional expectation operator, $E_t(P_S)$ is the conditional risk premium associated with the sector, $E_t(P_M)$ is the conditional risk premium associated with the maturity of the bond, and $E_t(P_R)$ is the conditional risk premium associated with the bond's default risk. In order to assess the degree to which these fundamental characteristics account for the observed differences across corporate yields, as a starting point we explicitly assume that the yield on a given corporate bond varies due to industry, maturity, and rating effects plus an idiosyncratic component:

$$R_{it} = \alpha_t + \beta_{j,t} + \gamma_{k,t} + \delta_{m,t} + u_{i,t}\,, \tag{14}$$

where α_t is the base level of return in period *t*, $\beta_{j,t}$ is the industry effect, $\gamma_{k,t}$ is the maturity effect, $\delta_{m,t}$ is the rating effect, and $u_{i,t}$ is an idiosyncratic white noise disturbance term. It is apparent that this formulation assumes that the industry, maturity, and rating effects can be linearly decomposed, and as a result any interaction between these two effects is ruled out.

The decomposition in Equation (14) can become operational by estimating the parameters of the following cross-sectional model in which a set of dummy variables is introduced:

$$\begin{aligned} R_i = \alpha &+ \beta_{i,I} S_I + \beta_{i,U} S_U + \beta_{i,T} S_T + \beta_{i,BF} S_{BF} + \gamma_{i,2Y} M_{2Y} + \gamma_{i,5Y} M_{5Y} \\ &+ \gamma_{i,10Y} M_{10Y} + \delta_{i,AAA} R_{AAA} + \delta_{i,AA} R_{AA} + \delta_{i,A} R_A + \delta_{i,BBB} R_{BBB} + u_i\,, \end{aligned} \tag{15}$$

where S_I is a dummy variable attaining the value 1 when the yield belongs to the Industrials sector and 0 otherwise (similarly we define dummies for the Telecommunications, Banking and Finance, and Utilities sectors), M_{2Y} is a dummy variable taking the value of 1 when the yield is of 2 years to maturity and 0 otherwise (similarly we define dummies for 5 and 10 years to maturity), R_{AAA} is a dummy variable taking the value 1 when the yield corresponds to a Triple-A bond and 0 otherwise (similarly we define dummies for the remaining ratings), α is an intercept term capturing the risk-free rate of return serving as the market benchmark and that is common to all yields, the β_i, γ_i, and δ_i are coefficients capturing the sensitivity associated with sector, maturity, and rating respectively, and u_i is a white noise error term.

It should be noted that by adopting this estimation strategy one explicitly assumes that the regressors (dummies) have been categorised into equally spaced discrete intervals. That is, for instance, the risk differential between a Double-A bond and Single-A bond is the same as between a Single-A bond and a Triple-B bond. The same holds for the dummy related to maturity. While we can think of these dummies as conveying ordinal information (a Double-A bond is more secure than a Single-A bond which is more secure than a Triple-B bond, and the same holds for the other dummies, especially the maturity dummy), certainly it is not apparent that we can interpret these dummies as representing equal intervals (Kaplan and Urwitz, 1979). In any case, this is not a crucial assumption for the case at hand.

The parameters in Equation (15) cannot be estimated directly by cross-sectional regression due to the perfect collinearity of regressors, since any given credit spread belongs to one industry, one maturity, and one rating. Consequently, industry, maturity, and rating effects can only be measured relative to some benchmark (Heston and Rouwenhorst, 1994). A straightforward way to overcome this problem is to select a particular sector/rating/maturity triplet to be used as a reference and estimate the parameters of Equation (15) by effectively excluding the reference asset.

The credit spread of Industrials with 2-years to maturity and Triple-A rating is selected as the reference triplet. The actual choice of the reference is not crucial for estimation of the model. In fact, any triplet of characteristics could have been used without affecting the results. However, selecting a benchmark yield such as the "safest" or the "riskiest" helps in the interpretation of the results.

As far as rating and maturity is concerned, we select yields of the highest rating category (Triple-A) and the lowest maturity as representing the assets with the lowest relevant risks (credit and interest rate risks). The choice of the sector, however, is not that straightforward since there is not a clear-cut argument as to which sector can be considered as the safest among the ones considered.

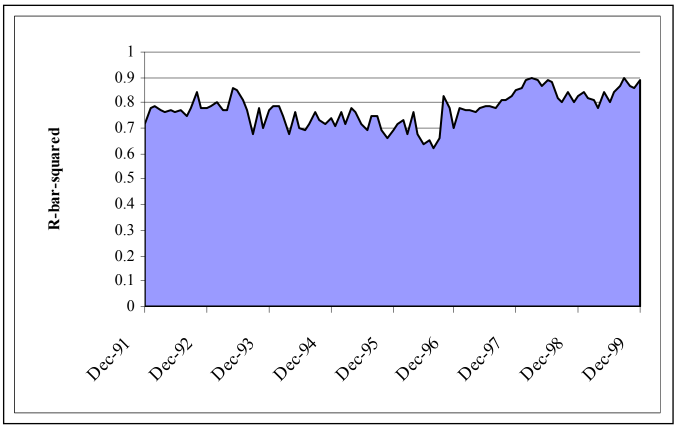
A more efficient way of solving this apparent problem has been proposed, in the context of stock returns, by Heston and Rouwenhorst (1994) who, in order to separate country performance from industry performance, proposed the use of a value weighted restricted model. However, since we do not have access to data on the monetary values of the outstanding bonds for each category, we cannot implement this estimation strategy. What we can do, though, is to adopt the Heston and Rouwenhorst (1994) methodology as far as the decomposition is concerned, which will allow us to assess the relative importance of each of the three factors in explaining cross-sectional differences in corporate yields as well as measuring the risk premia.

5.2 Empirical results

We estimate the specification given in Equation (15) for every month from December 1991 to December 1999, which produces 97 cross-sections with 68 observations each. In each equation the dependent variable is the credit spread. Hence, the model allows us to investigate the extent to which observed differences in terms of sector, rating, and maturity can explain the observed cross-sectional variation in credit spreads and therefore market premia.

The model fits the data relatively well with an explanatory power (adjusted coefficient of determination) typically above 70%. The trajectory of the model's explanatory power is given in Figure 1.

Figure 1. Model Explanatory Power (Equation 12)



The descriptive statistics of the risk premia are given in Table 4.

Table 4. Descriptive Statistics for Risk Premia

	Banking/ Finance	Tele-coms	Utilities	5 years to maturity	10 years to maturity	Double-A	Single-A	Triple-B
Mean	0.100	−0.026	−0.014	0.038	0.130	0.106	0.254	0.512
Median	0.086	−0.010	0.021	0.040	0.134	0.089	0.237	0.472
Maximum	0.267	0.140	0.150	0.314	0.427	0.352	0.560	0.937
Minimum	−0.059	−0.226	−0.327	−0.142	−0.167	0.007	0.116	0.300
Std. Dev.	0.067	0.082	0.098	0.097	0.143	0.067	0.108	0.162
Skewness	0.701	−0.614	−1.007	0.385	−0.189	0.964	0.934	0.590
Kurtosis	3.396	2.686	3.720	2.823	2.480	3.989	3.385	2.310

The risk premia associated with maturity are positive, as expected, implying that corporate yields differing in terms of maturity, but otherwise equivalent, would differ due to the increased risk embedded in the higher maturity assets. In particular, credit spreads for 10- and 5-year-to-maturity corporate bonds embody, relative to a 2-year-to-maturity bond, an average risk premium of 4 and 13 basis points respectively. This implies that the maturity risk premium increases monotonically with maturity.

A similar picture emerges when one considers the rating risk premia. Credit spreads of Double-A, Single-A, and Triple-B rating exhibit, relative to a Triple-A bond, a risk premium which is 10, 25, and 51 basis points higher on average. This evidence is again consistent with our expectations regarding the shape of the default risk premium, which should be a positive function of declining credit-worthiness.

Finally, the industry risk premia indicates that both the Telecommunications and the Utilities sectors traded at a discount relatively to the Industrials. In other words, the data suggest that for the period considered these two sectors were perceived as more creditworthy. In fact, the Telecommunications spreads relative to our chosen benchmark showed an average discount of almost 3 basis points and even reaching the level of 22 basis points. That hardly comes as a surprise given that during the past decade, due to technological advances in wireless and mobile telecommunications, this sector exhibited rapid growth and enjoys high expectations about future profits and consequently creditworthiness. Figures 2 to 4 depict the time series paths of the estimated premia.

Figure 2. Sector Risk Premia

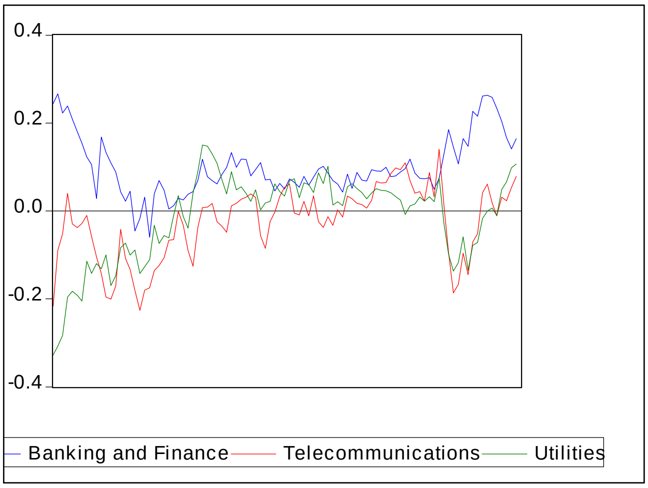


Figure 3. Rating Risk Premia

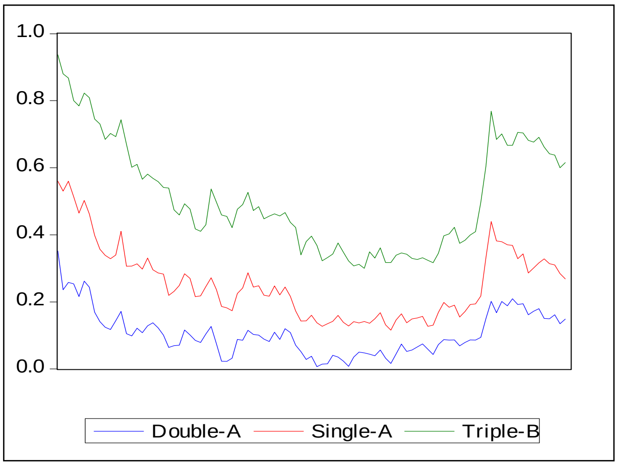
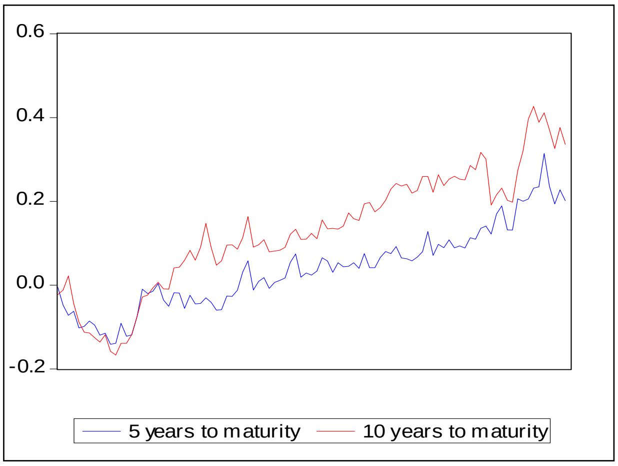


Figure 4. Maturity Risk Premia



In order to assess the significance of the risk premia we report their t-statistics in Table 5. The data suggest that on average the industry risk premia relative to the base have been insignificant with the exception of that associated with the banking sector. As far as the rating risk premia relative to the Triple-A rating are concerned, all of them have been on average (highly) significant. Finally, maturity premia produce a mixed picture with the 10 year premium being highly significant and the 5 year one being marginally significant at the 10% level. It should be noted, however, that during the sample considered there is a great degree of variability in all risk premia both in terms of their level as well as their significance, as shown by their range and their standard deviations. Figures 5 to 7 depict the time series paths of the premia t-ratios.

Table 5. Descriptive Statistics for Risk Premia T-Ratios

	Banking/ Finance	Tele- coms	Utilities	5 years to maturity	10 years to maturity	Double- A	Single- A	Triple- B
Mean	3.330	−0.413	−0.138	2.746	7.607	12.938	1.685	4.920
Median	3.563	−0.294	0.701	2.729	7.174	12.529	1.562	4.343
Maximum	7.260	5.200	3.757	5.902	13.636	20.189	9.070	14.920
Minimum	−1.592	−5.347	−5.580	0.231	3.419	6.871	−4.293	−4.900
Std. Dev.	1.695	2.399	2.324	1.251	2.180	2.638	3.256	5.114
Skewness	−0.411	0.005	−0.610	0.054	0.521	0.390	0.214	0.057
Kurtosis	3.284	2.430	2.281	2.487	2.610	2.691	2.066	2.107

Figure 5. T-Ratios of Sector Risk Premia

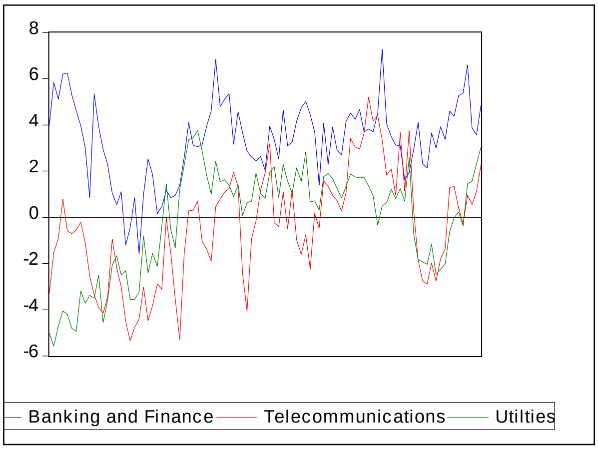


Figure 6. T-Ratios of Rating Risk Premia

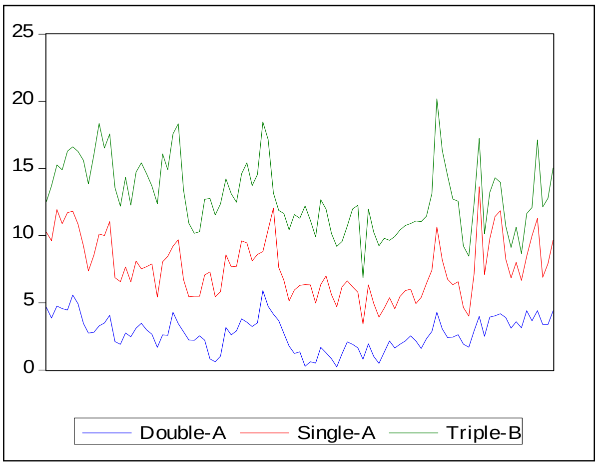
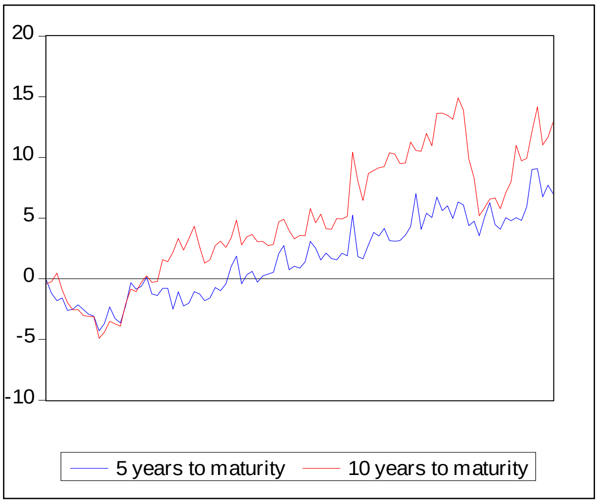


Figure 7. T-Ratios of Maturity Risk Premia



Our results indicate that the major determinants of risk premia are rating and maturity. In contrast, there is relatively weaker evidence for the importance of sector. The three characteristics typically account (significantly) for about 70% of the cross-sectional variation in credit spreads.

6. Conclusion

Using a sample of corporate yields from a wide range of industries, ratings, and maturities the aim of this analysis is twofold. First, to estimate the number of unobservable factors that account for the covariance structure of yields, and second to investigate the role of rating, maturity, and sector in the observed risk premia embodied in credit spreads.

Our findings indicate that two factors adequately describe the correlation structure of corporate yields. Interpreting this finding in the light of recent evidence reported in the literature, one may claim that these two factors identify the level and the slope of the yield curve. Furthermore, our results indicated that rating, maturity, and sector effects account for a large and significant part of the cross-sectional variation among corporate spreads. Our estimation allows us to quantify the risk premia associated with each of these characteristics.

Future research should extend the analysis in the second part of the paper by considering the role of rating, maturity, and sector both in the cross-sectional dimension as well as the time series variation of yields. Utilising data on the outstanding value of the corporate bonds could accommodate such analysis, where the Heston and Rouwenhorst (1994) methodology could be applied.

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