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RECONSTRUCTING DIMENSIONALITY OF CUSTOMER CORPORATE SOCIAL RESPONSIBILITY AND CUSTOMER RESPONSE OUTCOMES BY HOTELS IN KENYA

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KEYWORDS

Customer corporate social responsibility, customer response outcomes, classified hotels, Kenya tourist customers.

ABSTRACT

Study explored customer social responsibility and response outcomes perceptions of tourists of twenty selected classified hotels in Kenya. Using systematic random sampling, a sample of 661 resident tourists was selected from a total of 5440. Principal Component Analysis was used for data reduction. Six dimensions of customer social responsibility were extracted designated as environmental CSR, Customer CSR attitude, Customer CSR Orientation, customer switching potential, value of CSR and price criteria. Similarly, five customer response outcomes were obtained designated as customer competitive potential, customer satisfaction, service quality potential, degree of marketability and substitutability. Significant differences on customer CSR and customer responses outcomes across education levels, customer loyalty, gender and age of the customers existed. Additionally, lack of significant differences in perceptions across customer's intent to stay, country of origin, income level, hotel and customer's length of stay was found. Customer's willingness to pay for CSR was neutral in regard to CSR perceptions.

1. INTRODUCTION

Despite the beneficial effect of corporate social responsibility for companies such as increased profits, customer loyalty, trust, positive brand image among others being well documented in academic literature (Sen. *et al* 2006; Ferrell 2001; Rundle-Thiele 2008 and McDonald, 2008), review of literature on corporate social responsibility and its role in organization effectiveness indicate lack of convergence on the results of the outcome. Consequently, the efficacy of CSR programs on customer outcomes has been equivocal. For instance, Maignan *et al* (1999) identified a positive relationship between CSR and customer loyalty in a managerial survey. Others such as Berger & Kanetkar (1995) and Crayer & Ross (1997) established that customers are willing to support companies committed to CSR. However, Luo and Bhattacharya (2006) found CSR reduced customer satisfaction levels.

Studies on CSR and its related outcomes lack empirical convergence. For instance while it is evident that consumer preferences will increasingly favour products and services from socially responsible, transparent and trustworthy firms (Willmott, 2001 and Mitchell, 2001), other results have yielded quite opposite results. The lack of convergence tended to be due to measures and dimensions of CSR and organization effectiveness, the context of the study and method of analysis (Orlitzky *et al* 2003). Particularly, these mixed results are attributable in part to the fact that CSR has several dimensions whose impact varies across industries, stakeholder groups, and individuals within a stakeholder group (e.g., Berman et al. 1999; Hillman and Keim 2001; Sen and

Bhattacharya 2001). Accordingly, there is a need to conduct industry-specific studies and to distinguish between different dimensions of CSR as well as between different stakeholders (Godfrey and Hatch, 2007; and Raghubir *et al*. 2010).

In addition, extant studies on CSR have relatively ignored how customers respond to CSR efforts. CSR studies have increasingly focused on tangible products, while the service sector in general and the hotel sector in particular has remained relatively neglected. Whereas it is evident that CSR has large potential in enhancing the qualitative components of a product and service, this should be even instrumental in the hotel sector as it is largely dependent on image and reputation of its services.

Specific objectives of this study were to examine the dimensionality of customer corporate social responsibility, assess the dimensionality of customer response outcomes and also to evaluate the differences in perceptions of customer corporate social responsibility and customer related outcomes in sample classified hotels.

The organization of the study is as follows: the next section will review literature on concepts and dimensions of customer derived competitiveness and social responsibility, relationship between social responsibility and enterprises. Further sections covers methodology, results, conclusions and implications for further study is covered next.

2. CONCEPTS AND DIMENSIONS OF CUSTOMER CORPORATE SOCIAL RESPONSIBILITY AND CUSTOMER RESPONSE OUTCOMES

Similar to CSR, competitiveness is a multi dimensional construct that is subject to varied and conflicting interpretations. The recent literature on the dimensions of competitiveness has focused on resource based view and innovation as sources of competitive advantage. Other scholars have viewed competitiveness as dynamic (Porter and Kramer, 2002). Competitiveness of service products is only recently being recognized as a perceptual measure of enterprise competitiveness. Competitiveness has been viewed independently of the customer's service perception in mainstream tourism literature. However it is recognized that competitiveness cannot practically exist without positive perceptions and attitudes from the tourist customers. Repeat purchases or recommendations to other people are most usually referred to as customer loyalty in the marketing literature (Yoon and Uysal, 2003). Degree of loyalty is one of the critical indicators used to measure the success of a marketing strategy (Flavian, Martinez, and Polo, 2001). Concept of loyalty has been viewed from both behavioral and attitudinal approaches (Yoon and Uysal, 2003). CSR has partly evolved in response to consumer demands and expectations. It is argued that enterprises are increasingly sensitive to these demands both to retain existing customers and to attract new customers (EU, 2002). Customers may have perhaps the most influential effect on competitiveness of firms. Recent studies suggest that firms can differentiate themselves from competitors using reputation of excelling in their social responsibilities (Hollender, 2004).

H_1: There are significant differences on customer corporate social responsibility and customer response outcomes across socio-demographics

Firms focus their CSR activities on getting the appropriate reaction from customers. In the tourism sector, customer oriented CSR practices include providing quality products, ensuring diversity of products, serenity of the environment and environmental quality. In essence, this was expected to lead to: awareness, new markets, preferences, experiences seasonality, and length of stay, quality perception and place attachment. The benefits of a community socially responsible program in developing African countries have been found to be immense (Banerjee, 2005). These are

enhanced corporate reputation and image, improved relations to the community, increased employee morale and increased customer goodwill. Thus it is posited that:

H_2: Customer Response Outcomes are multidimensional constructs, factor analysis yields several components

2.1. Dimensions of Corporate Social Responsibility

True to its multidimensional and fuzzy character, several studies have defined and characterized CSR into various dimensions. Corporate social responsibility (CSR) refers to a firm's moral, ethical and social obligations beyond its own economic interests (Brown and Dacin 1997; McWilliams and Siegel 2001; Mohr, Webb, and Harris 2001). CSR has been characterized by Burge and Logsdon (1999) into five dimensions of CSR centrality, specificity, pro-activity, voluntarism and visibility. Further, Rahman (2011) definitions of CSR cover various dimensions including economic development, ethical practices, environmental protection, stakeholders‟ involvement, transparency, accountability, responsible behavior, moral obligation, corporate responsiveness and corporate social responsibility, human rights, law abidance, quality improvement and voluntariness. Similarly, the social responsibility of business encompasses the economic, legal, ethical, and discretionary/ philanthropic expectations that society has of organizations at a given point in time (Carroll, 1979).

Inoue & Lee (2010) examined effects of different dimensions of corporate social responsibility on corporate financial performance in tourism-related industries. Although stakeholder framework proposes the multidimensionality of corporate social responsibility (CSR) (Clarkson, 1995), previous research has yet to investigate the relationship between certain dimensions of CSR and corporate financial performance (CFP) in tourism. It disaggregated CSR into five dimensions based on corporate voluntary activities for five primary stakeholder issues: (1) employee relations, (2) product quality, (3) community relations, (4) environmental issues, and (5) diversity issues, and examined how each dimension would affect financial performance among firms within four tourism-related industries(airline, casino, hotel, and restaurant).

Traditionally, customers form value expectations and decide to purchase goods and services based more on their perceptions of products benefits, and less on the total costs incurred. Customer satisfaction indicates how well the product use experience compared to the buyers' value expectations (Cravens and Piercy, 2003). Hotel sector is an image driven industry, with the customer oriented CSR construct being measured using among others, quality product, product diversity of the product on offer, serenity and environmental quality.

It is thus posited that:

H_3: Customer corporate social responsibility is a multi dimensional construct, factor analysis yields several components

2.2. Corporate Social Responsibility and Response Outcomes

Empirical studies on the social issues in strategic management literature have dealt with the relationship between corporate social responsibility or its variants: corporate social responsiveness, corporate social performance, corporate citizenship, and corporate performance (Waddock & Graves, 1997; Griffin & Mahon, 1997; Russo & Fouts, 1997; Husted, 2001; Carroll, 1979, Wartick and Cochran, 1985). However, the results of these studies have been largely inconclusive and fragmented, sometimes indicating a direct relationship, an inverse relationship, and sometimes no relationship at all (Griffin and Mahon, 1997; Husted, 2001).

Furthermore, it has been found that empirical evidence on the effectiveness of strategic CSR as a good investment was equivocal. Several issues are not clear in as far as social responsibility and its effect on enterprise competitiveness is concerned, first, whether socially responsible corporations outperform or under perform other companies (McWilliams and Siegel, 2001 and Trevino and Nelson, 1999). Secondly, whether CSR precede or follow firm performance and thirdly, the moderating factors (contextual, internal, and external environment) of this relationship.

Other studies suggest a link between corporate social responsibility and performance of the corporation (Cochran and Wood, 1984; Griffin and Mahon, 1997; Preston and O'Bannon, 1997; Preston and Sapienza, 1990; Windsor and Preston, 1988 and Wood, 1991). Research suggests that firms experience benefits from improving their social and environmental performance. These benefits can result from competitive advantages that emanate from improved efficiency and performance and also from reputation and goodwill that result from positive perceptions of the corporation.

Though quantification of returns to social responsibility remains a challenge, research studies have found that short-term profits sometimes increase and at other times decrease when executives include social objectives. Some research shows that companies that practice social responsibility prosper in the long run, although these studies are neither conclusive nor exhaustive, nor do they clarify causality (*Business Ethics*, 2001).

General finding of Orlitzky *et al* (2003) seems to conclude that the strategically wise firms outperform their rivals by investing in CSR and creating above average returns. According to Little (2003) addressing corporate responsibility can help companies build market share, control risks, attract staff, stimulate innovation, gain access to cash, reduce costs and above all improve competitiveness, yet companies still fail to recognize the benefits. Similarly, corporate social responsibility may act as a product or service strategy designed to sustain competitive advantage (Banerjee, 2005).

3. RESEARCH METHODOLOGY

Research Design - The study adopted an exploratory survey to elicit attitudes and perceptions of tourists customers on social responsibility and competitiveness issues. The design was best suited for describing population characteristics, knowledge, beliefs, attitudes, preferences and behaviors. Similar studies have successfully used survey design (for instance, Masau and Prideaux, 2003).

Study Context - The study area covered 200km of Kenyan Southern and Northern coastline including Mombasa, Malindi, Watamu and Kilifi towns. The choice of study area was based on the fact that the area is host to the majority of international and local tourists annually with the coastal beach claiming slightly over 50 percent of the total bed night occupancy and higher length of stay by tourists in the country (KBS 2006). Furthermore, the coastline has the largest concentration of hotel accommodation and other tourism facilities. The choice of the classified hotel enterprises was on the basis of the intensity of competition amongst the international hotel chains and the importance attached to corporate social responsibility by international tourists and other key stakeholders. Secondly, the service industry was considered an image driven sector. Finally, classified hotels are trend setters in the tourism industry in Kenya besides being the largest and finest in the service sector.

Target Population and sampling - The study population focused on tourists from classified hotels in the study area. Ideally, population could potentially include all tourists who patronize the classified hotels over the study period. However, the total tourist population of 5440 was obtained from records of occupancy rates and bed capacities of the sample hotels during the study period.

Using a multistage sampling initially twenty classified hotels were selected from a total of list 87 hotels (GoK, 2004). Proportionate sampling method was used to select actual sample sizes from the hotels and finally systematic random sampling was utilized to identify actual tourist respondent. A total of 661 tourist respondents were selected.

Data collection Instruments and Procedures - Structured questionnaires were used and administered using drop and pick method**.** All research assistants were required to show an introductory letter to all potential respondents when soliciting participation in the research. As indicated in the introductory letter, the right of anonymity and confidentiality was guaranteed. This included the assurance that the study was only for academic purposes and not for circulation to other parties. The tourists were interviewed only at their convenient time and place. Caution was particularly observed not to intrude into respondent's hotel rooms and private residence.

Data Analysis - Both descriptive and inferential statistics were used for data analysis. Prior to data analysis evaluation of normality and Outliers was performed using skewness and kurtosis. It was then followed by first examining the measurement properties of the scales such as the uni-dimensionality of items on their constructs by assessing reliability and validity measures. Descriptive statistics was performed on measurement scales and analysis of variance (ANOVA) was performed to test for significant differences across socio-demographics variables. Finally an exploratory factor analysis (EFA) was performed for dimensions extraction. Factor analysis was appropriate for correlation relationships that are exploratory in nature. Exploratory Factor analysis was used to extract the scales dimensionality and to elicit relevant items for each dimension and the number of factors determined using the eigen value greater than one rule or the scree plot (Kline, 1999). The study adopted the former criteria since it is automatically generated from the analysis and is not subjectively determined as is the case for scree plot. According to the criterion, a given factor must account for at least as much variance as can be accounted for by a single item or variable. The orthogonal rotation method, specifically varimax with Kaiser Normalization Method was used (Tabachnick and Fidell, 2007).

3.5. Reliability and Validity of Instruments

As a prerequisite to further analysis, reliability and validity of used measurement scales were computed and reported. In order to retain the best items in a scale, the item with the lowest loading, reliability coefficient and/or item to total correlation was dropped. An iterative sequence of deleting items with low loadings and re-computing alphas and item to total correlations was done. Composite reliability refers to a measure of the internal consistency of indicators to the construct, depicting the degree to which they indicate the corresponding latent construct. An acceptable threshold for composite reliability is $\geq$0.70. If the composite reliability is $\geq$ 0.70, the indicators of the latent construct are deemed reliable and measure the same construct. As a complementary measure of the composite reliability, the variance extracted was computed to reflect the overall amount of variance in the indicators accounted for by the corresponding latent construct. A commonly used acceptable cutoff point is 0.50. If the variance extracted values were high, the indicators were truly representative of the latent construct.

Cronbach's coefficient alpha (α) was used to evaluate internal consistency of data scores. This is a statistic that measures internal consistency reliability, the degree to which responses are consistent across the items within a single measure. If internal consistency reliability is low, the content of items may be so heterogeneous that the total score is not the best possible unit of analysis for the measure (Kline, 2005). Although there is no absolute standard on how high coefficients should be, some proposed guidelines on score reliability are offered by Kline (2005). Accordingly, general

reliability coefficients around 0.90, may be considered excellent, values around 0.80 as very good and values of around 0.70 as adequate.

The reliability of five items measuring environmental corporate social responsibility (CSR) was evaluated using Cronbach Alpha (α) Coefficient. Initial reliability test showed that one item was inconsistent. The item was accordingly dropped from further analysis. When the item was deleted, the reliability increased to Alpha (α) = .748.

Regarding reliability of customer social responsibility, five items on customer social responsibility were subjected to reliability analysis. Due to some internal inconsistency, two items were omitted from the scale. The decision was based on initial low reliability and item to total statistics. To improve scale reliability three items were subsequently retained. Grand mean=3.504 standard deviation=2.1165 and α =0.704.

On reliability of customer CSR orientation, Initial ten items considered for measurement of customer CSR orientation were subjected to reliability test. The test was found to be below the threshold of α=0.70 considered necessary for internal consistency. Three items were systematically removed from the scale due to low item to total correlation. Accordingly, five items were retained, together the items had a relatively high reliability of α=0.727. The retained items had a grand mean of 3.448. As for the reliability of preference/expectations/diversity, similarly, in order to retain the best items in a scale, the item with the lowest loading, reliability coefficient and/or item to total correlation was dropped. An iterative sequence of deleting items with low loadings and re-computing alphas and item to total correlations was done.

Reliability for preference, expectations and product diversity increased to α=.703 when one item was deleted. This left a total of 5 items in the scale. Behavioral intentions scale was also evaluated for reliability and was found with alpha (α)=0.393. This was omitted from further consideration. Perceived service quality which had six initial items retained three items, accordingly increasing reliability to alpha (α) =0.672. Further, the dropped items were used to measure irresponsible CSR attributes and six items were retained from a total of 13 items, the alpha was raised to (α) =0.696. The main logic for this was that most of the dropped items were inclined to poor CSR practices.

For validity of data**, c**ontent, construct, convergent and concurrent related validity were evaluated. This concerns whether the test items are representative of the domain they are supposed to measure. For this purpose expert opinion was the basis for establishing whether item content was representative of the concept under study. Concurrent validity is used when scores on the predictor and criterion are collected at the same time (Kline, 2005 and Godard, Ehlinger and Grenier, 2001).

Convergent validity was assessed from the measurement model by determining whether each indicators estimated pattern coefficient (Factor loadings) on its posited underlying construct factor is significant (greater than twice its standard error). Pattern coefficients are generally interpreted as regression coefficients that may be in un-standardized or standardized form.

4. RESULTS AND DISCUSSIONS

Sample Characteristics of Tourist Respondents - On the gender of customer respondents, the proportion of female respondents was found to be 294 (44.48%) which is slightly less than the male respondents at 352(53.52%).

On the level of income, those earning below 1000 Euros (equivalent to Ksh.100,000), were 14.9% (94), (1000-2000) were 36% (227), 2001-5000 were 33.5% (211) and those earning more than 5000, were 15.6%(98). On education level, majority of the respondents were degree holders

comprising 50.9%(332), followed by diploma level;22.9%(149), postgraduate 9.4%(61)vocational 6.4%(42), high school 4.9%(32), certificate 4.4%(29) and primary 1.1%(7). This shows that tourist customers were relatively highly educated. While the average length of stay was 13.42 days (SD=27.44), the mean age of customer respondents were found to be 35.8 years (SD=10.13).

4.1. Perceived Customer Corporate Social Responsibility and Customer Response Outcomes Across Socio-Demographics

One way ANOVA was performed across ten tourist customer's socio demographics. The socio demographics were country of origin, gender, age, education level, income, intent to stay (loyalty), willingness to pay for CSR, number of prior visits by tourist, planned length of stay and hotel enterprise.

The proposition was that there were no significant differences across socio demographics. Results showed that across different *education levels* most variables were not significant, indicating that we reject the null hypothesis and accept the fact that there were significant differences across education levels. Therefore relative heterogeneity exists in perceptions across education levels. Only two dimensions were significant across education levels. These were customer CSR orientation and price criteria. There was therefore homogeneity of perceptions in regard to corporate social responsibility and price criteria across socio-demographics. Level of education was important determinant of perceptual differences in CSR and customer response outcomes.

Further, performing one-way ANOVA across *age of the tourist customer*, few customer CSR and customer response outcomes were significant. These were customer CSR attitude, customer CSR orientation and customer satisfaction. This means that the null is accepted, that there were no significant differences across socio-demographics. The rest of the variables showed relative homogeneity across tourist age. These showed that age only partially confounds certain customer CSR and customer response outcomes. Heterogeneity of perceptions is shown across socio-demographics.

ANOVA across *gender* showed that the perceptual differences were not significant at 5% except for two variables. These were: customer satisfaction and substitutability which were significant at 5% level. Most of the customer CSR and customer response outcomes were not significant. This implies that there were significant differences in perceptions across gender, with it playing a role in differences in perceptions on CSR and its response outcomes.

One way ANOVA across tourist *income levels* were performed. Three variables showed highly significant results across income categories. Perceptual differences were significant at 0.1% in respect to customer CSR orientation, switching potential and value of CSR. Two variables were significant at 1% level. These are environmental CSR and customer satisfaction. Three variables showed perceptual differences at 5% significance level. These are; customer CSR attitude, service quality and marketability. Finally, three variables showed no significant results at 5% level. These were price criteria, competitive potential and substitutability (see table 1). Majorly we accepted the null that there were no significant differences across income levels. This factor therefore has little effect on perceptions of customers. The exceptions however include price criteria, competitive potential and substitutability.

It was also found that across intent *to stay categories*, all the customer CSR dimensions were significant at 1% level. This means we accept that there were no significant differences across the variables. This implied that the customer orientation and customer response outcomes do not significantly differ across intent to stay. Only substitutability and service quality variables showed significant differences across intent to stay categories.

Willingness to pay for corporate social responsibility was one of the important categories across which significant differences were investigated across various dimensions. Customer CSR dimensions were all significant at 1% level. These were environmental CSR, customer CSR attitude, customer CSR orientation, switching potential and value of CSR. Others that were significant: price criteria, competitive potential at 1%, while service quality was significant at 5% significance level. This implies that for most variables there was no significant differences across willingness to pay customers, except for marketability and customer satisfaction. We asserted that there was relative homogeneity in perceptions in respect to willingness to pay.

Across *number of times a customer* is visiting (loyalty), the customer perceptions and attitudes showed that four variables were not significant at 5% level. Implying that there was significant differences across customer loyalty on environmental CSR, customer CSR orientation, competitive potential and marketability. Similarly, seven variables were significant. Meaning there was no significant differences across customer loyalty on customer CSR attitude, value of CSR, price criteria, substitutability. Three variables were significant at 1% level. These were switching potential, customer satisfaction and service quality.

C*ountry of origin* of the tourists showed a mixture of significant results. The country of origin has no significant differences in eight variables. These were environmental CSR, service quality, customer CSR attitude (significant at 1% level). Others were switching potential, value of CSR, customer satisfaction, marketability and substitutability (significant at 5%). Three variables showed relative heterogeneity across country categories. These were customer CSR orientation, price criteria and competitive potential. The three were all not significant at 5% level.

In contrast on the perceptual differences across *hotel enterprises*, all were significant at 0.1% level. This indicates relative homogeneity across hotel enterprises on customer CSR and customer response outcomes. One way ANOVA *across days of stay* were performed. Five variables showed significant differences at 0.1% level, across the various domains. These were customer CSR attitude, customer CSR orientation, value of CSR, price criteria and customer satisfaction. Two variables were significant differences at 1% level. These were environmental CSR and service quality. Finally two variables showed significant differences across age; these were marketability and competitive potential. Two variables were depicted no significant differences across; these were substitutability and switching potential.

4.2. Exploratory Factor Analysis (EFA) of Customer CSR and Customer Response Outcomes

Most of the constructs in the research model have not been firmly established in the literature. Accordingly, exploratory factor analysis was conducted as a step in the confirmation of the research constructs. The sample size was deemed adequate, since factor analysis was a large sample technique. As a general rule of thumb, it is comfortable to have at least 300 cases for factor analysis. Comrey and Lee (1992) provide as a guide sample sizes of 500 as very good and 1000 as excellent.

Before exploratory factor analysis was conducted three measures were applied when assessing factorability of the matrix. First measure was the Kaiser-Meyer-Olkin (KMO) measure of sampling adequacy. It is a ratio of the sum of squared correlations to the sum of squared correlations plus sum of squared partial correlation. This value varies between 0 and 1. The value approaches 1 if partial correlations are small. Values of .6 and above are required for good factor analysis (Hair, *et al.,* 2006). The second measure was the Bartlett's test of Sphericity which is a sensitive test of the hypothesis that the correlations in a correlation matrix are zero. Accordingly, the determinant of the matrix of the sums of products and cross products was converted to a chi

square statistic and tested for significance. Significant results at 0.05 level suggest sufficient correlation exists among variables. The third measure was done on preliminary results of exploratory factor analysis through inspection of factor loadings. The acceptable factor loading is normally ≥ 0.32. Ideally, absolute values less that 0.32 were suppressed. For the purpose of this study a more stringent criteria was applied to suppress any factor loading of ≤ 0.5. This was to facilitate a more robust analysis and interpretability.

Table 1: Customer Corporate Social Responsibility and Customer Response Outcomes Across Socio-Demographics

	Ed. Lev N= df=6	Plan stay N= df=1	WTP For CSR N= df=1	Times N= df=13	Country N= df=45	Gender N= df=1	Hotel N=df=19	Age N= df=51	Days N= df=35	Income N= df=3
Environmental CSR	1.73 (.11)	*13.26 (.00***)*	9.06 (.00**)	.95 (.51)	2.02 (00***)	1.40 .237	4.31 .00***	1.02 .44	1.87 .00**	4.16 .00**
Customer CSR attitude	.86 (.53)	19.48 (.00***)	57.64 (.00***)	2.02 (.02*)	1.79 (.00**)	.03 .869	29.45 .00***	2.27 .00***	2.94 .00***	3.46 .02*
Customer CSR orientation	8.42 (.00***)	26.41 (.00***)	29.68 (.00***)	1.28 (.22)	.55 .99	2.45 .118	8.62 .00***	1.60 .01**	2.25 .00***	9.53 .00***
Switching potential	1.49 (.18)	21.37 (.00***)	8.86 (.00**)	6.73 (.00***)	1.52 .02*	2.37 .124	11.09 .00***	1.36 .06	.75 .86	7.02 .00***
Value of CSR	1.18 (.32)	12.10 (.00***)	32.31 .00***	1.98 (.02*)	1.55 .01*	.27 .601	6.57 .00***	1.30 .09	3.23 .00***	9.43 .00***
Price criteria	2.56 (.02*)	12.67 (.00***)	9.48 (.00)	1.85 (.03	1.07 .35	.41 .520	5.44 .00***	.99 .49	2.36 .00***	1.83 .14
Competitive potential	1.22 .30	23.79 (.00***)	9.52 (.00)	1.68 (.06)	.83 .77	1.57 .211	4.63 .00***	1.17 .20	1.55 .02*	2.08 .10
Customer satisfaction	1.90 (.08)	45.99 (.00***)	3.58 (.06)	16.76 (.00)	1.52 .02*	6.30 .012	9.74 .00***	1.61 .01**	2.27 .00***	5.57 .00**
Service quality	.64 (.70)	1.50 (.22)	4.58 (.03)	2.22 (.01)	2.06 .00***	.94 .332	11.79 .00***	.96 .55	1.71 .00**	3.38 .02*
Marketability	1.56 (.16)	30.77 (.00***)	1.29 (.26)	1.35 (.18)	1.53 .02*	.04 .850	7.74 .00***	1.24 .13	1.50 .03*	3.51 .02*
Substitutability	.57 (.75)	1.29 (.26)	4.29 (.04)	1.97 (.02)	1.52 .02*	4.49 .035	8.17 .00***	.92 .64	1.18 .22	1.63 .18

Prior to exploratory factor analysis the items representing the above constructs were analyzed for factorability. This was using KMO and Bartlett's test of sampling adequacy. It was found that the items were factorable as demonstrated in subsequent sections below. The high value of KMO and a significant level of Bartlett's test of sphericity meant that factor analysis could be done. The 22 items measuring *customer CSR* was analyzed for factorability using Kaiser-Meyer-Olkin measure of sampling adequacy (KMO=.847) and Bartlett's test of Sphericity (χ^2 =8788.9, df=595 and p=0.000) showed sampling adequacy and significance amenable to factorability. As for *customer*

response outcomes, an analysis of Kaiser-Meyer-Olkin Measure of sampling adequacy (KMO =0.778) and Bartlett's test of Sphericity (χ^2=2274, df=91 and p=0.000) showing sampling adequacy and significance amenable to factorability.

4.3. Factor Analysis on Customer CSR

Six components were extracted after 8 iterations. The components that were extracted were having Eigen values ≥1.0. This represented at least 61% of the total variance. The factor components and their loadings are shown in Table 2.

Dimensions of Perceived Customer CSR. Six components extracted measuring perceived customer oriented CSR were labeled as follows: The first dimension labeled "Environmental CSR" was extracted representing 27.06% of variance. The items were concerned with customer's feelings about the local environment, the importance of the environmental conservation to them, the perceived cleanliness of the hotel's environment and the peacefulness of the hotel's surrounding. Others were fulfillment of its end of the bargain by hotel, support for local community's programs if well organized by the hotel, the range of choices regarding the hotel's offers/products and concern for the environment. One item had a negative but significant loading on the environmental CSR. This was concern for the environmental considered rather poor.

Second dimension labeled "Customer CSR Attitude" was extracted representing 11.31% of the variance. This component was associated with lack of consideration for social responsibility as a priority in tourist travel choices, the basis for future revisit on social responsibility of the hotel and the likelihood of stay at a more socially responsible hotel.

Similarly, dimension labeled "Customer CSR Orientation" was extracted representing 7.83% of variance. The component was associated with awareness of the hotels responsibility to their customers, consideration of social responsibility as important for their travel/leisure activities, the importance of the treatment of employees as criteria for choice of hotel, the importance of Community support by hotel as a criteria in hotel choice and tourist commitment to use only socially responsible hotels. Furthermore**,** a dimension labeled "Customer Switching Potential" was extracted representing 5.38 % of variance. The component was associated with likelihood to switch to a more socially responsible hotel and frequency of stay in different hotels on visiting had significant loadings to the component.

A dimension labeled "value of CSR" was extracted representing 4.89% of variance. This was consideration of a socially responsible hotel as being too expensive. Finally, dimension labeled "Price Criteria" was extracted representing 4.72% of variance. The component was associated with comparative cost consideration in customer's decision to stay at a hotel and poor concern for the environment by the hotel.

Table 2: Customer's CSR Rotated Component Matrix

Customer Oriented CSR Indicators	**Component**					
	1	2	3	4	5	6
The Quality of service in the hotel is good	.76	.22			.11	.11
The hotels local environment is uplifting to my feelings	.70		.13		.35	-.17
The hotels environment is quite clean	.69					
The hotels surrounding is very peaceful	.69				-.10	
The hotel's environmental conservation is important to me	.66	.12	.20			
I like the range of choices regarding the hotel's offers/products	.61		.21	-.11	.17	.38
The hotel has fulfilled its end of the bargain	.55	.29	.16	-.15	.21	.43
I would like to support local community's programs if well organized by the hotel	.54	.13	.28	.14	-.35	-.18
I belief hotels that are socially responsible have higher quality service	.49	.45			.13	-.20
My future return will not be based on social responsibility of the hotel	-.18	-.84				
I do not consider social responsibility as a priority in my travel choices		-.74	-.23		-.19	.17
I would likely switch to a more socially responsible hotel	.12	.56	.43	.26	-.20	
I'm aware of the hotels responsibility to their customers	.28		.66			-.20
Community support by hotels is an important criteria in my choosing the hotel		.44	.66		.12	
The treatment of its employees is an important criteria in my choice of hotel		.14	.64		.26	.16
I have taken personal responsibility to use only socially responsible hotels		.36	.59	-.23		-.34
I consider social responsibility as important for my travel/leisure activities	.26	.43	.54	-.12	.13	.19
I often switch from one hotel to another				.86	.11	
I have always stayed in different hotels whenever I visit				.83		.12
Hotel cost compared to other hotels influenced my decision to use the hotel		.21	.32	.13	.61	
I find the hotel's concern for the environmental rather poor	-.49				-.56	.15
A socially responsible hotel is too expensive	-.17	-.21	-.14	.19	-.19	.72

4.4. Factor Analysis for Customer Response Outcomes

Further, exploratory factor analysis was performed on 14 items indicative of response outcomes. Five components were extracted after 8 iterations. The components that were extracted had eigen-values ≥1.0. This represented at least 60% of the total variance.

Dimensions of Customer Response Outcomes - As indicated in the preceding section, five components were extracted from a total of fourteen items used to measure perceived customer response outcomes. The components and factor loadings are provided in table 3. The dimensions were renamed as follows: The First dimension labeled "Customer competitive potential" was extracted representing 27.80% of variance. A total of seven items had significant loading of ≥.5 on this component. Two items had negative but significant loadings on the component. These were perceived lack of willingness by employees to help customers and unwillingness to recommend the hotel to anybody. In addition, five items had significant positive loadings on the component. These were related to service quality, willingness to recommend to friends/relatives, trust and confidence on the employees of the hotel, the perceived quality of service in the hotel and meeting customer expectations. The two items with negative loadings had the highest absolute significant values. The negative loadings were attributed to the nature of the respective statements. Perceived Competitiveness was therefore attributed to high score on the positive statements. "Customer satisfaction" was extracted representing 12.44% of the variance. The component captured two key issues; customer preference to stay in the hotel on visiting and place attachment. The two had issues had positive loadings on the component and represent underlying customer satisfaction.

Similarly, a dimension labeled "service quality potential" was extracted representing 9.12% of variance. The component was reflective of empathy and tangibility of the service quality in the hotel as perceived by the customer. Specifically, statements like "I receive caring, individualized service from employees in this hotel" and "The physical facilities in the hotel were excellent" both had positive significant loading on service quality potential.

Furthermore, the "degree of Market-Ability" was also extracted representing 7.99% of the variance. One item had positive significant loading on this component. This was related to recommending behavior, specifically the statement "I was informed about how good this hotel is by a friend/relative/other" was elicited from the customer respondent.

Finally, a fifth dimension labeled "Substitutability" was associated with service switching potential of the customer. This component was extracted representing 7.15% of the variance. Two items had relatively high loadings on the component relating to frequency of switching and perceived lack of differentiated service. Specifically statements such as "I often switch from one hotel to another" and "Quality of service is similar to those of other hotels of same type" were elicited from the respondents. This indicated that the potential to switch was associated with the quality of service and lack of service differentiation. It could also indicate lack of customer loyalty. It has extended implication to customer derived competitiveness of the enterprise.

Table 3: Customer Response Outcomes

Customer Competitiveness Items	Component				
	1	2	3	4	5
I will not recommend this hotel to anybody	**-.76**		.25		.19
The employees lack the willingness to help customers	**-.71**			.23	
Quality of service is good	**.68**		.15	.18	
The hotel has met my expectations	**.68**		.28	.22	
I trust and have confidence in the employees of this hotel	**.67**	.13	.25		.21
I recommend this hotel to my friends/relatives	**.63**	.13		.44	-.16
The service I have received is more than what was asked for	**.62**		.16		.25
I feel this hotel is like my second home		**.87**	.13		
I prefer staying in this hotel whenever I'm visiting	.13	**.87**		.11	
The physical facilities in the hotel is excellent			**.81**	.16	-.20
I receive caring, individualized service from employees in this hotel	.42	.24	**.58**	-.21	.20
I was informed about how good this hotel is by a friend/relative/other				**.80**	
I am much more likely to stay at a more socially responsible hotel			-.19		**.84**
Quality of service is similar to those of other hotels of same type		-.14	.25	.49	**.52**

5. CONCLUSIONS AND IMPLICATIONS OF THE STUDY

It has been clearly established that customer CSR and customer response outcomes are multi-dimensional and multifaceted constructs. Customer CSR was characterized by environmental social responsibility, customer attitude and orientation related dimension representing key dimensions. Others are perceived value of CSR and price criteria representing fringe dimensions. Customer response outcomes were delineated as customer competitive potential, customer satisfaction, service quality potential, degree of marketability and substitutability.

It could be concluded whilst most issues had relative heterogeneity across education categories only social responsibility criteria was the exception. This indicated that education moderated the perceptions in regard to social responsibility. This is not true for the country of origin and hotel subtypes that customers resided.

It could be concluded that personal profile and some demographic factors influence the perceptions of the tourist in regard to corporate social responsibility and related competitiveness outcomes.

In conclusion while significant differences on customer CSR and customer responses outcomes across education levels, customer loyalty, gender and age of the customers existed, lack of significant differences in perceptions across customer's intent to stay, country of origin, income level, hotel and customer's length of stay was found. Customer's willingness to pay for CSR was neutral in regard to CSR perceptions.

Due to its dimensionality and customer differences on wide range of CSR practices and outcomes marketing strategy calls upon managers to focus efforts on custom CSR practices in their businesses. Corporate leaders should attempt to embed multiple forms of value across their company's CSR portfolio and even within CSR activities themselves. Managers should ensure consistent, long-term commitment to each CSR activity. Since different corporate activities have different impacts on the customer's perception of the overall firm's effort and long-term commitment to CSR. CSR activities are instrumental in customers' decisions to support the firm, with higher levels of perceived effort and long-term commitment leading to more positive customer responses.

This study focused on customer as homogenous individuals. However future research should focus on customer sub-types as it relates perceived effect of CSR. For instance, literature distinguishes two customer types: the self-oriented (self-enhancement) customer and the other-oriented (self-transcendent) customer.

Future research should also categorize various forms of CSR practices as it relates customer outcomes. For example product-related CSR activities versus philanthropic CSR could influence customer outcomes differently**.**

Finally, it could be useful to examine CSR and customer outcomes in different contexts. This will provide a deeper understanding of the role of CSR in different contexts

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THE PERSISTENCE EFFECT OF UNEMPLOYMENT IN TURKEY: AN ANALYSIS OF THE 1980-2010 PERIOD

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KEYWORDS

Hysteresis, unemployment, labor market, factor analysis.

ABSTRACT

The study aims to investigate the unemployment generating effects of economic crises in detail for the 1980-2010 period in Turkey. While investigating the unemployment generating effects of crisis, the important effects of persistence of unemployment should not be ignored; where these effects become stronger in emerging economies in addition to developed countries. In this context, hysteresis effect ,which is mostly debated by the European side of New-Keynesian economics, will be analyzed within the framework of the persistence of unemployment. Accordingly, the study aims at investigating the unemployment generating effects of crisis in Turkish economy within the framework of hysteresis effect and persistence. The economic crises that occurred in Turkey during 1980-2010 are evaluated in terms of their effects on the persistence of unemployment. For this purpose, TURKSTAT's household labor force surveys for the period 1980-2000 were referred. For the 2000-2010 period, published TURKSTAT Household labor force surveys were evaluated in detail to investigate the persistence framework of the economic crisis. The data examined in the period is generated annually, summing to a total of 4.7 million survey data. In the empirical part of the study, the data acquired from surveys was subjected to factor analysis to identify the most significant factors. In the second stage, frequency tables and crosstabs were formed. The main findings of the study indicate that the significant effects of economic crises over hysteresis carry importance and the existence of such effects lead to increasing rates in unemployment for the examined period in Turkey.

1. INTRODUCTION

In studies in economic literature where hysteresis effect have been examined, the analyses not only, concentrate in the context of "duration theory" and "Insider-outsider theory" but also the concepts; the marginalization of human capital and efficiency wage theory are seem to be included in the models. Duration theory, starting from a long term unemployment for more than a year or more, focuses on the negative effects of unemployment over labor demand and labor supply. Indeed, long-term unemployment can lead to a decrease in the effective labor supply due to low motivation and marginalization of human capital. Under these conditions, unemployed may follow an revising attitude of looking for work by choosing to reduce reservation fees or increasing job search activities. In case of these conditions emerge, due to the shifting of previously unemployed people to employed, it increases labor force participation rate and this trend is called of "positive duration dependence". Through the emegrence of opposite of these conditions, the decrease in

labor force participation is called "negative duration dependence" which leads the individual to accept to remain unemployed for a longer period. (Flatau, Lewis and Rushton, 1991: 49-50). Individuals who prefer negative duration dependence do not choose to reduce reservation fees, since they know that some obstacles may arise (Greenwald and Stiglitz, 1987: 124 and Mankiw, 1990, 1657). In this context, a long trend of high levels of actual unemployment may be discussed, NAIRU rises due to the fact that, it follows the traces of the actual unemployment rate, which means a rise in natural unemployment rate so hysteresis in unemployment takes effect.

The second part of the study, the structure of unemployment in Turkey during 1980-2010 will be examined. The third section consists of data and analysis results.

2. THE STRUCTURE OF UNEMPLOYMENT BETWEEN 1980-2010

When the factors increasing unemployment examined; rapid population growth, internal and external migration, the structure of technological advances, duality of interregional differences in development, urbanization and rural-urban differences in the context of productivity differences between regions and the wage differentials due to low rural marginal product of labor, educational policy problems, political and economic instability, lack of investment in public and private sectors, the insufficiency of labor quality to satisfy the needs of industry, labor quality, decrease in production caused by increase in production costs due to high interest rates, inadequacy in capacity utilization rates, the deficencies of production due to inadequacy of training, credit and organization facilities that entrepreneurs should be provided for, usv, can be listed. (ParasızveBildirici, 2002). Advanced technology, reveals a status of non-compliance between labor supply labor demand by qualitative and quantitative changes in the demand for labor, this also leads to structural unemployment. Unemployment, arising due to not affording of employment opportunities close to rapid population growth, which is a problem at emerging and developing countries, combined other problems, further aggravates the unemployment problem.

Especially while labor potential in cities is constantly increasing due to the effects of rapid population growth and migration from rural to urban areas; labor participation rate is decreasing continuously due to inter agricultural modern sector migration and misformation of new employment opportunities (Lewis, 1954; Lewis, 1979; Harris and Todaro, 1970). On the other hand, the often financial crises from the effect of globalization, reveal significant effects on unemployment. The aforementioned factors plays a role in persistence of unemployment.

Between 1980 and 2010 working-age population in Turkey increased by about 27 million, whereas only 6.5 million jobs were created in this period. In this case we can find the employment rate is around 40%. This rate is among the lowest levels in the world. EU-15 average of this ratio is 65%. Population is 72 million 606 thousand people at the end of 2006, the active population increased by 12% to 51 million 668 thousand from 46 million 211, out of, this increase in population and active population, has not been reflected at the same rate over labor and employment. Approximately labor force has showed a 7.5% increase, employment increased by only 3.5%. The number of unemployed has increased from 1 million 497 thousand in 2000 to 2 million 446 thousand in 2006, increased by 63% within seven years. Similarly, out-of labor force has increased by 16%; from 23 million 133 thousand 892 thousand to 26 million. In these circumstances it is clear that the unemployment rate is far from TURKSTAT rates. Unemployment rate is far from reflecting the reality while population increases and the labor force participation rate declines. A complete structural change can be examined based on the 2000s, except for labor force participation rate decline. Dissolving of agricultural sector, partial transition from labor intensive

production to capital intensive production at manufacturing sector plays had been effective in the persistence of unemployment.

When past 1990 period is investigated; the hidden unemployment is at a high level since the employment rates in the agricultural sector are still examined so high. Turkey is the second of the world in terms of the weight of employment in the agricultural sector.

While 3.1% of total employment in the EU is in agricultural sector, this rate is 41.4% in Turkey. Of the total employment in 2000, 34.5% agriculture, 24.6% industry, 40.9% is in services. In 2006, 47.3% of total employment is in the services sector, 27.3% is in the agricultural sector, 25.4% are employed in the industrial sector. In 2010, 54.9% of the total employed is in the services sector, while 19.9% of it is employed in the industrial sector 25.15% was employed in the agricultural sector. (Based on TURKSTAT data and HHIA)

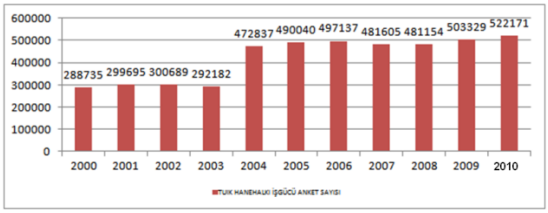
In 2010, Non-agricultural unemployment rate in Turkey stood at 13.3 per cent, 1.3 percentage point increase over the same period the previous year. When, non-agricultural sectors are examined, the majority of unemployment is in non-agricultural sector takes attention. As such, self-employment and wide implementation of unpaid family workers in Turkey is important.

3. EMPIRICAL FINDINGS

3.1. Data Set

In this study, seperately published TURKSTAT Household Labour Force Survey for the period 2000-2010 compiled, by using data sets generated, it is aimed to investigate the persistence of labor force structure over time. The data set consists approximately 300 000 surveys for the year 2000, the number of observations shows a rise over the years, in 2010, reaching about 500 000 observations. Total numbers of TURKSTAT Household Labor Force survey dataset between the years 2000-2010 are below The number of observations are based on a total number of 4 million 629 thousand 574 surveys.

Figure 1: TURKSTAT Household Labor Force Data Set



Source: TURKSTAT Household Labor Force statistics, 2000-2010

3.2. The Causes of Unemployment in Turkey

Causes of unemployment in Turkey are grouped under three headings; unemployment due to the temporary employment; unemployment due to being dismissed and/or business closing and bankruptcy reasons is expressed as casual unemployment and the frictional unemployment. Temporary employment is comprised of university graduates employed during a project or probationary period, besides seasonal workers. Disaggregated in terms of the causes of unemployment in the total unemployment rates for men are given in Figure 2.a 's, and the values calculated for the ladies are in Figure 2.b., total unemployment rates for the causes of

unemployment are included in the Figure 2.c'. In the figures, while the years of economic crisis are stated red , the years after the crisis where the effects of the crisis felt are indicated by gray. Women's labor force participation rate of the population is 28%. For this reason, the male labor force characteristics will be investigated as a proxy, whereas the differences will be highlighted in terms of women when examined.

Figure 2a: The Reasons of Unemployment among the Male Population

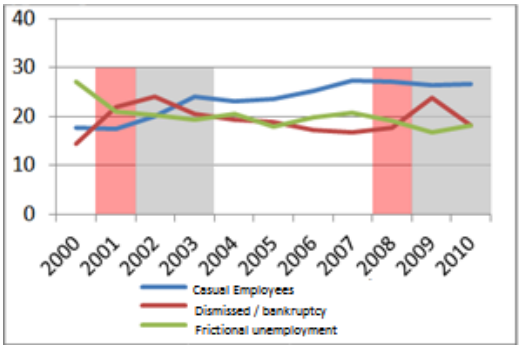
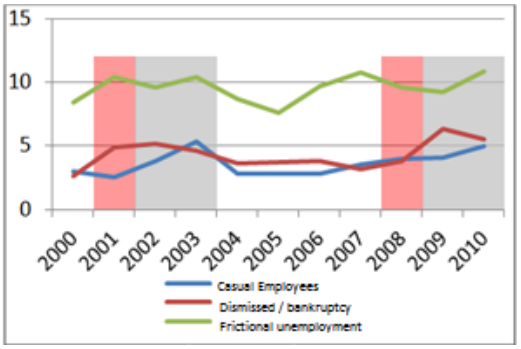


Figure 2b: The Reasons of Unemployment among the Female Population



Source: Household Labor Force Statistics 2000 – 2010, Turkish Statistical Institute

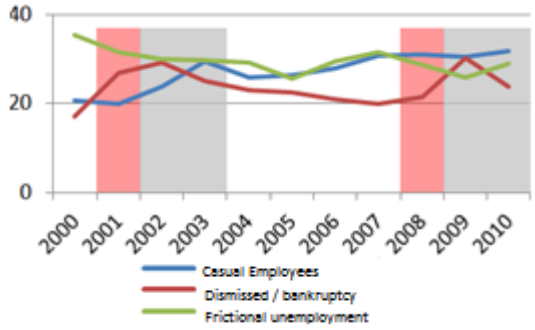
In 2010, unemployment due to temporary employment for men creates the first reason for being unemployed, second reason is for being dismissed, frictional unemployment is the third reason. Indeed, the first cause being unemployed is frictional unemployment in 2000. Over time unemployment of men due to temporary employment, which indicates short term employment, is seem to be an important phenomenon. Rate of unemployment due to dismissal during the economic crisis of 2001 has increased to 16% from 9% in the year 2000 level. Men's frictional unemployment of total unemployment has increased from of 14% in 2000 to 22% in 2001 crisis, rising to 24% in 2002, after the crisis; indicating the increased negative effects of the crisis on the labor market and continued to a lagged increase. Following the 2001 crisis, and the structural unemployment, due to structural transformation of the economy, fell from 27% in 2000 to 2001 crisis level of 21%,and fell to 20% in 2002. In 2000, while total of 18% of the men were examining the cyclical unemployment, this rate remained roughly the value in 2001, by the effect of the crisis, it has increased to 20% in 2002, 24% in 2003. Indeed, a dismissal rate of 15% between 2000-2004 period indicates persistence. On the other hand, the high rate of temporary employment and to be at 18% between 2000-2002 and showing a significant rise to 26% through the investigation period is important.

When the actual causes of male unemployment investigated, the effects of frictional unemployment, where only the short-term effects should be seen, is to spread over years after crisis, so employment decisions of firms emerge as lenghtening of working hours. On the other hand, in the period following the 2001 crisis which lasted until 2007, the raw unemployment, representing unemployed people due to dismissal, unemployment due to bankruptcy and business closure, declined to 11%, but the rate jumped to 17% in 2009, following 2008 crisis, even pre-crisis rates have not reached. The rate of cyclically unemployed men in total unemployed fell to only 23% in 2004, 18%, the value prior to 2001, has not been caught, gradually rising to 25% until 2007, it increased to 27% with the 2008 crisis, in the first year following the crisis declined only down by 1% to 26%, reaching the highest level of 27% in 2010 and remained steady. The rate of frictionally unemployed men in total unemployed showed the effects of two years after the 2001

crisis, it showed a gradual decline between two crises. Although this proportion declined to 16% in 2007, rose to 17% in 2008 crisis, in the years following crisis it gradually increased and reached 24% in 2009.

The remarkable persistence of frictional unemployment following crisis, that it in fact should shows employer worker mismatch occuring as a result of short-term disharmony between employment and skill, attracts attention in the context of hysteresis.

Figure 2c: The Reasons of Unemployment in the Total Population

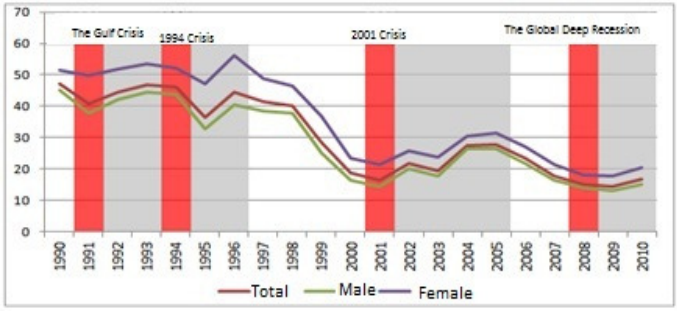


Source: Household Labor Force Statistics 2000 – 2010, Turkish Statistical Institute

The share of frictional unemployment in total umpleyment is 35.5% in 2000. During 2001 crisis, dismissals and business bankruptcies increased rapidly summing a total share of 17% in 2000, increased to 26.8% in 2001 crisis and never returned back to the in the pre-crisis levels afterwards. While, being unemployed due to dismissals and business bankruptcies declined to 23.7%, it was horizontal 2006, when remained at 19.8% in 2007 (pre crisis values uncatched) with the realization of the 2008 crisis, it has risen 25.9% in 2009.

In 2002, the total frictional unemployment, which is the main cause of unemployment reasons, is 31.5%. By 2002, the share of frictional unemployment in total unemployment has fallen rapidly, decreased up to 26% in 2005 as a minimum, but the pre-crisis levels not achieved. Frictional unemployment had risen to 30% before the 2008 crisis, in the two years following the crisis it declined 28.6% and 23.5% in 2010. In this context, the examination of the causes of unemployment reasons, indicates a significant hysteresis effect of persistence.

Figure 3: Long-Term Unemployment and Economic Crisis, 1990-2010 Period



Source: Household Labor Force Statistics , Turkish Statistical Institute

3.3.Unemployment by Duration of Job Search in Turkey, 1990-2010 Period

While analyzing the persistence of unemployment the need to pay attention on the length of unemployment between short-term and long-term differences. The long-term unemployment, refers to the number of people with continuous periods of unemployment extending for a year or longer, expressed as a percentage of the total unemployed, is important in terms of persistence in unemployment. Figure 3 gives information about the persistence of long-term unemployment.

In 1990, The share of long-term unemployed in total unemployed was approximately 47.1% and, generally decreased over time with a volatile track, the rate in 2000 declined by 21%. This rate was rather low from the average of 1990 - 2000 which was 41.7%. While Turkey's long-term unemployment rates were watching a flat course since the crisis years of 1990's and following years, the unemployment rates showed decline after three and four years from criss. Unemployment rates were increasing again during the crisis and then that increase is observed as horizontally in the following years of crisis. The long-term unemployment rate was about 47% in 1990, and due to the negative affects of the Gulf Crisis that decline in the unemployment rate stopped and started to rise again. Looking at the gender distribution in 1990 that created the long-term unemployed that 45% of unemployed men and, 51.5% of unemployed women were long-term unemployed. In 1991 the year of crisis, the long-term unemployment fell to 37.9% for men and, 49.9% for women. The long-term unemployment rate was could not reduced in 1992 and 1993, the years following the 1991 crisis, that rate was increase from 40.9% to 44.6% in total, from 37.9% to 42% for men and, from 49% to 51% for women. A decline seen that may be termed a relatively horizontal in the long-term unemployment rates in the crisis of 1994. The long-term unemployment rates had a rapid rise due to the crisis year of 1994 and in the following years. The long-term unemployment rate was 36.6% in total, 32.6% for men and, 47.2% for women. That rate increased to 44.4% in total. In the same year that rate increased to 40.5% for men and, reached its highest level with 56.1 % for women.

1991 and 1994 crises and in the follow-up years, as a result of unemployment was examined in terms of maturity seen that after years of crisis increased were permanence for long-term unemployment and unemployment rate. That is remarkable that the permanence was more powerful on women.

Long-term unemployment followed a decreasing path between 1997 and 2000. Reached by the yar 2000, the long-term unemployment rate was 16.5% for men, 23.2% for women and, 18.8% in total. Long-term decline path in unemployment rates were broken to upward by 2001 crisis and then rates were increasing rapidly. Persistence was higher in the following years of the crisis. The increasing trend, continued until the years 2005-2006, were noteworthy. By 2007 the long-term unemployment rate was reduced, but decreasing trend was stopped by the 2008 crisis and, entered the increase path again, especially for women. The average of long-term unemployment rate was 19% between 2000 and 2003. Following the crisis period 2004 - 2005 the average was around 27.5%, it declined to 17.8% and 15.1% in 2007 and 2008. It dropped to 14.3% in followed the year 2008. This ratio increased again and reached 17% in 2010. On the other hand, the ratio increased from 12.9% to 15% for men in the following years of the crisis which means that persistence unemployment for men. In 2009 that ratio was 17.7% for women and reached 20% in 2010. This indicate that hysteresis effects play an important role especially in the employment structure for women in Turkey women. As noted previously in the other issue is that the lack of female labor force participation is important on the structure of unemployment. In the following context, the structures of job search in labor market will be examined by gender.

3.4. Gender and Unemployment in Turkey, 2000-2010 Period

Although figure 3 gave detailed information about the persistence of unemployment rates were also calculated to verify that the rates of job seekers. Figure 4a gives the 2000 - 2010 period the percentage of job seekers in Turkey by gender and, in figure 4b gives percentages of the job seekers by genders in their own population. Compared to active job seekers in the labor market in Turkey, the percentage of job searching of men has been more than twice as percentage of job searching of women. Between 2000 and 2003 the total female population of women seeking employment rate ranged from 32% to 29%. This rate was 26% in 2004 and this was the minimum level for between 2000 and 2010 years. With the effect of 2008 crisis, women's labor force participation rate increased and job search percentage of women increased that was 33% in 2009 and has risen up to 38% in 2010.

Figure 4a: The Job Seekers in Turkey byGender

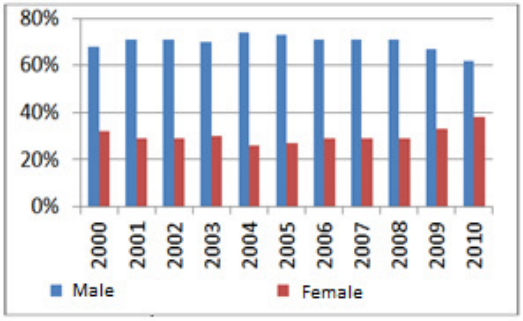
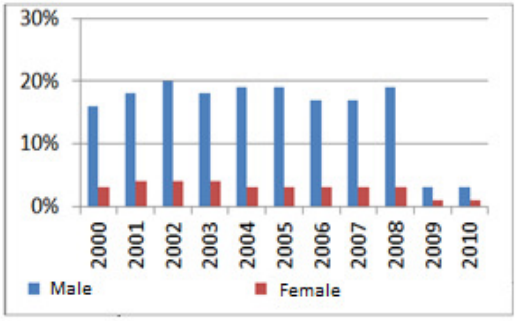


Figure 4b:The Job Seekers by Genders in Their Own Population



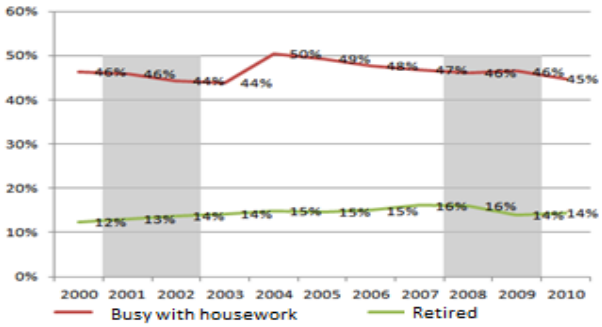
Source: Household Labor Force Statistics 2000 - 2010, Turkish Statistical Institute

Looking at the percentage of job search within the genders, the rate of labor force participation is higher for men than women. The percentage of job search of men ranged from 16% to 19% between 2000 and 2008 and that fell down to 3% in 2009 and 2010. During the period the percentage of job search ranged from 1% to 4% in females. Importantly, the survey respondents to the question about 2/3 reputation was that of women. In this context, low female labor force participation rates caused by decreasing unemployment rates of women. As an example we evaluated the year 2000, women were 138.756 people in 201.229 total survey population.

3.5. Active Labor Market Exclusions

When assessing the persistence of unemployment, another point which should be evaluated is the ratio of remaining outside the active labor force. Women are excluded from the labor market because of their housework and care of their children. At he same time, retirement at an early age is very high percentages of both men and women. Figure 5 shows that rate of staying out of active labor force. About 40% of women has remained out of the labor force since 2000.

Figure 5: The Reasons for Staying Out of Active Labor Force



Source: Household Labor Force Statistics 2000 - 2010, Turkish Statistical Institute

When analyzing the characteristics of the individuals, who stays outside of the labor force, reached the important findings. 46 percent of outside the labor force in 2009, had worked previously. Outside the labor force and those individuals who were employed before 20.1% of individuals who were employed in agriculture and 11.8% in industry, 3.5% of the construction sector, 19.9% are individuals who worked in the services sector. 44.7% of these individuals were unemployed for less than 8 years. 12 million people had been working in a job before, remained outside the labor force during this period. These individuals answered, the question that *why don't you join the labor force* ?, as 9.9% retirement, 10.5% due to seasonal reasons, 6.8% for health reasons, 4% due to marriage, 5.1% of total layoff / due to closure the place of business, 3.3% dissatisfaction with job. Other reasons have 16%. In 2009, the informal employment rate decreased 0.7 percentage points compared to 2008, decreased to 41.3%. Compared to the previous year, informality in the agricultural sector decreased 87.8% to 84.4% in 2009 and, in non-agricultural sectors that ratio decreased 29% to 28.7%.

Figure 6a: The Reasons of not Seeking a Job: Males

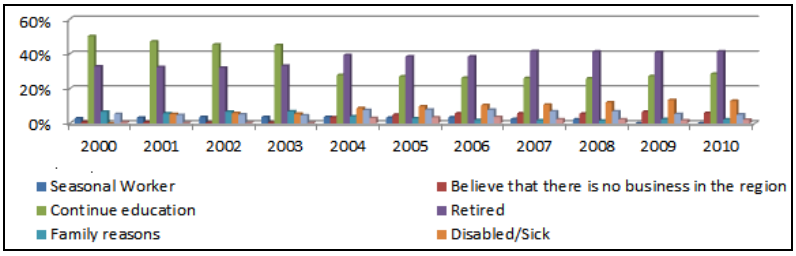


Figure 6b: The Reasons of not Seeking a Job: Females

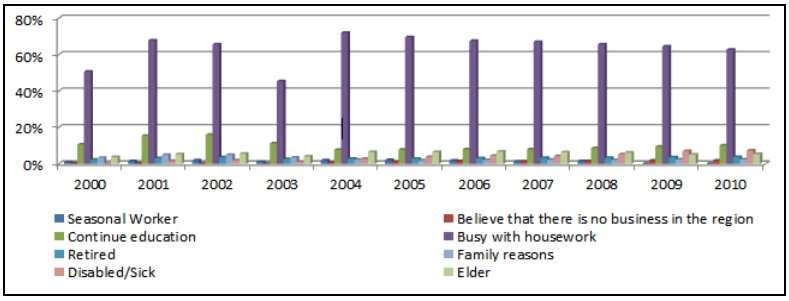
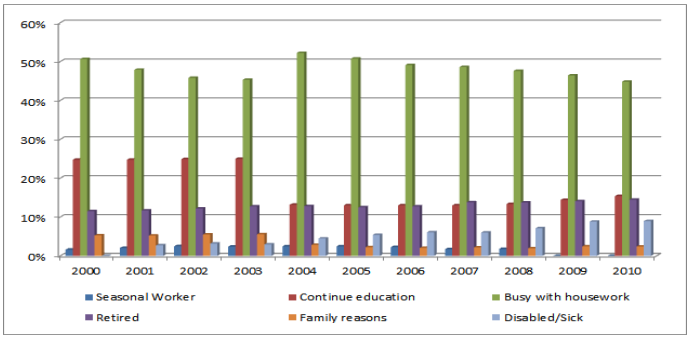


Figure 6c: The Reasons for not Seeking a Job over the Years: Whole Population



Source: Household Labor Force Statistics 2000 - 2010, Turkish Statistical Institute

Figure 6a shows that men's reasons for not seeking job over the years. To continue education is the most important factor for not searching job for men. 50% of the male population answer that not seek work because of to continue their education in 2000. This rate decreased to 27% over the years, between 2007 and 2010. The second factor is retirement. Due to retirement, not look for a job reached 44% and 42% in 2000 and 2007. In this context, a large part of men indicated that they did not search for a job because of retired or were in school. 10% of men not looking for a job due to disability and sickness. It seen that there is a significant health problem. Not work due to family reasons was 7% in 2000. It decreased to 1% in 2009. Seasonal workers, waiting to be called old work and, believe that there is no business in the region are indicate that the structural unemployment.

Figure 6b shows that women's reasons for not seeking job over the years. The main reason for not searching job for women is that to be busy with household tasks and, the second reason is to continue their education. Women not looking for work due to being busy with household tasks, corresponding 51% of the total female population. This rate increased to 68% in 2001. Considering these rates, an expansion and prosperity can be mentioned for the period before the crisis of 2001. Also, women entered the labor force market with higher rates in 2000 than 2001. This cannot be said for the 2008 crisis. The relevant statistics evaluated for the total, not looking for a job due to household tasks has high levels in women, retirement for men is the most important and to continue education is the first reason in general.

Figure 7a: Types of Job Searched: Male Population

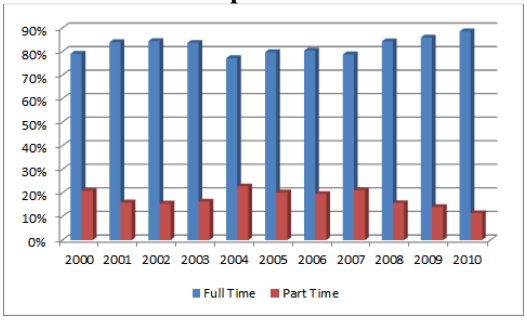
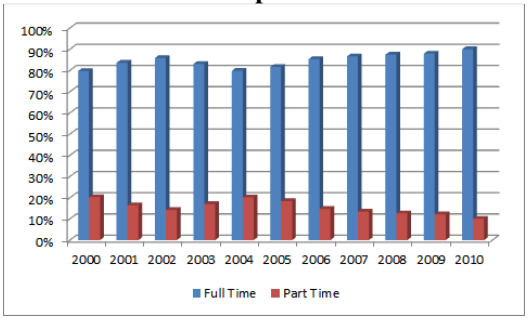


Figure 7b: Types of Job Searched: Female Population



Source: Household Labor Force Statistics 2000 - 2010, Turkish Statistical Institute

Figure 8a: Types of Job Searched by Males in the Total Population

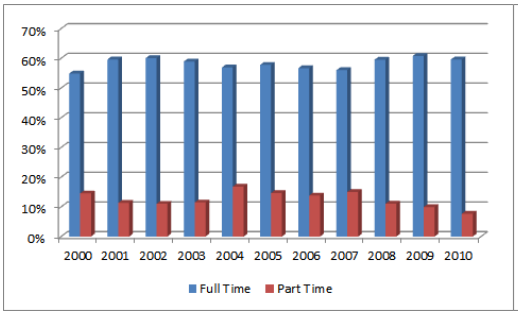


Figure 8b: Types of Job Searched by Females in the Total Population

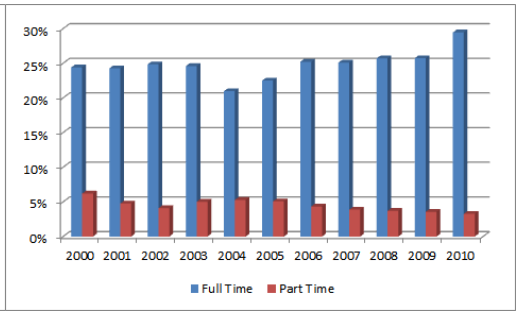
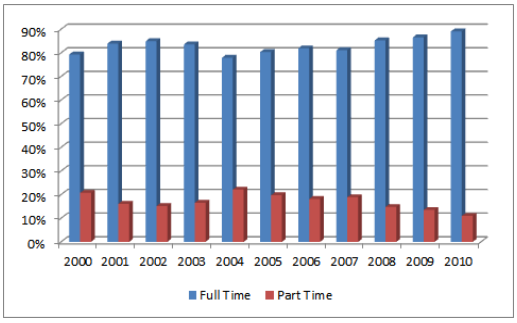


Figure 8c: Types of Jobs Searched Over the Years: Whole Population



Source: Household Labor Force Statistics 2000 - 2010, Turkish Statistical Institute

Men looking for full-time job in first place in job types. 79 % of male were looking for full-time job in 2000 and, this ratio was increased to 84% after the 2001 crisis. In this case, thought that impact of layoffs during the crisis to be high. Part-time job search rates decreased from 4% to 1% with the effects of the 2001 crisis, that rates took place 1% during 2005 and 2006 and was recorded as about zero in 2007.

Figure 8a shows that the annual distribution of types of jobs which are searched by men over the years. Women's and total populations' annual distrubition tables are seen seriatim in 8b and 8c. Full or part-time job-seekers ratio peaked with 23% in 2004 and, it decreased to 10% in 2010. In this context, in addition to full-time trend of unemployed job search increases in crisis' years and, part-time or full-time job search rates increses in economy's narrowing terms.

When examined the type of work which is searched by women, observed that a similar trend in men. Full-time jobs are mostly seen. Women in full-time job seekers were 80% in 2000. This has risen to 84% after the 2001 crisis. It was 86% in 2002 and decreased to 82% in 2004. In 2007, 2008 and, 2009 full time job seekers rate increased to 88% - 89% and, reached 90% in 2010. With the lights of findings, these are important that impact of layoffs is higher during the crisis and effects of persistence in the labor market is high after years of crisis. With the impact of labor force participation are low, especially in the context of women differ in the structure of unemployment is remarkable in Turkey.

4. CONCLUSION

The study aimed to investigate the unemployment generating effects of economic crises for the 1980-2010 period in Turkey. In this context, hysteresis effect and persistence derserves special attention in Turkey. The economic crises that occurred in Turkey during 1980-2010 is aimed to study in order to investigate the effect on the persistence of unemployment. For this purpose, TURKSTAT's household labor force surveys for the period 1980-2000 were analyzed and further, for the period 2000-2010, published TURKSTAT Household labor force surveys were analyzed in great detail to evaluate the persistence of unemployment within the framework of the economic crisis. The data acquired from surveys was analyzed with factor analysis to select the most significant factors. The findings of the study are collected in the following. i. The significant effects of economic crises over hysteresis effect carry importance. ii. The persistence in the labor market is higher in Turkey between the years 2000-2010 and increases especially following the economic crises. Accordingly, reduction of persistence of unemployment is even more difficult in these periods so that the other problems of labor market become more coherent. The policies aiming at reducing the unemployment rate require active labor market interventions to be applied in conjunction with monetary and fiscal policies. Without making the labor market more flexible, the effectiveness of monetary and fiscal policies significantly deteriorates. Therefore, applications of monetary and fiscal policies aiming at economic growth fail to achieve reductions in the unemployment rates.

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AN INTERACTIVE TOOL FOR MUTUAL FUNDS PORTFOLIO COMPOSITION USING ARGUMENTATION

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KEYWORDS

Mutual funds, portfolio management, decision support systems, knowledge-based systems.

ABSTRACT

This paper presents the PORTRAIT (PORTfolioconstRuction based on ArgumentatIon Technology) tool for constructing Mutual Funds investment portfolios. This work, from the field of finance, uses argumentation-based decision making that provides a high level of adaptability in the decisions of the portfolio manager, or investor, when his environment is changing and the characteristics of the funds are multidimensional. Argumentation allows for combining different contexts and preferences in a way that can be optimized, thus, resulting in higher returns on the investment. It allows for defining a set of different investment policy scenarios and supports the investor/portfolio manager in composing efficient portfolios that meet his profile. Moreover, the tool employs a hybrid evolutionary method for forecasting the status of financial market. This seamless merging of the investors profile, preferences and the market context is a capability which is rarely addressed by portfolio construction methods in the literature. The PORTRAIT tool is intended for use by decision makers such as investors, fund managers, brokers and bankers.

1. INTRODUCTION

Portfolio management is concerned with constructing a portfolio of securities (e.g., stock, bonds, mutual funds, etc.) that maximizes the investor's utility. Taking into account the considerable amount of the available investment alternatives, the portfolio management problem is often addressed through a two-stage procedure. At a first stage an evaluation of the available securities is performed. This involves the selection of the most proper securities on the basis of the decision makers' investment policy. At a second stage, on the basis of the selected set of securities, the portfolio composition is performed.

The PORTRAIT (PORTfolioconstRuction based on ArgumentatIon Technology) tool that this paper aims to present, uses, for the first time, argumentation-based decision making (Kakas and Moraitis, 2003) for selecting the proper securities, in our case, mutual funds (MF). More precisely, for the first stage of our analysis, the proposed methodological framework that is implemented by our tool gives the opportunity to an investor/portfolio manager to define different investment scenarios according to his preferences, attitude (aggressive or moderate) and the financial environment (e.g. bull or bear market), including the possibility to forecast the status of financial market for the next investment period, in order to select the best mutual funds which will compose the portfolio. For the second stage (portfolio composition), we use four different strategies, based on the MFs' performance in the past, to define the magnitude of its participation in the final portfolio.

The endeavour of the argumentation-based decision making is to select MFs through rules that are based on evaluation criteria of fund performance and risk. The performance of the MFs on these criteria is inserted to a knowledge base as facts along with facts describing the market condition.Then, in a first level, the basic inference rules that refer directly to the financial domain are edited and an MF is selected or not based on the above mentioned facts (e.g. "select an MF with a high return"). Following, in the second level, experts express their theories (or arguments) for selecting funds, either for simple contexts, or for expressing the needs and directives of different investor roles, by defining priorities between the first level rules. Finally, in the third level, the decision maker combines the theories defined at the previous level by expressing his combination policy, again using priority rules.

In the present study we aim to show that argumentation is well-suited for addressing the needs of this type of application, thus its results can be adapted to be applied to other such managerial problems (where decision is dependent on user preferences, profile and context of application), and also to show that the composed portfolios can help an individual investor or fund manager to outperform a broad domestic market index by applying profitable investment strategies.This is important for decision makers, such as investors, fund managers, brokers and bankers, especially in private banking. Argumentation allows for seamless merging of the investors profile and preferences with the context of the financial environment, which, to our knowledge, is rarely addressed by existing methods on portfolio construction in the literature.

The rest of the paper is organized as follows. Section two reviews and discusses the related literature. Section three describes the data set that we used for validating our approach and the different methods that we employed. We also describe how the different methods were instantiated and our knowledge engineering approach. In section four we present the PORTRAIT tool, its architecture and usage. Section five presents the PORTRAIT tool validation and obtained results. Finally, section six concludes the paper hinting on our future research directions.

2. LITERATURE REVIEW

In international literature, a series of programming approaches upon the performance of mutual funds have been proposed, but only few of them (see, e.g. Gladish et al., 2007) deal with both the portfolio evaluation and the stock selection problem.

The traditional portfolio theories (Markowitz, 1959; Sharpe, 1964) accommodate the portfolio composition problem on the basis of the existing trade-offs between the maximization of the expected return of the portfolio and the minimization of its risk (mean-variance model). On the same mean-variance basis or in other similar probabilistic measures of return and risk, several other approaches have been developed, including the Capital Asset Pricing Model-CAPM (Mossin, 1969), the Arbitrage Pricing Theory-APT (Ross, 1976), single and multi-index models, average correlation models, mixed models, utility models and models using different criteria such as the geometric mean return, stochastic dominance, safety first and skewness (see Elton and Gruber, 1995). Many of these models used in the past were based on a unidimensional nature of risk approach, and they did not capture the complexity presented in the data. This study, aims to resolve this troublesome situation using, for the first time, a technology from the artificial intelligence domain, namely argumentation-based decision making, which provides a high level of adaptability in the decisions of the portfolio manager or investor, when his environment is changing and the characteristics of the funds are multidimensional.

Overall, the use of argumentation: (a) allows for decision making using conflicting knowledge, (b) allows to definenonstatic priorities between arguments, and (c) the modularity of its representation allows for the easy incorporation of views of different experts (Amgoud and Kaci, 2005). Traditional approaches such as statistical methods need to make strict statistical hypothesis (Sharpe, 1966), multi-criteria analysis methods need significantly more effort from experts (e.g. Electre-tri,Gladish et al., 2007), and neural networks require increased computational effort and are characterized by inability to provide explanations for the results (Subramanian et al., 1993).

Regarding the funds participation strategy in the final portfolio, there is a series of empirical studies in support to the efficient markets hypothesis that past performance is no guide to future performance, even though a series of empirical studies reveal that the relative performance of equity mutual funds persists from period to period. Hendricks et al. (1993) and Gruber (1996) found evidence of performance persistence. On the other hand, Jensen (1969) and Kahn and Rudd (1995) found only slight or no evidence of performance persistence. This evidence is in accordance to our results, which showed that the success of an asset does not depend on its past performance.

Generally speaking, an investor does not invest in individual securities, instead, investors want to combine many assets into well-diversified portfolios in order to reduce the risk of their overall investment and increase their gains (see e.g. Delong et al., 1990; Shy and Stenbacka, 2003). According to our results, the more diversified a portfolio is the higher average return on investment it has. In light of this evidence, diversification represents crucial investment strategies for mutual fund managers.

3. METHODOLOGY AND DATA

3.1. Data Set and Criteria Description

The sample data used in this study is provided from the Association of Greek Institutional Investors and consists of daily data of domestic equity mutual funds (MFs) over the period January 2000 to December 2005. Daily returns for all domestic equity MFs are examined for this six-year period. Further information is derived from the Athens Stock Exchange and the Bank of Greece, regarding the return of the market portfolio and the return of the three-month Treasury bill respectively.

Based on this information, we compute five fundamental variables that measure the performance and risk of the MFs. These variables are frequently used in portfolio management (Brown and Goetzmann, 1995; Elton et al., 1993; Gallo and Swanson, 1996; Ippolito, 1989; Redman et al., 2000) and are the following:

1. the return of the funds,
2. the standard deviation of the returns,
3. the beta coefficient,
4. the Sharpe index, and,
5. theTreynor index.

Appendix A provides a brief description of these criteria. The examined funds are classified in three homogeneous groups for each one of the aforementioned variables. The three groups are

defined according to the value of the examined variables for each MF. For example, we have funds with high, medium and low performance (return), funds with high, medium and low beta coefficient, etc. Thus, we have 90 groups (6 years × 3 groups × 5 variables) in total.

This classification is formally defined for the return of the funds criterion as follows. Let the set R^y be the *partially ordered set by* $\leq$ of the return on investment values of a set of funds F for a given year y. Thus, there is a function $f : F \to R^y$ that defines a one to one relation from the set of funds F to the set of values R^y. If $s \in \mathrm{N}$ is the size of R^y, then the **set of high R funds** $H^y \subset R^y$ can be defined as the last m elements of R^y, where m is defined as:

$$m = \begin{cases} \lceil (3/10)s \rceil, (3/10)s - \lceil (3/10)s \rceil = 0 \\ \lceil (3/10)s \rceil + 1, otherwise \end{cases}.$$

Thus, H^y contains the higher 30% (rounded up) of the values in R^y, which represents the return of investment values of the 30% most profitable funds in F. The **set of low R funds** $L^y \subset R^y$ is similarly defined as the first m elements of R^y. Finally, the **set of medium R funds** $M^y \subset R^y$ is defined as $M^y = (R^y \bigcap L^{yC}) \bigcap H^{yC}$, i.e. those funds that belong to R^y but not to H^y or L^y.

The classification for the other four criteria is achieved in a similar manner. The resulting thresholds, which determine the MFs grouping for all criteria are presented in Table 1. The Upper (U) threshold separates the funds in the high group with those in the medium group and the Lower (L) threshold separates the funds in the medium group with those in the low group.

Table 1: Thresholds which Determine MFs Groups

Year	*Threshold*	*Return*	*σ*	*β*	*Sharpe*	*Treynor*
2000	U	-4.23	32.80	0.96	-2.55	-0.35
	D	-36.60	27.30	0.82	-2.91	-0.41
2001	U	-20.78	27.87	0.93	-1.41	-0.16
	D	-26.09	24.82	0.84	-1.66	-0.20
2002	U	-26.25	14.97	0.82	-3.08	-0.23
	D	-31.90	13.00	0.73	-3.57	-0.26
2003	U	25.35	16.77	0.84	0.93	0.07
	D	15.73	14.90	0.73	0.41	0.04
2004	U	16.26	13.04	0.84	0.57	0.03
	D	2.46	12.29	0.75	-0.50	-0.03
2005	U	29.29	11.73	0.86	1.51	0.08
	D	25.00	10.79	0.75	1.25	0.07

3.2. The Argumentation Based Decision Making Framework

Argumentation can be abstractly defined as the principled interaction of different, potentially conflicting arguments, for the sake of arriving at a consistent conclusion. The nature of the "conclusion" can be anything, ranging from a proposition to believe, to a goal to try to achieve, to a value to try to promote.

In our work we adopt the argumentation framework proposed by Kakas and Moraitis(2003), where the deliberation of a decision making process is captured through an argumentative evaluation of arguments and counter-arguments. A theory expressing the knowledge under which decisions are taken compares alternatives and arrives at a conclusion that reflects a certain policy.

Briefly, an **argument** for a literal L in a theory $(\mathcal{T}, \mathcal{P})$ is any subset, T, of this theory that derives L, $T \vdash L$, under the background logic. A part of the theory $\mathcal{T}_0 \subset \mathcal{T}$, is the **background theory** that is considered as a non defeasible part (the indisputable facts).

An argument attacks (or is a counter argument to) another when they derive a contrary conclusion. These are conflicting arguments. A conflicting argument (from $\mathcal{T}$) is admissible if it counter-attacks all the arguments that attack it. It counter-attacks an argument if it takes along priority arguments (from $\mathcal{P}$) and makes itself at least as strong as the counter-argument.

In defining the decision maker's theory we specify three levels. The first level ($\mathcal{T}$) defines the (background theory) rules that refer directly to the subject domain, called the *Object-level Decision Rules*. In the second level we have the rules that define priorities over the first level rules for each *role* that the agent can assume or *context* that he can be in (including a *default context*). Finally, the third level rules define priorities over the rules of the previous level (which context is more important) but also over the rules of this level in order to define *specific contexts*, where priorities change again.

3.2.1. Experts Knowledge

For capturing the experts knowledge we consulted the literature but also the empirical results of applying the found knowledge in the Greek market. We identified two types of investors, *aggressive* and *moderate*. Further information is represented through variables that describe the general conditions of the market and the investor policy (selection of portfolios with high performance per unit of risk). The general conditions of the market are characterized through the development of funds which have high performance levels, i.e. high Return on Investment (RoI).

Regarding the market context, in a bull market, funds which give larger return in an increasing market are selected. Such are funds with high systematic (the beta coefficient) or total risk (standard deviation). On the other hand, in a bear market, funds which give lower risk and their returns are changing more smoothly than market changes (funds with low systematic and total risk) are selected.

The aim of an aggressive investor is to earn more, independently of the amount of risk that he is willing to take. Thus, an aggressive investor is placing his capital upon funds with high return levels and high systematic risk. Accordingly, a moderate investor wishes to have in his possession funds with high return levels and low or medium systematic risk.

Investors are interested not only in fund's return but also in risks that are willing to take in order to achieve these returns. In particular, the knowledge of the degree of risk incorporated in the portfolio of a mutual fund, gives to investors the opportunity to know how much higher is the return of a fund in relation to the expected one, based to its risk. Hence, some types of investors select portfolios with high performance per unit of risk. Such portfolios are characterized by high

performance levels, high reward-to-variability ratio (Sharpe ratio) and high reward-to-volatility ratio (Treynor ratio). These portfolios are the ones with the best managed funds.

Thus, the main properties of our empirical problem is firstly to make decisions under complex preference policies that take into account different factors (market conditions, investor attitudes and preferences) and secondly synthesize together these different aspects that can be conflicting.

3.2.2. The Decision Maker's Argumentation Theory

In our work we needed on one hand to transform the criteria for all MFs and experts knowledge to background theory (facts) and rules of the first and second level of the argumentation framework and on the other hand to define the strategies (or specific contexts) that we would define in the third level rules.
The goal of the knowledge base is to select some MFs to participate to an investment portfolio. Therefore, our object-level rules have as their head the predicate *selectFund/1* and its negation. We write rules supporting it or its negation and use argumentation for resolving conflicts. We introduce the *hasInvestPolicy/2*, *preference/1* and *market/1* predicates for defining the different contexts and roles. For example, Kostas, an aggressive investor is expressed with the predicate *hasInvestPolicy(kostas, aggressive)*.

We provide a brief summary of the strategies that we defined in order to validate the use of the argumentation framework. In the specific context of:

- *Bull market* context and *aggressive investor* role, the final portfolio is the union of the individual context and role selections
- *Bear market* context and *aggressive investor* role, the final portfolio is their union except that the aggressive investor now would accept to select high and medium risk MFs (instead of only high)
- *Bull market* context and *moderate investor* role, the moderate investor limits the selections of the bull market context to those of medium or low risk (higher priority to the moderate role)
- *Bear market* context and *moderate investor* role, the final portfolio is their union except that the moderate investor no longer selects a medium risk fund (only low is acceptable)
- *Bull market* context and *high performance per unit of risk* context, the final portfolio is the union of the individual context and role selections
- *Bear market* context and *high performance per unit of risk* context, the final portfolio is their union except that the bear market context no longer selects MFs with low or medium reward-to-variability ratio (Sharpe ratio) or with low or medium reward-to-volatility ratio (Treynor ratio)
- *Aggressive investor* role and *high performance per unit of risk* context, the final portfolio is their union except that the aggressive investor no longer selects MFs with low reward-to-variability ratio or with low reward-to-volatility ratio
- *Moderate investor* role and *high performance per unit of risk* context, the final portfolio is their union except that the moderate investor no longer selects MFs with low reward-to-variability ratio or with low reward-to-volatility ratio
- Every role and context has higher priority when combined with the general context

The knowledge base facts are the performance and risk variables values for each MF, the thresholds for each group of values for each year and the above mentioned predicates

characterizing the investor and the market. The following rules are an example of the object-level rules (level 1 rules of the framework - $\mathcal{T}$):

$r_1(Fund)$: $selectFund(Fund) \leftarrow highR(Fund)$
$r_2(Fund)$: $\neg selectFund(Fund) \leftarrow highB(Fund)$

The *highR* predicate denotes the classification of the MF as a high return fund and the *highB* predicate denotes the classification of the MF as a high risk fund. Thus, the r_1 rule states that a high performance fund should be selected, while the r_2 rule states that a high risk fund should not be selected. Such rules are created for the three groups of our performance and risk criteria.

Then, in the second level we assign priorities over the object level rules. The $\mathcal{P}_R$are the *default context rules* or level 2 rules. These rules are added by experts and express their preferences in the form of priorities between the object level rules that should take place within defined contexts and roles. For example, the level 1 rules with signatures r_1 and r_2 are conflicting. In the default context the first one has priority, while a moderate investor role reverses this priority:

R_1: $h\_p(r_1(Fund), r_2(Fund)) \leftarrow true$
R_2: $h\_p(r_2(Fund), r_1(Fund)) \leftarrow hasInvestPolicy(Investor, moderate)$

Rule R_1defines the priorities set for the default context (an investor selects a fund that has high RoI even if it has high risk). Rule R_2 defines the default context for the moderate investor (who is cautious and does not select a high RoI fund if it has high risk).

Finally, in $\mathcal{P}_C$ (level 3 rules) the decision maker defines his strategy and policy for integrating the different roles and contexts rules. The decision maker's strategy sets preference rules between the rules of the previous level but also between rules at this level. Relating to the level 2 priorities, the moderate investor priority of not buying a high risk MF even if it has a high return is set at higher priority than that of the general context. Then, the specific context of a moderate investor that wants high performance per unit of risk defines that in the case of both a high Treynor and high Sharpe ratio the moderate preference is inverted (in order to have a union of the individual contexts selections). See the relevant priority rules:

C_1: $h\_p(R_2(Fund), R_1(Fund)) \leftarrow true$
C_2: $h\_p(R_1(Fund), R_2(Fund)) \leftarrow preference(high\_performance\_per\_unit\_of\_risk),$
$hasInvestPolicy(Investor, moderate), highSharpeRatio(Fund),$
$highTreynorRatio(Fund)$
C_3: $h\_p(C_2(Fund), C_1(Fund)) \leftarrow true$

Thus, a moderate investor would buy a high risk fund only if it has high ratios in the Sharpe and Treynor criteria. In the latter case, the argument r_1 takes along the priority arguments R_1, C_2 and C_3 and becomes stronger (is the only admissible one) than the conflicting r_2 argument that can only take along the R_2 and C_1 priority arguments. Thus, the *selectFund(Fund)* predicate is true and the fund is inserted in the portfolio.

3.3. Forecasting the Status of the Financial Market

The algorithm that we used for forecasting combines Genetic Algorithms (GA), MultiModel Partitioning (MMP) and the Extended Kalman Filters (EKF) technologies (see Beligiannis et al., 2004). This algorithm captured our attention because it had been used in the past successfully for predicting accurately the evolution of stock values in the Greek market (this application on economic data can be found in the work of Beligiannis et al., 2004).

Table 2: Results Obtained After Applying the Presented Forecasting Algorithm in Order to Forecast the Sign of the Return of the Athens Stock Exchange Index for Each Semester.

Semester	*RASE change (%)*	*Forecasted value*
1st sem 2001	-19.112	-2.409
2nd sem 2001	-5.267	-2.989
1st sem 2002	-14.822	-0.826
2nd sem 2002	-21.206	-2.334
1st sem 2003	6.468	-3.412
2nd sem 2003	21.190	1.025
1st sem 2004	1.535	3.391
2nd sem 2004	19.219	6.656
1st sem 2005	8.357	3.067
2nd sem 2005	19.204	1.343
1st sem 2006	0.831	3.118

This algorithm forecasted the behavior of the financial market in relation to its current status. The market was characterized as *bull market* if it was forecasted to rise in the next semester, or as *bear market* if it was forecasted to fall. We used the percentage of the Return of the Athens Stock Exchange (RASE) index variation for each semester (in relation to the previous semester) starting from year 1985 to the years of our sample data (2000 to 2005), plus one (2006) for evaluating the performance of the portfolios constructed for year 2005. Our algorithm indicates a bull market if this percentage is forecasted to be positive or a bear market if it is forecasted to be negative. For achieving better results, we predicted the ASE index variation every semester, however, in the end we just used the values for the 1st semester of each year (the proposed investment period). In Spanoudakis et al. (2009) we present the instantiation of this algorithm in detail along with its integration with the argumentation framework. Table 2 shows the predicted values. The sign of the forecasted values is positive or negative, while the row with the grey background indicates the failed forecast. Note that while the algorithm generally performed very well with a success rate of 90.9 % (10 out of 11 right predictions) for the studied period, the yearly investment plan that we followed got five out of six right predictions (success rate of 83.3%).

3.4. Portfolio Funds Participation Strategies

Having selected the funds that will compose the investment portfolio, through the reasoning phase, we had the challenge of choosing the participation percentage of each one of them to the final portfolio. Therefore, we defined a weight vector $w = (w_1, w_2, ..w_N)$, where each w_i defines the proportion of the available capital invested in the selected funds. We defined four different portfolio construction strategies for computing this vector.

In the first portfolio construction strategy (or equal participation strategy) the portion of the portfolio that is allocated to the i^{th} selected fund ($i=1,\ldots,N$, where N is the number of total funds selected by the reasoning phase) is equal, i.e.:

$$w_i = 1/N \ .$$

In the second strategy (or performance-based participation strategy), w_i is dependent on the performance of the i^{th} fund in the current year:

$$w_i = \frac{r_i^{y_0}}{\sum_{j=1}^{N} r_j^{y_0}},$$

where y_0 is the current year and r_i^y is the return on investment (RoI) value of the i^{th} selected fund for year y.

In the third strategy (or history-based participation strategy), w_i is dependent on the years where the i^{th} fund had high performance:

$$w_i = \frac{\sum_{y=y_h}^{y_0} h_i^y}{\sum_{j=1}^{N} \sum_{y=y_h}^{y_0} h_j^y},$$

where y_k is the year from which we have historical data and h_i^y is defined as:

$$h_i^y = \begin{cases} 1, r_i^y \in H^y \\ 0, otherwise \end{cases}.$$

In the fourth and final portfolio construction strategy (or history combined with performance-based participation strategy), w_i is defined as follows (a mix of the two previous strategies):

$$w_i = \frac{\sum_{y=y_h}^{y_0} h_i^y r_i^y}{\sum_{j=1}^{N} \sum_{y=y_h}^{y_0} h_j^y r_j^y}$$

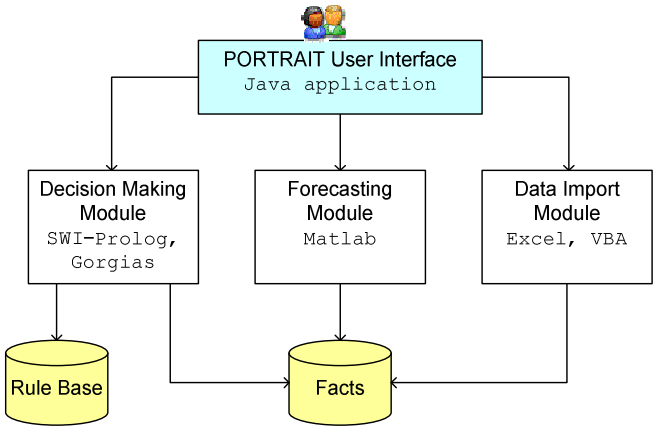
4. THE PORTRAIT TOOL

4.1. Architecture

The PORTRAIT tool is a Java program creating a human-machine interface and managing its modules, namely (see Figure 1):

- the *decision making module*, which is a prolog rule base (executed in the SWI-prolog[1] environment) using the Gorgias[2] argumentation framework,
- the *forecasting module*, which is a Matlab[3] implementation of the forecasting hybrid system,
- the*data import module*, which uses Visual Basic for Applications code in Microsoft Excel to transform the tabular data that are obtained by web sources to the logic format needed by Prolog.

Figure 1: The Portrait Tool Architecture.



[1]SWI-Prolog offers a comprehensive Free Software Prolog environment, http://www.swi-prolog.org

[2]Gorgias is an open source general argumentation framework that combines the ideas of preference reasoning and abduction, http://www.cs.ucy.ac.cy/~nkd/gorgias/

[3]MATLAB® is a high-level language and interactive environment for performing computationally intensive tasks, http://www.mathworks.com/products/matlab

The application connects to the SWI-Prolog module using the provided Java interface (JPL) that allows for inserting facts to an existing rule-base and running it for reaching goals. The goals can be captured and returned to the Java program. The forecasting module writes the results of the algorithm to the Prolog facts base along with the data import module. Thus, after the execution of the forecasting module the predicate market/1 is determined as bull or bear and inserted in the Facts.

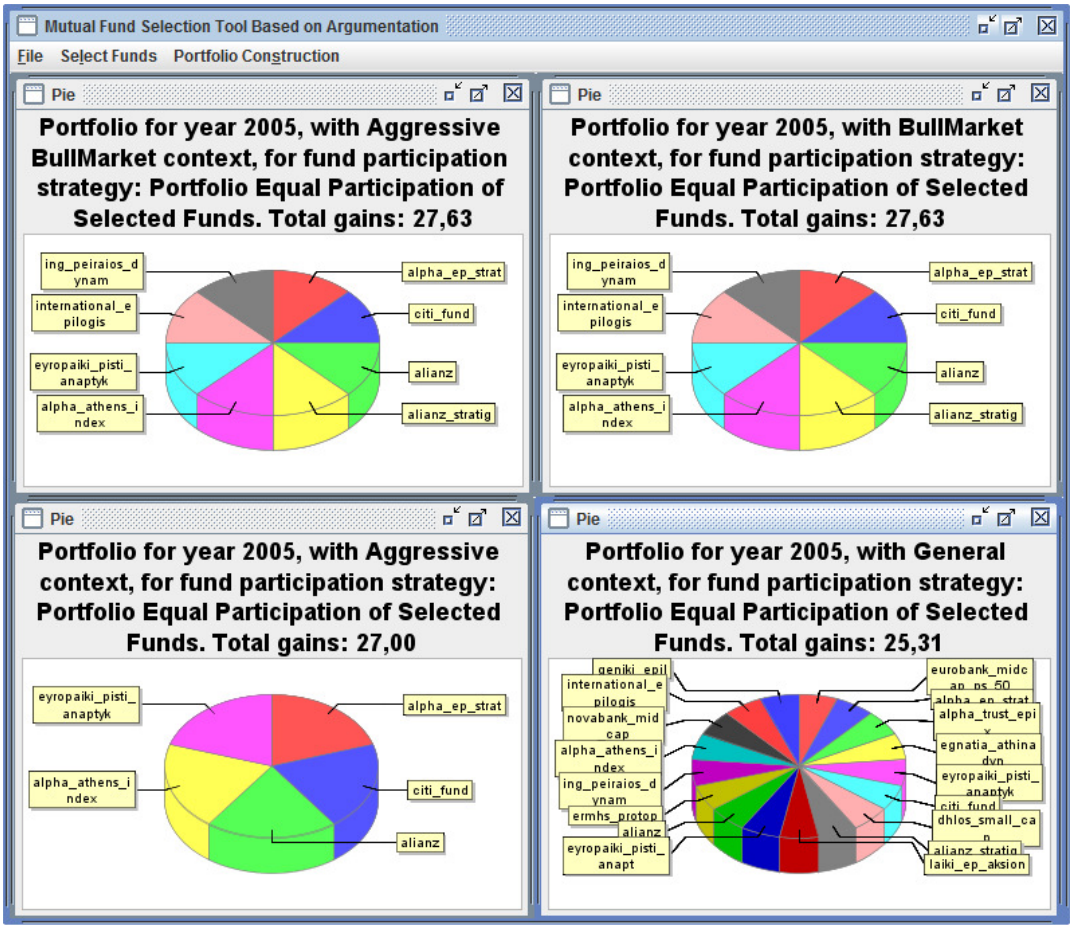
4.2. Tool Usage

The PORTRAIT user can take the following actions:

1. Select the investment period (i.e. the year of the investment)
2. The investor can select his profile that can be:
    a. Either aggressive or moderate in attitude
    b. Possibly seeking a high performance per unit of risk
    c. He might want to not use the forecasting algorithm results at all or dictate his own forecast according to his private information for the financial market (to characterize the market in the following year as bull or bear)
3. The investor chooses the portfolio construction strategy
4. The tool runs the selected scenario outputting the final portfolio

In Figure 2, a screenshot from the tool usage is presented. The user has just run four different investment scenarios for year 2005.

Figure 1: A screenshot for portfolio generation for the general context (bottom right), for the aggressive investor role (bottom left), the growing market context (top right) and the specific context of an aggressive investor in a growing market context for the equal participation strategy (all funds participate equally in the constructed portfolios) for 2005.



5. PORTRAIT VALIDATION AND RESULTS

We run our application on a "Pendium 4" computer with three GHz processor speed and one GByte of RAM. The sample data set provided 2,323 facts. On the first level, we had 140 object rules, while on the second and third level, 43 simple context and 60 specific context rules respectively. The tool performed very well as it produced results for simple contexts within 4 seconds, while for specific contexts within 17 seconds.

For evaluating our results we defined scenarios for all years for which we had available data (2000-2005) and for all combinations of contexts. That resulted to two investor roles (aggressive and moderate) combined with the market status (growing, declining or forecasted), plus these two investor roles combined with the high performance option, plus the market status combined

with the high performance option, all together eleven different scenarios run for six years each, plus the simple contexts, roles and preference. Each one of the examined scenarios refers to different investment choices and leads to the selection of different number and combinations of MFs.

The evaluation of the proposed methodological framework and the obtained portfolios (in year *t*) is performed through their comparison to the return of the Athens Stock Exchange General Index (ASE-GI) and the average performance of the examined MFs (in year *t+1*). In Table 3, the reader can inspect the average return on investment (RoI), i.e. the performance of the constructed portfolios, for the six years for all different contexts and for all four different portfolio construction strategies, while in the last two rows of the table the average returns of the ASE-GI and of the examined MFs are presented. This table shows the added value of our approach. While there are roles and/or contexts that are more successful than others they are all better than the average performance of the considered MFs and most of them (14 out of 18) beat the general market index. This validates our approach as it shows that while we allow the investor to insert information relevant to his profile we can also offer high returns, always better than the average performance of the mutual funds of the Greek market. Moreover, we gain information on the Greek market.

Firstly, an investor that uses the bull market rules gains a better average return than by using our forecasting algorithm. Among the six examined years three were positive for the market index (growing or bull market) and three were negative (declining or bear market). An aggressive investor is also quite successful regardless of whether the market rises or not.

Three of the six cases where the constructed portfolios did not beat the market index are scenarios where the moderate context is involved either in simple context or specific context (3^{d}, 12^{th} and 14^{th} scenario). This is maybe due to the fact that in these contexts we have an investor who wishes to earn more without taking any amount of risk in the examined period where the market is characterized by significant variability. The simple general context also performs less than the Athens GI and shows that the successful MFs of one year are not generally successful the next year, however, they provide better performance than the average of all MFs. The remaining two cases where the portfolio returns were less than the market index involve scenarios with the high performance role (i.e. the 17^{th} and the 18^{th}). As we have already mentioned, the high performance context characterizes mutual funds with high reward-to-variability ratio and high reward-to-volatility ratio, i.e. the ones with the best managed securities. In this case the performance of a mutual fund manager is the one that is taken into account. Again, the variability of the market in the examined period makes it very difficult to implement successful investment strategies.

Additionally, there are findings that cannot be depicted in such a concentrative table as Table 3. The most important one is related with the use of argumentation and is that in some specific contexts the results are more satisfying than the results obtained by simple contexts while in others there is little or no difference. This means that using effective strategies in the third preference rules layer the decision maker can optimize the combined contexts. Specifically, in Table 4the reader can see the return of investment for each year for the aggressive role, the high performance context and the specific context of their combination when the portfolio has been constructed with the third strategy. Note that the average RoI of the combination is higher than that of the individual contexts. Moreover, note that for the year 2005 (first column) the RoI of the combination of the scenarios is higher than both scenarios. This shows that by successfully

selecting the priority rules at the third level we add knowledge to the knowledge base thus we are able to provide better results. The pies in Figure 2 agree to this finding as when the growing market context and the aggressive investor role for year 2005 are merged, the best RoI choice is selected by the priority rules, thus the specific context has the return of the growing market context (i.e. 27.63%).

In Table 5, we present the return on investment for different diversities of funds participation in the constructed portfolios. Each one of the examined contexts refers to different investment choices and leads to the selection of different number and combinations of MFs. From a total of 59 constructed portfolios, the MFs which composed them ranged between three and 19. Looking at the results of this table, it is obvious that the more diversified a portfolio is, the higher average return on investment it has.

We applied the four strategies detailed in §3.4 to all portfolio construction scenarios for the years 2001 to 2005. Each of these strategies can be combined with each investment context. The investor can choose the strategy that best fits his needs. Our results show that the success of the portfolio is mainly dependent on the selected context. The best average performance, 7.03%, is gained by the first portfolio construction strategy, i.e. the equal participation of all funds in the final portfolio, while according to the second, third and fourth investment strategies, the average gains for all constructed portfolios and all contexts are 6.83%, 6.62% and 6.42% respectively. Thus, our research shows that the success of an asset does not in general depend on its past performance. Figure 3 illustrates these results.

Table 3: Average Return on Investment for Six Years

Scenario ID	***Context type***	***Context***	***RoI***
1	Simple context	General	6.43
2	Role	Aggressive	7.22
3	Role	Moderate	5.85
4	Preference	High performance	6.85
5	Simple context	Growing market	7.18
6	Simple context	Declining market	7.03
7	Simple context	Forecasted Market	6.84
8	Specific context	Aggressive role in a Growing Market	7.18
9	Specific context	Aggressive role in a Declining Market context	6.87
10	Specific context	Aggressive role in a forecasted Market context	7.07
11	Specific context	Aggressive role and High Performance seeking role	7.11
12	Specific context	Moderate role in a Growing Market	5.85
13	Specific context	Moderate role in a Declining Market	6.80
14	Specific context	Moderate role in a forecasted Market context	5.44
15	Specific context	Moderate role and High Performance seeking role	6.85
16	Specific context	Growing Market context with a High Performance seeking role	6.85
17	Specific context	Declining Market context with a High Performance seeking role	6.42
18	Specific context	Forecasted Market context with a High Performance seeking role	6.42
ASE-GI	-	-	6.75
Avg MFs	-	-	4.80

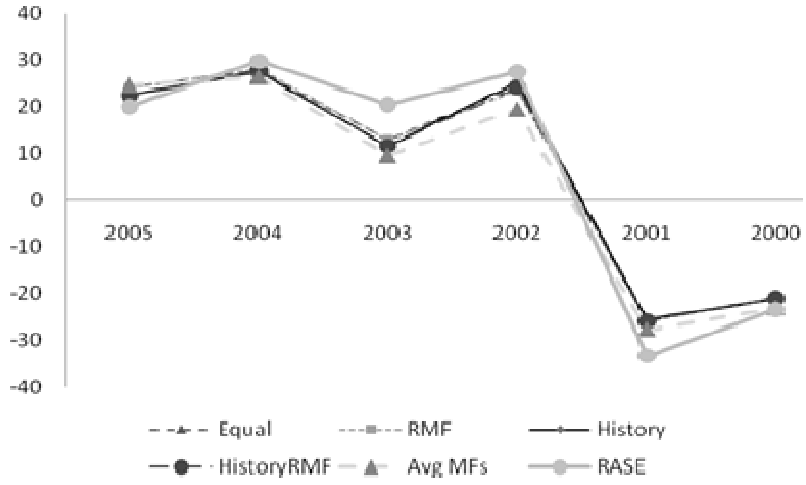
Table 4: The Roifor all Years for the third Strategy for the Specific Scenarios

	Year	***2005***	***2004***	***2003***	***2002***	***2001***	***2000***	***Avg***
Context	Aggressive	19.53	27.56	9.93	29.63	-25.33	-21.31	6.67
	High Perf.	20.73	28.33	14.12	23.79	-27.47	-21.19	6.39
	Aggressive - High Perf.	21.77	27.21	9.54	29.63	-25.33	-21.31	6.92

Table 5: Average Return on Investment for Different Funds Participation Number in the Constructed Portfolios. The Last Column Shows the Percentage of the Constructed Portfolios that Belongs to Each Category.

Number of Funds participating in portfolio	*Average RoI*	*%No*
3-8	5.22	32.20
9-15	7.06	49.15
16-19	10.34	18.64

Figure 2: Average Performance of the Portfolio Construction Strategies Compared with RASE and Average Performance of all MFS for Each Year.



6. CONCLUSIONS AND FUTURE PERSPECTIVES

This paper presented a methodology for the MF portfolio generation problem. The main result of our work is the ability of a decision maker (fund manager) to construct multi-portfolios of MFs under different, possibly conflicting contexts that can achieve higher returns than the ones achieved using simple knowledge. The proposed framework can embody in a direct way the various decision policies and knowledge (Kakas and Moraitis, 2003) and is used for the first time for this type of application.

The empirical results of our study showed that argumentation is well suited for this type of applications and showed our hypothesis "that the proposed methodological framework for the resolution of the presented financial problem" to be true. Thus, with our approach we answered to two questions: (1) which MFs are the most suitable to invest in, and (2) what portion of the available capital should be invested in each of these funds. The proposed methodology gives the opportunity to a decision maker (fund manager) to construct multi-portfolios of MFs in period *t*,

that have the ability to achieve higher returns than the ones achieved from the ASE-GI in the next period, *t+1*.

The PORTRAIT tool has been validated using the data set described in this paper and is available for demonstration at the Applied Mathematics and Computers Laboratory (AMCL) of the Technical University of Crete, Greece. It is intended for use by banks, investment institutions and consultants, and the public sector.

Our future work is related to the optimization of the strategies so that all combinations add value to the decision maker. Moreover, it would be of interest to integrate this methodology with trading approaches, so that one could monitor his portfolio in real time and perform changes to the portfolio composition instantly as new information becomes available. Thus, it would be of a great interest to make our tool web-based incorporating: (a) on-line questionnaire for determining the investor role properties, (b) on-line feed from capital market, and (c) capability to determine when to update the portfolio (buy or sell) – possibly with a new knowledge base.

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Appendix A

The *Return of the funds is the actual value of return of an investment.* The *fund's return* in period *t* is defined as follows: $R_{pt} = (NAV_t + DIST - NAV_{t-1}) / NAV_{t-1}$, where R_{pt} is the return of mutual fund in period *t*, NAV_t is the closing net asset value of the fund on the last trading day of the period *t*, NAV_{t-1} is the closing net asset value of the fund on the last trading day of the period *t-1*, and $DIST_t$ is the income and capital distributions (dividend of the fund) taken during period *t*.

The *standard deviation* σ is used to measure the variability of its daily returns, thus representing the total risk of the fund.The standard deviation of a MF is defined as follows: $\sigma = \sqrt{(1/T)\sum (R_{pt} - \overline{R}_{pt})^2}$, where σ is the standard deviation of MF in period *t*, $\overline{R}_{pt}$ is the average return in period *t*, and T is the number of observation (days) in the period for which the standard deviation is being calculated.

The *beta coefficient* (β) is a measure of fund's risk in relation to the capital market. The beta coefficient is defined as follows: β = cov (R_{pt}, R_{Mt}) / var (R_{Mt}), where cov (R_{pt}, R_{Mt}) is the covariance of daily return of MF with market portfolio (Athens Stock Exchange), and var (R_{Mt}) is the variance of daily return of market portfolio.

The *Sharpe index*(Sharpe, 1996) is used to measure the expected return of a fund per unit of risk, defined by the standard deviation. This measure is defined as the ratio (R_{pt}- R_{ft}) / σ, where R_{ft} is the return of the risk free portfolio expressed through the three-month treasury bill.

The *Treynor index*(Treynor, 1965) is obtained by simply substituting volatility for variability in the Sharpe index. This measure is defined as the ratio (R_{pt}- R_{ft}) / β. The evaluation of MFs with these two indices shows that a MF with higher performance per unit of risk is the best-managed fund, while a MF with lower performance per unit of risk is the worst managed fund.

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COMPARATIVE DUE DILIGENCE ANALYSIS OF DEBT CAPACITY AND COST OF DEBT: COMPANIES IN EURO AREA VERSUS COMPANIES IN TURKEY

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KEYWORDS

Capacity of debt, cost of debt, industrial firms.

ABSTRACT

During and after 2008 global financial crisis, financial indicators and sources of corporations in Euro Area countries and Turkey have been changed. This study aims to compare and analyze the debt capacities and the cost of debt for a large sample of 2.938 industrial firms operating in 17 Euro Area countries and Turkey between 2006 and 2010. Furthermore, it aims to determine the effects of global financial crisis on these firms. As a result of the study, when all firms are concerned, Anova test showed that firms in Euro Area and Turkey have debt ratios significantly different from each other for the whole period. All firms slightly increase their debt ratios in the crisis period. Increase is higher for Turkish firms for both production and service sectors. The cost of debt was maximum for Turkish firms in the group at four out of five years. In 2009, it started to decrease and got closer to the level of Euro Area firms in 2010. Furthermore, the effects of the global financial crisis were felt deepest in production sector firms in Turkey. Suggestions for Turkish firms to continue to decrease their cost of debt are made at the conclusion.

1. INTRODUCTION

Capital structure is a result of firms' preferences between debt and equity financing. These preferences are determined by variety of factors that are investigated by several researchers at the finance literature. These studies show that the determinants of capital structure differ across countries, time and conditions. During last three decades, some theories have been developed and tested in order to get the idea of how capital structure is determined. Theories that have been tested most frequently are pecking order theory and trade-off theory.

Pecking order theory, first stated by Myers in 1984, is based on information asymmetry, which states that firms have no target debt ratio. According to this theory, firms have only three sources of finance, which are retained earnings, liabilities and equity. They prefer to use liability only when there are no retained earnings. Equity financing is the last option for firms as the cost of equity is first among others.

Trade-off theory infers that capital structure is determined by comparisons of the benefits and costs of debt. For example, debt has an advantage of tax shield despite disadvantage of increasing bankruptcy costs. Firms have to make repayment of loans at the maturity whether they make profit or not. Another approachconsidersincreases and decreases in agency costs. This approach states that liability leads the managers to increase the performance in order to make payments. In this way, agency costs are decreased. On the other hand,debt might increase the costs to shareholders in product and factor markets in some cases.

This study aims to make comparative due diligence analysis of capacity and cost of debt for non-financial firms in 17 countries operating in Euro Area and Turkey for 2006-2010 period. As well known, global financial crisis was experienced during 2007 and 2008. This study also aims to compare the effects of this financial crisis on these two groups in terms of financial costs and debt ratios.

2. INDEBTNESS OF FIRMS AND RELATED PREVIOUS STUDIES

Taking in the account the bankruptcy costs and agency costs, corporate debt financing is a firms' choice that includes multi directional and cross-functional decision-making process. During and after this process, there are benefits and costs, which should be analytically examined by managers and shareholders since since the results of the decision might be dramatic. Several studies (most frequently cited studies are Rajan and Zingales (1995), Frank and Goyal (2003 and 2009), Bancel and Mitto (2002) and Hovakimian et al. (2001)) have been made about the tradeoffs between equity financing and debt financing as well as the determinants of capital structure.

The bankruptcy cost results from financial distress, when promises to creditors are broken. As stated by Brealey, Myers and Marcus (2009), cost of financial distress is reflected in the current market value of the levered firm's securities. Financial distress is costly when the conflicts among stakeholders get in the way of running the business.

The agency cost between managers and investors or between debt holders and equity holders, as explained by Mello and Parsons (1992), emanate from the different assumed financial structures and different operating strategies of firms resulting in various stochastic processes of firm's value and debt. The divergence of the chosen and the first best operating policy make the agency cost increase.

Beside the already mentioned associated costs, the macro benefit of corporate debt financing is that it pushes firms to undertake profitable investments. Otherwise, firms may not be financed by using the leverage effect and the economy grows as a result. The primary micro benefit is the tax deductibility of financial expenses, which has a positive effect on the cash flows. Moreover, Binsbergen, Graham and Yang (2010) stated that other benefits include committing managers to operate efficiently and engaging lenders to monitor the firm.

For the cost and the capacity of corporate debt financing, country-level factors are found significant as well as firm-level factors. For example, Mitton (2007) analyzed the trends in market-value corporate debt ratios in 34 emerging economies for the period 1980 and 2004. He found that the ratios increase by 15 percent over 24 years. This increase is tied both to the renowned determinants of capital structure of firms and financial development as well as the financial openness to the foreign markets of these emerging countries.

Zou and Adams (2008) studied the relationship between debt ratio, cost of debt and the corporate property insurance. Using 1997-2003 data of Chinese listed firms, they found that the three variables are simultaneously related. This study also emphasizes the role of high credit risk of banks on the cost of borrowing for firms.

Shareholder identity and cost of debt are examined by Ballesta and Meca (2011). Using variety of control variables, they examined Spanish listed firms between 1999 and 2002, found that firms with government ownership face lower cost of debt and that banks monitor managers to lower the agency costs associated with debt.

Bondt (2005) analyzed the macroeconomic determinants of the corporate debt issuance in Euro Area between 1991 and 2003. There is a structural break on the debt issuance over the Euro introduction time period. Both for the short and the long run, it is found that mergers and acquisitions together with the gross domestic product determine the cost of debt securities. Another important finding of Bondt is that for the short run, internal financing and the debt securities are substitutes for each other.

One of the two parts of the traditional weighted average cost of capital (WACC) formula constitutes the cost of debt for firms. Pagano and others (2004), Farber and others (2006), Husmann and others (2006) and Brusov and others (2011) studied the WACC in the frameworks of different taxation systems, finite lifetime companies, real empirical examples and adjusted present value and they all develop a general WACC formula by modifying the traditional Modigliani-Miller's (1963) formula.

The study of Hennessy and Whited (2005) develops the dynamic trade-off model, which has inconsistent findings with the static model. It also designates that firms have no target debt ratio and leverage is a path dependent concept. They state that "... leverage is decreasing in lagged cash flow and profitability; and leverage varies negatively with an external finance weighted average Q ratio. We also show that taxation does not have a "second order" effect on leverage decisions..."

Gaud, Hoesli and Bender (2007) analyzed the debt and equity preferences of European Union and European Free Trade Association member firms from 13 different countries for 1998-2000 interval. They prepared tables that clear out the average debt ratios of firms, and they make dynamic analysis of the determinants for the debt ratios. They investigate the coefficients' signs of frequently used independent variables. The main findings are as follows: debt ratio depends both on the concepts of corporate governance and market timing; the preferences could be in conflictsince the windows of opportunity and the future excess of slack probability may change the preferences.

Gomez-Puig (2008) analyzed the cost of borrowing for nine Euro Monetary Union Countries before and after the constitution of the union. This is 1996-1998 and 1999-2001 periods. Even though the aim of this study is about the cost of borrowing for firms, cost of borrowing for union countries provides valuable information for better understanding of the data. Puig defined the cost of borrowing as 10-year yield difference of governmental bonds over Germany and as 10-year interest rate swap difference over Germany. According to these definitions, Belgium and Italy used the most expensive debt after the monetary union. However, France and Ireland used the cheapest debt in the group. Cost of borrowing was increased after the monetary union compared to before. This increase is explained by domestic factors rather than the global factors.

Lin and others (2011) using a wide data set of 3468 firms in 22 countries for 1996-2008 period, analyzed the relationship between cost of debt and the ownership structure by taking into account both direct and indirect cash flow rights and control rights. They used loan spreads as a measure of cost of debt and at the same time used a wide range of control variables. They found that control-ownership wedge results in a higher cost of debt financing. On the other hand, sensitivity is higher for family-controlled firms, firms with greater informational opacity, lower credit ratings and firms during financial crises.

Binsbergen, Graham and Yang (2010) studied the function of tax benefit of debt and function of firm-level cost of debt. They estimated the marginal cost curves for a panel of firms for the period 1980 and 2007 by simulating the tax benefit curve assuming that marginal benefit and marginal cost curves intersect at the observed level of debt. Their main finding is that being over levered is more expensive than being under levered.

3. DATA AND METHODOLOGY

3.1. Data

The scope of this study is the industrial companies in Euro zone and Turkey. The financial and non-financial secondary data about these companies were obtained from the Osiris database of Bureau van Dijk Electronic Publishing. It allows ensuring the obtainability, comparability and reliability of the data and frigid attitudes of companies in sharing information regarding their operations and results. Osiris is a database containing the comparable financial and non-financial data of about 50 000 private and public financial and non-financial companies active in 130 different countries. The industrial company financial data on OSIRIS is provided by World'Vest Base (WVB) and five regionally specialized providers; Korea Information Service (KIS), Teikoku Databank (Japan), Huaxia International Business Credit Consulting Company (China), Reuters (USA) and Edgar Online (USA).

The combined industrial company dataset contains standardized and as reported financials, including restated accounts. As a result of studies carried out using the database, 2006 and 2010 periods are determined as containing the maximum available data, at the same time which could represent pre and post global financial crisis period. Accounts are presented on OSIRIS database in three categories: Industrial, Bank and Insurance. Industrial category is used for effective cross-border account analysis and comparison.

Companies in the sample are operating in variety of industry sectors. The SIC (Standard Industrial Classification) three-digit core codes were used in this study. For simplifying purposes, these sectors are classified as production sector and service sector, then analysis are made separately for these two groups so that the sectorial differences can be observed.

Euro Area includes 17 of the EU countries using Euro currency officially: Austria, Belgium, Cyprus, Germany, Estonia, Spain, Finland, France, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Slovenia and Slovakia.

In OSIRIS database, there are 3850 firms in Euro Area and 315 firms for Turkey, which operate in industrial or service sector. Firms not having the required accounts record are set aside. Firms that may be financially constrained (with zero debt) are also eliminated in order to study with firms that are balancing the capital structure. Table 1 presents the country list as well as the number of firms in each country. In total, 2657 Euro Area firms (1381 in service sector and 1276 in production sector) and 281 Turkish firms (136 in service sector and 145 in production sector) are included in the analysis.

Table 1: Number of Firms Included in the Analysis

Countries	Service	Production	Service+Production
Austria	26	45	71
Belgium	61	66	127
Cyprus	86	25	111
Germany	376	298	674
Estonia	6	8	14
Spain	64	77	141
Finland	44	65	109
France	362	310	672
Greece	99	121	220
Ireland	25	24	49
Italy	87	138	225
Luxembourg	29	13	42
Malta	11	1	12
Netherlands	59	59	118
Portugal	38	16	54
Slovenia	7	6	13
Slovakia	1	4	5
EuroArea SUM	**1381**	**1276**	**2657**
Turkey	136	145	281

3.2. Methodology

The most widely preferred methods in financial analysis are ratio analysis, vertical analysis and horizontal analysis. Ratio analysis is the frequently used method for the evaluation of financial status and the activity results of firms. The chosen accounts in the ratio analysis are related to each other considering the aims of the analysts and they are used as a measure of the activity results.

In this study comparison of debt structure for countries in the Euro Area and Turkey is aimed. Therefore, ratios are built so as to reflect the debt capacity and cost of debt. The capacity of debt is measured by the leverage ratio, measured by "total debts and liabilities/total assets". This ratio shows what portion of a firm's assets is financed by short and long term debts. In general, high debt ratio is linked with high level of risk and low debt ratio is linked with low level of risk. Shareholders are mostly affected from this increase in the level of risk because they have the right on the income and assets of the firm after the debt holders. The cost of debt is an important factor in order to make connection between debt capacity and the risk of a firm as well as the firm size, cash flows, sector, etc. It affects the level of business risk and the expected return on the investments. The cost of debt is generally measured by the ratio "financial expenses/total debts and liabilities". Quite often cost of debt is increased with the increase in the capacity of debt since the default risk is higher for these firms.

Total liabilities and debt include total current liabilities, total long-term interest bearing debt, minority interest, deferred taxes, provisions and other long-term liabilities. Financial expenses cover interest and investment expenses and total periodic expense for using borrowed short and long term debt. In certain countries this also includes debt discounts and foreign exchange losses. It would be better to see the composition of debt and financial expenses in detail or how they change over the time however; the related data does not exist accurately. Therefore, analyses are made based on the total values.

In order to shed a light on these connections, tables reflecting the debt capacity and the cost of debt for firms operating in Euro Area countries and Turkey for five years are prepared. The main assumption here is that the firms try to make optimal debt choices and their choices are reflected by the debt ratio. In order to find out whether Turkish and European firms significantly differ in debt capacity and the cost of debt, Anova test was run for both factors and both sectors. Data set is considered as a mini panel (t=5 and n=2) for five years and two groups as Turkish and European companies between year 2006 and 2010.

4. ANALYSIS RESULTS

This part of the study includes the tables of debt capacity and the cost of debt for service sector and production sector companies in 17 Euro Area countries and Turkey. Each column in tables represents the mean values of measures for the firms in two sectors. Table 2 represents that for 2010, service sector in Portugal used 79.15 percent leverage and it is the country with the highest debt ratio. In the same year, production sector in Estonia used 37.97 percent leverage and this is the lowest debt ratio. In that year, Turkish service sector and production sector used 56.31 percent and 47.90 percent leverage, respectively. Debt ratio for production sector is lower than that of the Euro Area average of 56.39 percent.

Production sector firms in Portugal had the highest debt ratio of 78.27 percent while service sector firm in Slovakia had the lowest debt ratio of 37.51 percent in 2009. Turkish production sector debt ratio (49.58 percent) is lower than the Euro Area countries' debt ratio (56.01 percent) so is the service sector firms (57.26 percent versus 54.75 percent). From Table 2 it is obvious that again, service sector firms in Portugal have the highest leverage used with the debt ratio of 78.96 percent in 2008. On the other hand, least levered were the service sector firms in Malta with 44.92 percent. Production sector firms in Turkey financed 51.26 percent of their assets by creditors while production sector firms in the Euro Area financed 57.71 percent of their assets by creditors.

The most levered firms were production sector firms in Netherlands with the debt ratio of 73.94 percent in 2007. In the group, service sector firm in Slovakia used minimum debt for financing assets. Debt ratio was 38.18 percent. In this year, both service and production sector firms in Euro Area on the average had higher leverage ratios than the Turkish firms. For service sector it is 55.38 percent vs. 51.71 percent and for production sector it is 55.64 percent vs. 45.19 percent.

Table 2: Capacity of Debt for Firms in 2010

Countries	Sectors	2010	2009	2008	2007	2006
Austria	Service	53.38	51.23	52.75	50.76	55.98
	Production	58.63	59.97	58.97	56.68	58.85
Belgium	Service	51.39	53.93	55.09	53.20	51.40
	Production	53.04	53.54	55.14	53.84	55.82
Cyprus	Service	55.72	52.29	49.97	50.48	46.81
	Production	49.02	46.85	50.85	47.71	40.45
Germany	Service	53.89	55.03	54.29	53.32	54.73
	Production	55.90	57.40	58.56	56.22	56.63
Estonia	Service	54.94	55.82	52.30	44.84	49.90
	Production	37.97	39.25	45.48	42.72	49.38
Spain	Service	63.62	62.26	63.83	58.07	56.86
	Production	64.48	64.08	61.86	62.30	61.09
Finland	Service	55.50	59.25	55.35	56.27	52.66
	Production	55.51	56.70	57.23	52.96	55.47
France	Service	60.07	61.99	62.07	60.42	61.76
	Production	57.33	59.17	60.85	58.91	58.91
Greece	Service	62.70	60.21	61.14	59.61	60.09
	Production	63.40	61.91	64.50	59.41	58.54
Ireland	Service	51.72	55.14	58.04	52.64	48.68
	Production	56.58	58.13	61.56	62.18	56.17
Italy	Service	67.65	67.28	67.27	65.59	67.41
	Production	64.98	64.64	65.38	61.65	63.48
Luxembourg	Service	53.43	56.30	54.07	50.81	51.78
	Production	56.79	62.79	57.57	59.33	57.89
Malta	Service	47.93	47.92	44.92	45.29	39.65
	Production	40.84	42.52	45.57	56.04	59.78
Netherlands	Service	56.71	56.56	60.33	52.74	59.72
	Production	56.37	54.76	59.96	73.94	54.43
Portugal	Service	79.15	77.94	78.96	71.45	74.04
	Production	72.89	78.27	78.16	46.66	71.74
Slovenia	Service	66.25	62.85	61.84	54.00	41.90
	Production	56.16	45.89	53.13	63.23	44.81
Slovakia	Service	39.40	37.51	48.91	38.18	33.03
	Production	58.78	46.26	51.52	50.76	61.36
Euro Area AVERAGE	Service	57.26	57.26	58.02	55.38	53.32
	Production	56.39	56.01	57.71	55.64	56.75
Turkey	Service	56.31	54.75	55.82	51.71	51.50
	Production	47.90	49.58	51.26	45.19	45.80

In 2006, mostly levered firms were service sector firms in Portugal with 74.04 percent leverage ratio. However, service sector firm in Slovakia had the lowest debt ratio of 33.03 percent. Euro Area service sector and production sector firms on the average had higher debt ratios than Turkish firms. For service sector, leverage ratios were 53.32 percent vs. 51.50 percent; and for production sector debt ratios were 56.75 percent vs. 45.80 percent.

In order to analyze the differences between capacity of debt for Turkish and European companies for the whole period, panel data Anova test was run for production and service sector. According to the test, null hypothesis stating that there is no difference between Turkish and European companies in terms of debt capacity is rejected for production and service sectors. Table 3 and Table 4 present the results.

Table 3: Test for Equality of Means of Debt Capacity of Production Sector Companies

Sample: 2006 2010 Includedobservations: 10				
Method		df	Value	Probability
Anova F-test Analysis of Variance		(2, 7)	46.99643	**0.0001**
Source of Variation		df	Sum of Sq.	MeanSq.
Between		2	196.6555	98.32777
Within		7	14.64568	2.092239
Total		9	211.3012	23.47791
CategoryStatistics				
PRODUCTION SECTOR CAPACITY	Count	Mean	Std. Dev.	Std. Err. of Mean
[45, 50)	4	47.11750	2.010578	1.005289
[50, 55)	1	51.26000	NA	NA
[55, 60)	5	56.50000	0.793473	0.354852
All	10	52.22300	4.845401	1.532250

Table 3 shows that companies in production sector have significantly different debt ratios in Euro area and Turkey with $\alpha = 0.0005$significance level. Euro area companies actually have taken less leverage risk during the analysis period.

Table 4: Test for Equality of Means of Debt Capacity of Service Sector Companies

Sample: 2006 2010 Includedobservations: 10				
Method		df	Value	Probability
Anova F-test Analysis of Variance		(4, 5)	48.29591	**0.0003**
Source of Variation		df	Sum of Sq.	MeanSq.
Between		4	46.44843	11.61211
Within		5	1.202183	0.240437
Total		9	47.65061	5.294512
CategoryStatistics				
SERVICE SECTOR CAPACITY	Count	Mean	Std. Dev.	Std. Err. ofMean
[50, 52)	2	51.60500	0.148492	0.105000
[52, 54)	1	53.32000	NA	NA
[54, 56)	3	55.31667	0.537804	0.310501
[56, 58)	3	56.94333	0.548483	0.316667
[58, 60)	1	58.02000	NA	NA
All	10	55.13300	2.300981	0.727634

Table 4 shows that companies in service sector also have significantly different debt ratios in Euro area and Turkey with $\alpha = 0.0005$ significance level. Euro area companies actually have taken less leverage risk during the analysis period.

Table 5: Cost of Debt for Firms in 2010

Countries	Sectors	2010	2009	2008	2007	2006
Austria	Service	2.16	2.87	4.68	2.18	1.56
	Production	2.97	2.82	3.14	2.68	2.40
Belgium	Service	3.71	3.96	4.03	3.49	2.85
	Production	2.88	3.20	3.66	3.27	2.89
Cyprus	Service	3.80	3.75	4.22	3.54	3.66
	Production	3.41	3.88	3.95	3.11	3.60
Germany	Service	2.93	2.83	3.06	2.83	2.69
	Production	3.00	3.09	3.36	2.95	2.74
Estonia	Service	3.43	4.21	3.03	2.99	2.58
	Production	3.78	2.82	2.35	1.64	1.81
Spain	Service	2.39	2.43	3.35	2.74	1.99
	Production	2.76	2.90	3.53	3.12	2.41
Finland	Service	2.33	2.69	3.12	2.32	2.00
	Production	2.85	3.26	3.63	2.72	2.65
France	Service	2.06	2.02	2.53	1.92	1.71
	Production	2.50	2.33	2.80	2.44	2.09
Greece	Service	2.84	2.83	3.88	3.18	2.92
	Production	3.06	3.19	4.11	3.52	2.97
Ireland	Service	2.90	2.24	3.07	2.20	2.78
	Production	3.75	3.46	3.37	3.49	2.72
Italy	Service	2.31	2.55	3.04	2.84	2.23
	Production	2.42	2.71	3.64	2.87	2.81
Luxembourg	Service	2.74	2.79	2.67	2.93	2.81
	Production	4.31	4.16	4.02	4.12	3.84
Malta	Service	2.18	2.41	2.37	1.68	2.43
	Production	2.75	2.98	3.07	2.39	2.69
Netherlands	Service	2.71	2.47	2.70	2.68	2.28
	Production	3.00	3.20	3.31	3.33	2.86
Portugal	Service	3.12	2.86	3.56	4.04	2.67
	Production	3.45	4.09	4.32	3.34	3.33
Slovenia	Service	6.02	5.06	4.79	2.87	2.83
	Production	4.91	3.13	5.64	1.56	3.18
Slovakia	Service	1.41	1.34	2.84	5.57	6.09
	Production	2.85	2.20	4.71	2.18	3.36
Euro Area Average	Service	2.88	2.90	3.68	2.67	2.71
	Production	3.21	3.14	3.35	3.19	2.85
Turkey	Service	4.13	5.80	7.42	5.44	6.25
	Production	3.94	6.04	9.45	5.78	7.05

For the cost of debt, Table 5 shows that service sector firm in Slovakia paid the minimum percentage of its total debt and liabilities as financial expense equals to 1.41 percent in 2010. On the other hand, service sector in Slovenia used the most expensive debt as 6.02 percent. In the same year, service sector firms in Euro Area used cheaper debt (2.22 percent) on the average than Turkish service sector firms (4.13 percent). The same situation is valid for production sector firms. (3.21percent vs. 3.94 percent).

The cost of debt was lowest for service sector firm in Slovakia (1.34 percent) in 2009. However, firms operating in service sector in Turkey used the most expensive debt (5.80 percent). Euro Area firms in service sector used cheaper debt (2.90 percent) as well as firms in production sector. Euro Area average for production sector was 3.14 percent and it was 6.04 percent for Turkish firms.

The cost of debt was highest for production sector firms in Turkey in 2008. It was 9.45 percent. However, production sector firms in Estonia paid 2.35 percent of their total debt and liabilities as financial expense. For service sector, Turkish firms almost doubled Euro Area firms. Their cost of debt was 7.42 percent and 3.68 percent, respectively. For production sector, it was 3.35 percent for Euro Area firms.

Production sector firms in Turkey used the most expensive debt with 5.78 percent in 2007. On the other hand, production sector firms in Slovenia used the cheapest debt in the group. Their costs were 1.56 percent. Compared to Turkish firms, Euro Area firms were on the average using cheaper debt in service sector (2.67 percent vs. 5.44 percent) and in production sector (3.19 percent vs. 5.78 percent).

The cost of debt was highest for production sector firms in Turkey with 7.05 percent in 2006. It was lowest for service sector firms in Austria with 1.56 percent. Cost of debt was higher for both of the sectors. The cost of debt was 2.85 for Euro Area firms in production sector and 2.71 in service sector. Turkish service sector firms had a cost of debt of 6.25 percent.

For analyzing the differences between cost of debt for Turkish and European companies for the whole period, panel data Anova test was run for production and service sector. According to the test, null hypothesis stating that there is no difference between Turkish and European companies in terms of cost of debt is rejected for both production and service sectors. Results can be found on Table 6 and Table 7.

Table 6:Test for Equality of Means of Cost of Debt for Production Sector Companies

Sample: 2006 2010 Includedobservations: 10				
Method		df	Value	Probability
Anova F-test Analysis of Variance		(3, 6)	72.83139	**0.0000**
Source of Variation		df	Sum of Sq.	MeanSq.
Between		3	42.53535	14.17845
Within		6	1.168050	0.194675
Total		9	43.70340	4.855933
CategoryStatistics				
PRODUCTION SECTOR COST	Count	Mean	Std. Dev.	Std. Err. ofMean
[2, 4)	6	3.280000	0.362767	0.148099
[4, 6)	1	5.780000	NA	NA
[6, 8)	2	6.545000	0.714178	0.505000
[8, 10)	1	9.450000	NA	NA
All	10	4.800000	2.203618	0.696845

Table 6 shows that companies in production sector have significantly different cost of debt in Euro area and Turkey with $\alpha = 0.0005$ significance level. Euro area companies actually have used cheaper debt during the analysis period.

Table 7:Test forEquality of Means of Cost of Debt for Service Sector Companies

Sample: 2006 2010 Includedobservations: 10				
Method		df	Value	Probability
Anova F-test Analysis of Variance		(5, 4)	200.2114	**0.0001**
Source of Variation		df	Sum of Sq.	MeanSq.
Between		5	26.47796	5.295592
Within		4	0.105800	0.026450
Total		9	26.58376	2.953751
CategoryStatistics				
SERVICE SECTOR COST	Count	Mean	Std. Dev.	Std. Err. ofMean
[2, 3)	4	2.790000	0.116905	0.058452
[3, 4)	1	3.680000	NA	NA
[4, 5)	1	4.130000	NA	NA
[5, 6)	2	5.620000	0.254558	0.180000
[6, 7)	1	6.250000	NA	NA
[7, 8)	1	7.420000	NA	NA
All	10	4.388000	1.718648	0.543484

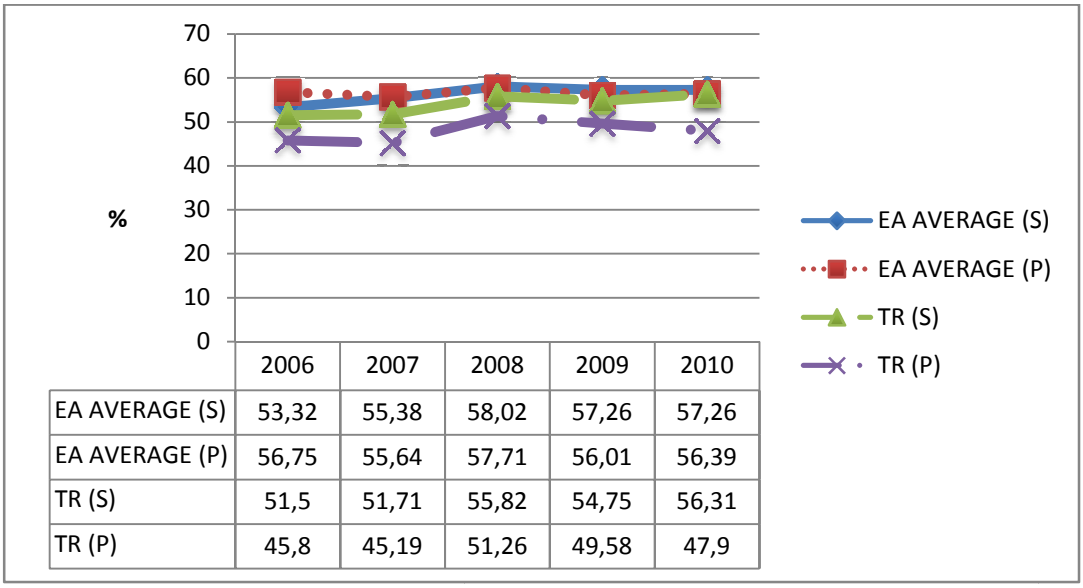
Table 7 shows that companies in service sector have also significantly different cost of debt in Euro area and Turkey with $\alpha = 0.0005$ significance level. Euro area companies actually have used cheaper debt during the analysis period.

In order to find out which country in which sector has used more or less leverage, at the same time in order to figure out which country in which sector used the most expensive or the cheapest debt, Table 2 and Table 5 could be analyzed vertically. In four out of five years, firms in Portugal had the maximum debt capacity and three out of five years, firms in Slovakia had the minimum debt capacity among 18 countries. On the other hand, the cost of debt was highest for Turkish firms in four out of five years, and it was lowest for Slovakia in two out of five years. In the light of these information, we can reach a conclusion that low debt ratio might provide low cost of debt and vice versa. This may be related to bankruptcy costs, which are considered to be lower for these firms. In order to horizontally analyze these tables, two figures are drawn presenting the capacity and cost of debt across the time. Time is an important factor since the effects of the 2007-2008 global financial crises on the capacity and the cost of debt for industrial firms could be determined.

Figure 1 shows that in general, firms in Euro Area and Turkey have capital structures are different from each other. All firms slightly increase their debt ratios in the crisis period. Increase is higher for Turkish firms compared to firms in Euro Area. When four groups of firms are analyzed

simultaneously it is seen that debt ratios of service sector firms are more sensitive to financial stress than production sector firms.

Figure 1: Debt Ratios for Firms in Euro Area and Turkey, 2006-2010.

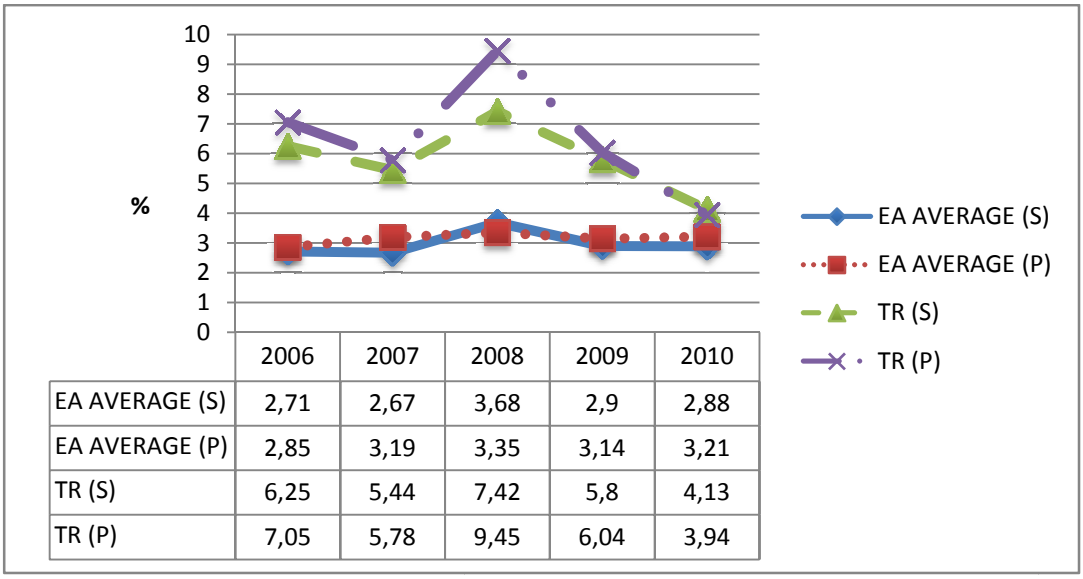


	2006	2007	2008	2009	2010
EA AVERAGE (S)	53,32	55,38	58,02	57,26	57,26
EA AVERAGE (P)	56,75	55,64	57,71	56,01	56,39
TR (S)	51,5	51,71	55,82	54,75	56,31
TR (P)	45,8	45,19	51,26	49,58	47,9

Figure 2 shows that the cost of debt was higher for Turkish firms than Euro Area firms for the whole period. In 2009, costs started to decrease and got closer to the level of Euro Area firms in 2010. Inflation rates as consumer prices for Euro Area countries and Turkey take place in Table 8 and credit ratings take place in Table 9. Inflation rate was highest in Turkey for the whole period so that one can expect that the cost of borrowing would be highest for firms operating in Turkey. Moreover, credit rating of Turkey is the second lowest after the Greece, together with Italy and Ireland. The highest credit ratings are for Germany, Slovakia, Slovenia and Spain. Firms in these countries also had low cost of debt in the analysis period. Since a firm is not able to have a rating higher than the country it operates in, as expected, the cost of debt and credit ratings are actually seem to be related to each other.

The cost of debt that Turkish production sector firms used are more expensive than the service sector firms especially in 2008, but cost of borrowing for these two sectors was very close to each other in Euro Area for the same period of time. The effects of the global financial crises were felt deepest in production sector firms in Turkey. Their costs of debt increased by almost 50 percent in the crisis year 2008. Service sector firms in Turkey also could found more expensive debt in the crisis period. The cost of debt for Euro Area firms in both sectors did not increase significantly in the crisis. This might result from the better structured and long-term planning of debts of Euro Area companies. Besides, Turkish firms were able to reach towards the Euro Area firms' levels after the crisis. This may be regarded as a positive indication for Turkish firms.

Figure 2: Cost of Debt for Firms in Euro Area and Turkey, 2006-2010.



	2006	2007	2008	2009	2010
EA AVERAGE (S)	2,71	2,67	3,68	2,9	2,88
EA AVERAGE (P)	2,85	3,19	3,35	3,14	3,21
TR (S)	6,25	5,44	7,42	5,8	4,13
TR (P)	7,05	5,78	9,45	6,04	3,94

Table 8: Inflation Rates as Consumer Prices (Annual - %)

Countries	2006	2007	2008	2009	2010
Austria	1.45	2.17	3.22	0.51	1.81
Belgium	1.79	1.82	4.49	-0.05	2.19
Cyprus	2.50	2.37	4.67	0.37	2.38
Estonia	4.43	6.60	10.37	-0.08	2.97
Germany	1.57	2.29	2.63	0.31	1.14
Finland	1.57	2.51	4.07	0.00	1.22
France	1.68	1.49	2.81	0.09	1.53
Greece	3.20	2.90	4.15	1.21	4.71
Ireland	3.94	4.88	4.05	-4.48	-0.95
Italy	2.07	1.82	3.38	0.75	1.54
Luxembourg	2.68	2.30	3.40	0.37	2.28
Malta	2.77	1.25	4.26	2.09	1.52
Netherlands	1.14	1.62	2.48	1.19	1.27
Portugal	2.74	2.81	2.59	-0.83	1.39
Spain	3.52	2.79	4.07	-0.40	1.92
Slovenia	2.46	3.61	5.65	0.86	1.84
Slovakia	4.48	2.76	4.60	1.62	0.96
Euro Area Average	2.59	2.70	4.17	0.21	1.75
Turkey	10.51	8.76	10.44	6.25	8.57

Source: The World Bank, http://www.worldbank.org/

Table 9: Standard&Poors Credit Ratings for Countries, 2012

Austria	AA NEGATIVE
Belgium	AA NEGATIVE
Cyprus	BB NEGATIVE
Estonia	AA NEGATIVE
Germany	AAA STATIONARY
Finland	AAA NEGATIVE
France	AA NEGATIVE
Greece	CC NEGATIVE
Ireland	BBB NEGATIVE
Italy	BBB NEGATIVE
Luxembourg	AAA NEGATIVE
Malta	A NEGATIVE
Netherlands	AAA NEGATIVE
Portugal	BB NEGATIVE
Spain	A NEGATIVE
Slovenia	A NEGATIVE
Slovakia	A STATIONARY
Turkey	BBB NEGATIVE

Source: http://www.standardandpoors.com/ratings/en/us/

5. CONCLUSION

As it is well known, Turkey and Euro Area countries have differentiated during and after the global financial crisis. They have priced economic and business risks differently and implemented different public and private sector policies. For Euro Area, focus is said to be on increasing demand and growth and low inflation prospects are indicated as a room for monetary easing to the real economy. On the contrary, Turkey concerns about potential activity slowdown. After the recovery from recession and cutting off the policy interest rates, monetary tightening is considered by the economists to be need. Capital expenditures are considered as another important issue for the Turkish economy. This study is trying to constitute the reflections of these differences on the real production and service sector firms. The aim is to expose how the debt capacity and the cost of debt for firms have experienced the differentiation of Euro Area and Turkey.

The main conclusion of the study is that Turkish firms should continue to decrease their cost of debt in order to enhance their competitive position in the world. Firms in the Euro Area and Turkey are competing over the export operations and over the sources of funds. Turkish firms should increase their credibility by any way such as exhibiting better performance on their operations in contravention of the effects of inflation and credit rating scores of the countries on the cost of borrowing of firms. Cash flows are also considered as very important factor for increasing the credibility. At a given capacity of debt, a firm, which has more regular cash flows, may have higher credit score than a firm, which have more irregular cash flows. Therefore,

Turkish firms should increase the quality and disposal of their cash flows. Redesigning of the sales, procurement and investment decisions and timing of these activities could do this. On the other hand, the sources of debt may be diversified in order to benefit from the competition among the sources of debt. Turkish firms should find ways to take advantage of the unsustainable debt structure of Euro Area firms. Expectation of increase in exchange rate and interest rates for Turkish firms may be the key point. Turkish firms will benefit as the foreign demand increase for their goods and services.

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MEASURING THE AGENCY COSTS OF DEBT: A SIMPLIFIED APPROACH

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KEYWORDS

Capital structure, agency costs, investment distortion, trade-off model.

ABSTRACT

This paper provides a model with which the agency costs of debt can be quantitatively analyzed. The traditional bankruptcy cost model in theories of corporate capital structure cannot explain actual financial leverage. This model extends the bankruptcy cost model by considering the agency costs. Simulating this model reveals several features. One is that it can realize likely optimal capital structure for actual firms. The other is that the agency costs of debt have a strong impact on optimal financial leverage though they are not very large. Furthermore, this paper also attempts tests to investigate whether this model fits behavior of actual firms. For more than 500 firms listed on the Tokyo Stock Exchange, parameters of the model can be appropriately estimated, and our measures of the agency costs of debt are almost consistent with past empirical research concerning agency costs hypotheses..

1. INTRODUCTION

These days the agency costs advocated by Jensen and Meckling (1976) have become a popular concept in investigating corporate capital structure. It is well known what causes agency costs and how they affect financial leverage. However, there are few quantitative studies that focus on agency costs for actual firms: For example, how do we measure their agency costs? How big are their agency costs? How strongly do agency costs influence their capital structure?

This paper constructs a model that enables us to make a quantitative analysis of the agency costs of debt. By fitting this model to data about actual firms, unknown parameters within the model are estimated, and the amounts of the agency costs of debt are computed. We investigate whether or not the calibration given in this paper is appropriate. The purpose of this paper is to test whether a corporate capital structure model grasps actual financial behavior with a simple method.

There are two kinds of agency costs: One is between debtholders and shareholders, the other is between external shareholders and internal managers. The model in this paper considers quantifying the former. Hereafter, we designate this as the agency costs of debt. These are caused by two incentives: Debt overhang and asset substitution. According to Jensen and Meckling (1976), a firm mitigates incentives through monitoring and bonding activities, which give rise to their execution costs. Since such activities cannot perfectly obviate these incentives, firm's earnings decline further owing to the incentives that remain. This decline can be interpreted as another cost, called residual loss. The agency costs of debt are the sum of the

execution costs and the residual loss that occurs when the firm is leveraged. We calculate the agency costs of debt in this paper.[1]

The theory of asset pricing in capital markets is essential to fit a capital structure model to behavior of real firms. These days there are several models which depend on the continuous time risk-neutral method for security valuation. Although a continuous time framework is helpful in modeling agency costs together with security valuation, difficulty remains concerning applicability to actual firms. We employ the single period CAPM for pricing securities. A model in this paper is so simple that we can estimate unknown parameters from actual firm's data straightforwardly.

Simulating this model reveals several features. One is that it can realize likely optimal capital structure for an actual firm. The other is that there is a negative correlation between firm's earnings and its debt ratio. Furthermore, there are two observations concerning the amount of the agency costs. First, the agency costs of debt have a strong impact on optimal financial leverage. Second, the agency costs of debt are not very large, which suggests that they do not seriously damage economic welfare. These characteristics about the agency costs have been already pointed out by Parrino and Weisbach (1999) and Parrino, Poteshman, and Weisbach (2005). This paper confirms them using a more simplified method with valid security valuation.

This paper also attempts two tests to investigate whether this model fits behavior of actual firms. We sampled more than 500 firms listed on the Tokyo Stock Exchange 1st section and which belonged to manufacturing industries. The first test is whether this model follows the debt ratio of actual firms and whether parameters estimated by this model are appropriate. For almost all firms, this model is able to make its optimal debt ratio correspond to the actual one observed from data, and moreover, the estimated values of the model's parameters do fit well with data.

The second test is to ascertain the validity of our quantitative measure for the agency costs of debt calculated using this model. In corporate finance, there are many empirical studies in which firms' debt ratios are cross-sectionally regressed on some explanatory variables. These days, when interpreting these estimation results, some hypotheses based on agency costs have been generally accepted. If these hypotheses are true, then the quantitative measure of this model would need to be consistent with them. Since we have not found any contradiction with these hypotheses, we conclude that the model in this paper is very successful in its application to actual firms.

This paper is summarized as follows. Section 2 digests prior research on a quantitative approach to agency costs. Section 3 formulates the valuation of debt and equity. Section 4 models agency costs and proposes a measure for them. Section 5 simulates this model and demonstrates its features. In Section 6, several regressions are conducted in order to test our model's validity. Section 7 concludes this paper.

[1] It is easy to extend this model into the generalized one which includes the agency costs between shareholders and managers as well, assuming a utility function on the part of managers. We do not think that such a generalization is useful. As Stulz (1990) and Berkovitch and Israel (1996) pointed out, debt has the effect of mitigating agency costs between shareholders and managers. Strictly speaking, the method provided here is to quantify the mixture of pure agency costs associated with debt and the effect of mitigating them when a firm becomes leveraged. When different materials are confused, measurement of the agency costs becomes obscure. This is why this paper focuses only on the agency costs of debt.

2. PRIOR RESEARCH

This paper draws on the theory of optimal capital structure that disputed the irrelevancy theorem of Modigliani and Miller (1958), and that presumed that a firm decides its capital structure as the result of optimal decision-making. The most representative model in the 1970s was the bankruptcy cost model. This derived optimal capital structure from balancing advantages and disadvantages associated with debt: The trade-off between tax shields and bankruptcy costs came under consideration. The economic implications of the model were clear, and it was possible to undertake a quantitative analysis of the capital structure of actual firms using the CAPM with which securities were priced and in which investors were assumed to be risk averse. The most famous research into the traditional bankruptcy cost model is Kim (1978). Warner (1977) points out a defect in the model.

The agency costs hypothesis is one of the optimal capital structure theories because, according to Jensen and Meckling (1976), a firm or manager makes an optimal decision regarding capital structure. However, the hypothesis depends on an assumption that is quite different from previous model's. The biggest difference concerns the assumption about firm's earnings before interest and taxes (EBIT). The traditional bankruptcy cost models assumed that the distribution of EBIT remained unchanged even if capital structure altered. On the other hand, the agency costs hypothesis presumes that capital structure determines the distribution of EBIT. Hence, the agency costs hypothesis that allows the distribution to change makes it easier to come up with a new way of thinking that is able to undertake an interpretation of behavior of actual firms. There are many studies that take this standpoint: Myers (1977), Long and Malitz (1985), Jensen (1986), Stulz (1990), Berkovitch and Israel (1996), and Lang, Ofek, and Stulz (1996). We can say that these studies are qualitative in that they provide several important implications.

These primary models that initially proposed agency costs often ignored security valuation. They assumed that a discount rate in pricing securities was zero, and that an expected cash flow at the end of a period was equal to a security price. However, it is impossible to study agency costs quantitatively without asset pricing methods to security valuation. Mello and Parsons (1992) and Leland (1998) developed models that enabled quantitative research into agency costs. They depend on risk-neutral security valuation in a continuous time framework. Morellec (2004) and Parrino, Poteshman, and Weisbach (2005) are significant steps toward grasping how to measure agency costs. While it is not regarded as an agency costs model, Goldstein, Ju, and Leland (2001) provides a path-breaking trade-off theory of capital structure in that dynamic debt restructuring is considered. Strebulaev (2007) attempts to investigate whether these continuous time models fit financial behavior for actual firms.

Parrino and Weisbach (1999) employed another approach under which some estimation was possible for actual firms. Their model is similar to that of the current paper in that it considers over-investment and under-investment as incentives for agency costs within a discrete time framework. However, their formulation is quite different from that used in this paper. The difference lies in security valuation. We wonder whether their method of calculating the cost of capital maintains capital market equilibrium. It is necessary to confirm that what Parrino and Weisbach (1999) showed is appropriate in terms of a different method.

This paper constructs a model that enables us to make a quantitative analysis of the agency costs of debt. This model must be so simple that we can fit it to data about actual firms. This is the reason why we depend on the single period CAPM in pricing securities. Once cash flows to equity and debt are formulated, the CAPM derives security values from the cash flows. These days the single period CAPM is not as popular as a continuous time model. We believe that the

single period CAPM is still a useful tool for security valuation in corporate finance if we regard one period as a very long term, such as 10 years.

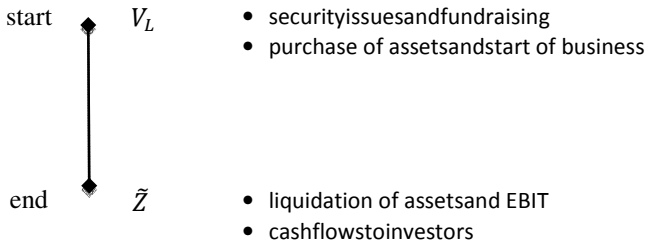
Valuation through an asset pricing theory is concerned with a security value at the beginning of a period. The agency costs are caused by manager's discretionary behavior that will become apparent during the period. An asset pricing theory assumes capital markets to be perfect, which means that, being aware of what the manager will do, investors price securities at the beginning of the period. The manager pursues his or her own objectives, and this gives rise to agency costs. Unable to be verified, the manager's behavior is not enforceable by investors through contracts. All investors can do is to forecast what the manager will do along his or her objectives. On the other hand, capital markets can influence the manager; he or she must accede to security valuation by investors. Under these suppositions, we formulate a security value so as to model the agency costs and provide our measures to quantify them.

3. VALUATIONOF EQUITY AND DEBT

In order to measure the agency costs of debt, we discuss a one-period model, which is summarized in Figure 1. At the beginning of the period, a firm is founded and issues debt and shares of stock. The firm purchases assets and starts up in business. Investors are debtholders and shareholders. The person who makes decisions for the firm is called a manager, who works on behalf of the shareholders. At the end of the period when the firm is liquidated, EBIT over the period and proceeds from the sale of the assets are distributed among the investors. The values of equity and debt issued at the beginning of the period are denoted as S_L and B. The sum of S_L and B is a firm value V_L.

The debt in this model, which is a senior claim, promises a payment L to debtholders at the end of the period. L consists of the principal and interest on the debt. The sum of the EBIT and the liquidation value is $\tilde{Z}$, which is the cash flow of the firm distributed to debtholders and shareholders at the end of the period. $\tilde{Z}$ is a random variable that follows a normal distribution $\mathrm{N}(\mu_Z, \sigma_Z^2)$. If its realized value Z is greater than L, the firm pays L to the debtholders first, then corporate income taxes are paid, and the residual is paid to the shareholders as dividends. However, if Z is less than L, the firm is in default and goes bankrupt. Then, bankruptcy costs that amount to K are incurred. This paper assumes bankruptcy costs to be proportional to the firm value, $K = kV_L$.

Figure 1: Time Structure of the Model



This expresses the time structure of this one-period model. V_L is a firm value at the beginning of a period. $\tilde{Z}$ is a cash flow distributed among investors at the end.

Suppose that corporate income tax is an asymmetric type of tax loss offset provisions. Asymmetric income tax is such that taxable income is charged at the rate τ if and only if it is positive. If taxable income is negative, the tax payment is zero. Taxable income is calculated as $Z - V_L - (L - B)$, where $Z - V_L$ is earnings from business activities and $L - B$ is an interest expense that is deductible. When the realized value of $\tilde{Z}$ is greater than $V_L + L - B$, the tax payment amounts to $\tau[\tilde{Z} - V_L - (L - B)]$. The calculation of taxable income in this model is similar to that in a traditional bankruptcy cost model.

Shareholders' cash flow at the end of the period, $\tilde{Q}_{LS}$, is formulated as

$$\tilde{Q}_{LS} = \begin{cases} \tilde{Z} - L - \tau\left(\tilde{Z} - V_L - [L - B]\right) & \text{for } Z \geq V_L + L - B, \\ \tilde{Z} - L & \text{for} V_L + L - B > Z \geq L, \\ 0 & \text{for } L > Z. \end{cases} \quad (1)$$

Since shareholders have limited liability, this means $S_L = V_L - B > 0$. $V_L + L - B$ is always greater than L. There are three equations for $\tilde{Q}_{LS}$, depending on whether Z is greater than $V_L + L - B$ or L. The first equation is the case where $Z \geq V_L + L - B$ and where taxable income is positive. Then the firm pays debtholders$L$, pays the income tax, and gives shareholders the remainder as dividends. In the second equation, the taxable income is negative but the firm does not go bankrupt. Hence the firm does not have to pay income tax. The cash flow $\tilde{Z}$ is divided between debtholders and shareholders. The third equation designates the case of $Z < L$, which makes the firm bankrupt. In this case, $\tilde{Z}$ belongs to the debtholders, and the shareholders get nothing.

Debtholders' cash flows are represented as $\tilde{Q}_{LB}$, the formula for which depends on whether the promised payment of debt L is greater than the bankruptcy costs K. In the case where $L > K$, $\tilde{Q}_{LB}$ is

$$\tilde{Q}_{LB}^{(L>K)} = \begin{cases} L & \text{for } Z \geq L, \\ \tilde{Z} - K & \text{for } L > Z \geq K, \\ 0 & \text{for } K > Z. \end{cases} \quad (2)$$

The superscript shows $L > K$. When $Z \geq L$, debtholders receive the promised payment L. When Z is less than L, the firm goes bankrupt and $\tilde{Z}$ belongs to the debtholders who have to incur the bankruptcy costs K. If Z is less than K, debtholders' cash flow from the firm becomes zero because of their limited liability.[2]

In the case where $K \geq L$, the formula for $\tilde{Q}_{LB}$ changes into

$$\tilde{Q}_{LB}^{(K \geq L)} = \begin{cases} L & \text{for } Z \geq L, \\ 0 & \text{for } L > Z. \end{cases} \quad (3)$$

[2] As long as shareholders and debtholders are limited liable, any claims charged on a firm are cancelled unless it has cash to fulfill them. $\tilde{Z}$is assumed to be normally distributed and Z can be negative. What does the negative Z mean? According to the Absolute Priority Rule, wages paid employees are senior to payments to debtholders, taxation, and shareholders. A negative value of Z is regarded as the situation where firm's cash flow acquired through its business and liquidation is short of its payroll. Shareholders and debtholders have no obligation to overcome the shortage. Since nobody covers it, the deficit, which is equal to the value of Z, is written off. When a firm goes bankrupt, the sum of cash flows to shareholders and debtholders is not always equal to the value of Z.

The first equation is the case where there is no bankruptcy. In the second equation, the bankruptcy occurs and there is no cash flow because of limited liability.[3]

The equity value S_L and the debt value B at the beginning of the period are derived from their cash flows at the end of the period. This paper applies the CAPM in pricing securities. The certainty equivalent approach in the CAPM can be applied to their valuation:

$$S_L = \frac{\mathrm{E}\left(\tilde{Q}_{LS}\right) - \lambda cov\left(\tilde{R}_M, \tilde{Q}_{LS}\right)}{1 + R_F}, \tag{4}$$

$$B = \begin{cases} \left[\mathrm{E}\left(\tilde{Q}_{LB}^{(L>K)}\right) - \lambda cov\left(\tilde{R}_M, \tilde{Q}_{LB}^{(L>K)}\right)\right] \Big/ (1 + R_F) & \text{for } L > K, \\ \left[\mathrm{E}\left(\tilde{Q}_{LB}^{(K\geq L)}\right) - \lambda cov\left(\tilde{R}_M, \tilde{Q}_{LB}^{(K\geq L)}\right)\right] \Big/ (1 + R_F) & \text{for } K \geq L, \end{cases} \tag{5}$$

where R_F is a riskless interest rate, $\tilde{R}_M$ is the rate of return on the market portfolio, and

$$\lambda = \frac{\mathrm{E}\left(\tilde{R}_M\right) - R_F}{\sigma\left(\tilde{R}_M\right)^2}.$$

Means and covariances that appear in Equations (4) and (5) are computed through partial moment formulas:

$$\begin{aligned} \mathrm{E}\left(\tilde{Q}_{LS}\right) = \mu_Z[1 - \tau + \tau F(V_L + L - B) - F(L)] + \sigma_Z^2[f(L) - \tau f(V_L + L - B)] \\ -L\left(1 - F(L)\right) + \tau(V_L + L - B)[1 - F(V_L + L - B)], \end{aligned}$$

$$cov\left(\tilde{R}_M, \tilde{Q}_{LS}\right) = cov\left(\tilde{R}_M, \tilde{Z}\right)[1 - \tau + \tau F(V_L + L - B) - F(L)],$$

$$\begin{aligned} \mathrm{E}\left(\tilde{Q}_{LB}^{(L>K)}\right) = L[1 - F(L)] - K[F(L) - F(K)] + \mu_Z[F(L) - F(K)] \\ -\sigma_Z^2[f(L) - f(K)], \end{aligned}$$

$$cov\left(\tilde{R}_M, \tilde{Q}_{LB}^{(L>K)}\right) = cov\left(\tilde{R}_M, \tilde{Z}\right)[F(L) - F(K) + Kf(L)],$$

$$\mathrm{E}\left(\tilde{Q}_{LB}^{(K\geq L)}\right) = L[1 - F(L)],$$

$$cov\left(\tilde{R}_M, \tilde{Q}_{LB}^{(K\geq L)}\right) = cov\left(\tilde{R}_M, \tilde{Z}\right)Lf(L),$$

where $F(\cdot)$ is the cumulative distribution function of the normal distribution $\mathrm{N}(\mu_Z, \sigma_Z^2)$ and $f(\cdot)$ is its density function.

[3] Who is going to pay the bankruptcy costs K in the case of $K > L$? When a firm goes bankrupt, debtholders obtain Z and bear K. Then $Z - K$ is negative since K is larger than Z. If the debtholders are burdened with all of K, the negative value of $Z - K$ means that they pay extra money out of their pocket, which violates their limited liability. The limited liability ensures that debtholders are free from any additional outlays except their initial investment B. A shortfall of $|Z - K|$ dollars debtholders do not have to pay is not charged on any other investors and, in other words, is written off. This is the reason why a cash flow to debtholders is assumed to be zero when a firm goes bankrupt in the case of $K \geq L$.

Although Equations (4) and (5) are formulations of S_L and B, they are not solutions of S_L and B. The cash flows depend on V_L, which is the sum of S_L and B, and the right-hand sides of Equations (4) and (5) include S_L and B through V_L. Although S_L and B cannot be analytically solved from these equations, the values of S_L and B that satisfy Equations (4) and (5) can be computed. We focus on these numerical solutions in later sections.

4. MODELING THE AGENCY COSTS OF DEBT

In this section, we consider modeling the agency costs of debt. The valuation of equity and debt in Section 3 is premised on the CAPM, which assumes that capital markets are perfect and that investors have perfect information. It is in the probability distribution parameters, μ_Z and σ_Z, that this model reflects managerial discretion that causes agency costs. After issuing securities, the manager runs the firm according to his or her own targets so that μ_Z and σ_Z can reach the most preferred values. The manager's objective in this model is to maximize the wealth of the shareholders. On the other hand, anticipating the manager's decisions, the investors correctly forecast the values of μ_Z and σ_Z that the manager will select. This is the meaning of "perfect information" in this model.

μ_Z and σ_Z might be observable but cannot be verified. Unable to be verified, they are not enforceable by investors through contracts.[4] All investors can do is to forecast what the manager will do along his or her objectives. While the manager might promise these values, these promises are not enforceable and not necessarily trusted by the investors. In valuing the securities, they anticipate the values of μ_Z and σ_Z, which the manager will decide.

We know from the means and the covariances of Equations (4) and (5) that S_L and B are functions of several parameters: L, μ_Z, σ_Z, k, τ, λ, R_F, and $cov(\tilde{R}_M, \tilde{Z})$. What the manager is able to control directly in his or her decision-making is assumed to be L, μ_Z, and σ_Z. There are other parameters that he or she influences indirectly. For example, the ratio of bankruptcy costs to a firm value, k, depends on what kinds of assets the firm comprises. The systematic risk in the capital market, $cov(\tilde{R}_M, \tilde{Z})$, can be an objective for the manager. We assume that the parameters other than L, μ_Z, and σ_Z are given and constant. The equity and debt values are denoted as

$$S_L = S_L(L, \mu_Z, \sigma_Z),$$

$$B = B(L, \mu_Z, \sigma_Z).$$

With these functions, the agency costs of debt are formulated as follows. At the beginning of a period, the manager chooses firm's capital structure to maximize the firm value.[5] The capital structure is derived from L, which is

[4] It is usually assumed in contract theories that L is verified, but that Z, a realized value of $\tilde{Z}$, is not. Many models use this assumption; for example, see Hart and Moore (1998). In this paper we assume that auditing works well for listed firms and that their Z is also verifiable. Its verifiability does not necessarily mean that μ_Z, the expected value of $\tilde{Z}$, is also verifiable.

[5] The reason why a firm must decide its capital structure to maximize a firm value is discussed in (Kane, Marcus, and McDonald, 1984,1985). Fischer, Heinkel, and Zechner (1989) and Goldstein, Ju, and Leland (2001) adopt this discussion to derive optimal capital structure. This paper also follows it. A traditional bankruptcy cost model maintains that maximizing a firm value makes shareholders' wealth maximized. (Kane, Marcus, and McDonald, 1984,1985) advocate the maximization of a firm value because of no arbitrage in equilibrium. The cash flow equations in Section 3 of this paper are similar to those in a traditional bankruptcy cost model. However, one of differences lies in this point.

$$L^* = \arg\max_L \{S_L(L, \mu_Z, \sigma_Z) + B(L, \mu_Z, \sigma_Z)\}. \tag{6}$$

During the period just after the beginning, the manager behaves so as to maximize the equity value. Then, agency costs between shareholders and debtholders arise. One of the reasons behind the agency costs is asset substitution, which enables the equity value to increase at the sacrifice of the debt value, with the firm taking more risk in the management. Through the incentive of asset substitution, the value of σ_Z is chosen by the manager, which leads to the maximization of S_L.[6]

$$\sigma_Z^* = \arg\max_{\sigma_Z} S_L(L^*, \mu_Z, \sigma_Z) \tag{7}$$

Capital markets being perfect, the manager's incentive in asset substitution during the period is predicted exactly by the investors at the beginning of the period. Thus, they can price securities using σ_Z^*, which is designated in Equation (7). On the other hand, since the manager selects the capital structure according to investors' valuation, Equation (6) must be rewritten as

$$L^* = \arg\max_L \{S_L(L, \mu_Z, \sigma_Z^*) + B(L, \mu_Z, \sigma_Z^*)\}. \tag{8}$$

Mathematically, if the value of μ_Z is given, L and σ_Z are solved from Equations (7) and (8), from which two first-order conditions are derived. These are the functions of L and σ_Z, the values of which can be solved endogenously with the given value of μ_Z.

How is μ_Z decided? We assume following constraint about μ_Z. Suppose that the expected cash flow of an unleveraged firm is μ_Z^U, which for the manager is given. μ_Z is regarded as a function of μ_Z^U and L. There are two factors that have opposing effects of L on μ_Z. One is that L has a positive effect through the tax saving by which an increase in L raises the firm value. The other is that L has a negative effect because an increase in L causes the agency costs to be aggravated.

The incentives that are known as asset substitution and debt overhang give rise to agency costs. Even if asset substitution reduces EBIT, the manager can conduct business that makes the firm sufficiently riskier to increase the equity value. The debt overhang leads the manager to abandon business that improves the EBIT yet might decrease the equity value owing to leakage into debt. If a firm is unleveraged, asset substitution and debt overhang never arise, and all the activities that increase the EBIT are undertaken. As a result, the value of μ_Z^U is decided. However, if the firm is leveraged and has to pay L at the end of the period, L reduces μ_Z to below μ_Z^U through these incentives.

In order to formulate μ_Z as a function of μ_Z^U and L, the real investment behavior of a firm should be factored into the agency costs model, and this is too complicated to be tractable. Instead of modeling the firm's investment, we assume that μ_Z is a linear function of L as the result of the incentives that cause the agency costs:

$$\mu_Z = \mu_Z^U + aL.$$

If the effect of the tax saving is greater than that of the agency costs, a is positive. If a is negative, the effect of the agency costs predominates. The purpose of this model is to account

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This model is by no means a bankruptcy cost model. Full discussion about their differences is available on request to authors.

[6] Note that the optimal value of σ_Z can exist as an interior solution because $\tilde{Q}_{LS}$ has both convex and concave regions in the function of $\tilde{Z}$.

for the effect of agency costs, hence the value of a is assumed to be negative, and the above linear equation is rewritten as[7]

$$\mu_Z = \mu_Z^U - \alpha L \tag{9}$$

for $\alpha > 0$. Equation (9) is correctly recognized by investors at the beginning of the period because they have perfect knowledge of the manager's behavior.

In sum, the equity and debt values are functions of three parameters: L, μ_Z, and σ_Z. The manager determines their values by carrying out his or her objectives, and investors, having perfect knowledge of these, price the securities. As a result, the parameters are endogenously decided using the three equations; (7), (8), and (9). We denote the solutions as L^*, σ_Z^*, and μ_Z^*. These can be used to rewrite the simultaneous equations:

$$\frac{\partial}{\partial \sigma_Z} S_L(L^*, \mu_Z^*, \sigma_Z^*) = 0, \tag{7'}$$

$$\frac{\partial}{\partial L} V_L(L^*, \mu_Z^*, \sigma_Z^*) = 0, \tag{8'}$$

$$\mu_Z^* = \mu_Z^U - \alpha L^*. \tag{9'}$$

The purpose of the numerical calculation is to determine the three variables that satisfy the above equations.

In Equation (9), new exogenous parameters, μ_Z^U and α, have arisen. Thus, by formulating agency costs, the equity and debt values become functions of μ_Z^U and α:

$$S_L = S_L(\mu_Z^U, \alpha), \tag{10}$$

$$B = B(\mu_Z^U, \alpha). \tag{11}$$

The purpose of this model is to quantify the agency costs associated with debt. Which parameter of the model is useful in measuring agency costs? It is α. L is the burden of debt, and any increases in α mean that the loss of EBIT per unit of debt becomes greater, which renders the agency costs more serious. So, α is considered to be the marginal effect of the agency costs of debt.

This model obtains the optimums of L^* and μ_Z^*, with μ_Z^U and α given. Large α does not always lead to a large loss in EBIT. For example, if a firm faces large α, small L^* can be optimal because the firm is willing to decrease debt so as to avoid the loss associated with debt. Then, μ_Z^* does not deviate from μ_Z^U as much. Hence, another quantitative measure is the extent to which the firm incurs ex post loss in EBIT as the result of optimal behavior:

$$LOSS = \frac{\mu_Z^U - \mu_Z^*}{\mu_Z^U}. \tag{12}$$

This is denoted as the loss rate associated with the agency costs of debt.[8]

[7] In the case where $a = 0$, this model cannot fit well with observed capital structure because it resembles a bankruptcy cost model. If a were positive, it would be more difficult to realize actual firm leverage. As a increases, optimal leverage in the model encourages greater debt and is more markedly different from the actual situation. However, if a is negative, the model's optimum more nearly approaches an actual firm. See Appendix A about validity of Equation (9).

[8] As was pointed out in Footnote 1, *LOSS* is not a pure measure for the agency costs of debt. There exists another agency cost that occurs between outside shareholders and inside managers. While discharging a debt brings about the agency costs of debt, it alleviates the one between shareholders and managers (Jensen and Meckling, 1976). See also Stulz (1990) and Berkovitch and Israel (1996). Strictly speaking, *LOSS* quantifies a composite of two kinds of the agency costs.

In Section 6 we calculate parameter values μ_Z^U, μ_Z^*, σ_Z^*, L^*, α, and $LOSS$from data of actual firms. Then, we investigate whether or not these are appropriate.

5. SIMULATION

This section presents some simulation results of this model. Since the model does not have analytical solutions, it would be difficult to make its characteristics clear without numerical solution methods. Simulation that depends on these could determine what the model is like.

Some parameter values used in the simulation are as follows: One period in this model is 10 years. The corporate income tax rate τ is 0.45. Capital market data are computed from April 1985 to March 1994: $\mathrm{E}(\tilde{R}_M) = 0.07706$, $\sigma(\tilde{R}_M) = 0.17885$, and $R_F = 0.054$. These values are based on one year and those that are converted into 10 years are employed in the model. $\tilde{R}_M$ is the rate of return on TOPIX, and R_F is the Nikkei long-term bond index. The correlation between $\tilde{R}_M$ and $\tilde{Z}$ is assumed to be 0.4.

In order to investigate the effect of agency costs on capital structure, we begin with the simplest case where α is zero and where σ_Z is given. This corresponds to the assumption that $\tilde{Z}$ is distributed over $\mathrm{N}(\mu_Z, \sigma_Z^2)$, which is exogenously given. Then, the model is similar to the bankruptcy cost model. If all the V_L in the cash flow equations were replaced with V_U, the unleveraged firm value, the model would become a traditional bankruptcy cost model. Although the economic meaning is very different between the simplest case and the bankruptcy cost model, these valuations are comparable due to similarity in the cash flow equations.

Table 1: The Effect of Changes in k in the Case where μ_Z and σ_Z are Given

k	L^*	Prob	S_L	B	V_L	B/V_L
0.1	54.09	0.667	0.41	26.03	26.44	0.985
0.2	42.04	0.201	2.70	23.03	25.73	0.895
0.3	38.09	0.105	4.07	21.35	25.43	0.840
0.4	35.95	0.069	4.92	20.32	25.24	0.805
0.5	34.51	0.051	5.52	19.59	25.10	0.780
0.6	33.44	0.040	5.97	19.02	25.00	0.761
0.7	32.59	0.033	6.34	18.57	24.91	0.745
0.8	31.89	0.028	6.65	18.19	24.84	0.732
0.9	31.29	0.024	6.91	17.87	24.78	0.721

This table presents simulation results in the case where $\alpha = 0$. This case corresponds to the assumption that $\tilde{Z}$ is distributed over $\mathrm{N}(\mu_Z, \sigma_Z^2)$, which is exogenously given. k is a bankruptcy cost parameter. When k is changed from 0.1 to 0.9, an optimal value L^* that maximizes V_L is provided for each k in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal L^*. The probability of default is denoted as Prob and the debt ratio as B/V_L. Suppose that$\mu_Z^U = \mu_Z = 50.0$ and $\sigma_Z = 9.487 = 3 \times \sqrt{10}$ are numbers based on 10 years. Suppose that $\mu_Z = 50.0$ and $\sigma_Z = 9.487$ are numbers based on 10 years. The standard deviation is obtained from one-year value 3.0 multiplied by $\sqrt{10}$. For each k, which is a bankruptcy cost parameter, the optimal value that maximizes V_L with respect to L is provided in Table 1, where the equity, debt, and firm values are computed under the optimal L^*. The probability of default, $Pr\{\tilde{Z} < L\}$, is denoted as Prob and the debt ratio as B/V_L.

When k is 0.4, the debt ratio is greater than 0.8. Even if k is 0.9, the debt ratio is greater than 0.7. These results are similar to those of the bankruptcy cost model. Since an actual debt ratio is less than 0.5 for most firms, it is true that a bankruptcy cost model is not able to fit this. The simplest case of this model demonstrates the fact. It is obvious that simply replacing V_U with V_L is not enough for the model to realize actual capital structure because the two equations remain similar.

A traditional bankruptcy cost model shows that an increase in firm's earnings leads to a higher debt ratio. So does the simplest case in our model. As long as μ_Z and σ_Z are exogenously given, earnings have a positive correlation with the debt ratio in this model. On the supposition that $k = 0.4$ and $\sigma_Z = 9.487$, Table 2 calculates an optimal L^* and its debt ratio for each value of given μ_Z. It is confirmed that larger μ_Z has a larger debt ratio as well as larger L^*. However, empirical studies observe that earnings and debt have a strong negative correlation, which contradicts the predictions of the models. As shown later, this model permits them to have a negative correlation.

Table 2: The Effect of Changes in μ_Z in the Case where μ_Z and σ_Z are Given

$\mu_Z^U = \mu_Z$	L^*	Prob	S_L	B	V_L	B/V_L
35.0	24.29	0.129	3.63	13.04	16.67	0.782
40.0	27.91	0.101	4.15	15.36	19.50	0.787
45.0	31.83	0.082	4.57	17.80	22.36	0.796
50.0	35.95	0.069	4.92	20.32	25.24	0.805
55.0	40.21	0.060	5.22	22.90	28.13	0.814
60.0	44.58	0.052	5.49	25.53	31.02	0.823
65.0	49.03	0.046	5.72	28.20	33.92	0.831
70.0	53.54	0.041	5.93	30.90	36.83	0.839

This table presents simulation results in the case where $\alpha = 0$. This case corresponds to the assumption that $\tilde{Z}$ is distributed over $\mathrm{N}(\mu_Z, \sigma_Z^2)$, which is exogenously given. When μ_Z is changed from 35.0 to 70.0, an optimal value L^* that maximizes V_L is provided for each μ_Z in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal L^*. The probability of default is denoted as Prob and the debt ratio as B/V_L. Suppose σ_Z =9.487 and $k = 0.4$.

The next step is to make σ_Z endogenous in the model, which means that asset substitution is considered as agency costs. L^* maximizes V_L, and σ_Z^* maximizes S_L. Table 3 assumes that $k = 0.4$ and that each value of μ_Z is given. Compared with Table 2, S_L in Table 3 increases. Then, B decreases in the cases where $\mu_Z \geq 40.0$ and where σ_Z^* in Table 3 is greater than $\sigma_Z (= 9.487)$ in Table 2.

The most interesting result in Table 3 is that the debt ratio becomes constant. While the positive correlation between earnings and debt is observed in the case of exogenous σ_Z, this correlation disappears by making σ_Z^* endogenous. This is because the debt value decreases when endogenous σ_Z^* is greater than fixed σ_Z. As an aside, the effect on the debt ratio is not very great. The debt ratio, which is 0.784, remains high, inconsistent with actual values.

Table 3: The Effect of Changes in μ_Z in the Case where Only σ_Z is Endogenous

$\mu_Z^U = \mu_Z$	σ_Z^*	L^*	Prob	S_L	B	V_L	B/V_L
35.0	8.92	24.31	0.115	3.64	13.21	16.85	0.784
40.0	10.19	27.78	0.115	4.16	15.10	19.26	0.784
45.0	11.47	31.25	0.115	4.68	16.99	21.67	0.784
50.0	12.74	34.72	0.115	5.20	18.88	24.08	0.784
55.0	14.01	38.20	0.115	5.72	20.76	26.48	0.784
60.0	15.29	41.67	0.115	6.24	22.65	28.89	0.784
65.0	16.56	45.14	0.115	6.76	24.54	31.30	0.784
70.0	17.84	48.61	0.115	7.28	26.42	33.71	0.784

This table presents simulation results in the case where only σ_Z is endogenous and α remains equal to zero. When μ_Z is changed from 35.0 to 70.0, an optimal pair, L^* and σ_Z^*, which maximizes V_L and S_L, is provided for each μ_Z in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal L^* and σ_Z^*. The probability of default is denoted as Prob and the debt ratio as B/V_L. Suppose $k = 0.4$.

The effect of agency costs is not only to make σ_Z endogenous but also to distort firm's business through its under-investment or over-investment incentives. Debt deviates μ_Z from the potential that would arise with μ_Z^U for the unleveraged firm. This correlation is shown in Equation (9). In the previous simulation, μ_Z was given. Now, μ_Z^U and α being given, μ_Z becomes endogenous in Equation (9). Mathematically, μ_Z^*, σ_Z^*, and L^* are solved from the three equations (7), (8), and (9). Table 4 gives calibration results for some changes in α in the case where $k = 0.4$ and $\mu_Z^U = 50.0$.

It is obvious from Table 4 that α significantly influences capital structure. $\alpha = 0.1$ lowers the debt ratio to 0.61 from about 0.8 in the case where $\alpha = 0$. $\alpha = 0.15$ reduces the debt ratio to less than 0.5, and $\alpha = 0.175$ makes it about 0.3, which is appropriate for actual capital structure. While the bankruptcy cost model was not able to reduce the debt ratio to an actual level even given an unrealistically large value of k, this model derives any values of the debt ratio as optimal capital structure, depending on the value of α. Capital structure models are not able to provide actual debt ratios without considering the decline in μ_Z associated with the agency costs of debt.

Table 4: Agency Costs of Debt: The Effect of Changes in α

α	μ_Z^*	σ_Z^*	L^*	Prob	S_L	B	V_L	B/V_L	ROA	$LOSS$
0.025	49.19	13.97	32.41	0.115	5.71	17.49	23.21	0.754	0.112	0.016
0.050	48.50	15.39	29.93	0.114	6.33	16.02	22.35	0.717	0.117	0.030
0.075	47.96	17.00	27.22	0.111	7.08	14.44	21.52	0.671	0.123	0.041
0.100	47.58	18.73	24.24	0.106	7.98	12.77	20.74	0.615	0.129	0.049
0.125	47.38	20.57	20.95	0.099	9.07	10.98	20.05	0.548	0.136	0.052
0.150	47.40	22.49	17.30	0.090	10.38	9.05	19.43	0.466	0.144	0.052
0.175	47.68	24.51	13.23	0.080	11.96	6.93	18.90	0.367	0.152	0.046
0.200	48.28	26.64	8.62	0.068	13.90	4.56	18.45	0.247	0.162	0.034
0.225	48.57	24.53	6.36	0.043	15.18	3.50	18.68	0.187	0.160	0.029
0.250	48.94	23.87	4.26	0.031	16.33	2.39	18.72	0.128	0.161	0.021
0.275	49.62	23.01	1.37	0.018	18.04	0.79	18.83	0.042	0.164	0.007

This table presents simulation results in the case of considering the agency costs of debt. When α is changed from 0.025 to 0.275, an optimal triad, μ_Z^*, σ_Z^*, and L^*, which maximizes V_L and S_L and which makes Equation (9) hold, is provided for each α in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal triad. The probability of default is denoted as Prob and the debt ratio as B/V_L. ROA is computed as $(\mu_Z^* - V_L)/(10 \times V_L)$. $LOSS$ is an agency costs measure, that is, $(\mu_Z^U - \mu_Z^*)/\mu_Z^U$. Suppose $k = 0.4$ and $\mu_Z^U = 50$.

A more interesting result in Table 4 is that the debt ratio was observed to have a negative correlation with μ_Z^*. The debt ratio decreases as α increases, and μ_Z^* increases at the same time for $\alpha > 0.1$. We can say that the debt ratio is negatively correlated with earnings although there are a few exceptions. If we define earnings as a ratio such as ROA, ROA in Table 4 confirms the negative correlation with debt.

Another interesting point in Table 4 is $LOSS$, which was defined in Equation (12). The difference between μ_Z^U and μ_Z^* becomes the ex post loss in earnings owing to debt. Table 4 calculates μ_Z^* with $\mu_Z^U = 50.0$ and each value of α given, and $LOSS$ is estimated. As α increases, $LOSS$ also increases initially and then quickly begins to decrease. $LOSS$ is at most about 5%, which suggests that agency costs are not very serious in terms of economic welfare.

The next simulation of the agency costs model addresses the effect of k. Table 5 summarizes the calculations when k is changed from 0.1 to 0.7 with $\mu_Z^U = 50.0$ and $\alpha = 0.175$ given. They are similar to those of the bankruptcy cost model in that the debt ratio declines as k increases. In the cases where $k \geq 0.5$, however, this model becomes irrelevant for k. When k is 0.6 or 0.7, the results are almost the same. Compared with $k = 0.5$, the difference is negligible. When k is between 0.1 and 0.5, an increase in k leads to a decrease in the debt ratio and to an increase in μ_Z^* and ROA. Thus, a negative correlation also exists between earnings and debt.

Table 5: Agency Costs of Debt: The Effect of Changes in k

k	μ_Z^*	σ_Z^*	L^*	Prob	S_L	B	V_L	B/V_L	ROA	$LOSS$
0.1	44.74	15.07	30.06	0.165	4.95	16.28	21.22	0.767	0.111	0.105
0.2	46.06	18.83	22.50	0.105	8.06	12.11	20.17	0.601	0.128	0.079
0.3	46.97	21.85	17.31	0.087	10.25	9.18	19.43	0.473	0.142	0.061
0.4	47.68	24.51	13.23	0.080	11.96	6.93	18.90	0.367	0.152	0.046
0.5	48.29	27.08	9.76	0.077	13.41	5.08	18.49	0.275	0.161	0.034
0.6	48.30	25.43	9.69	0.064	13.57	5.15	18.73	0.275	0.158	0.034
0.7	48.30	25.42	9.70	0.064	13.57	5.15	18.73	0.275	0.158	0.034

This table presents simulation results in the case of considering the agency costs of debt. When k is changed from 0.1 to 0.7, an optimal triad, μ_Z^*, σ_Z^*, and L^*, which maximizes V_L and S_L and which makes Equation (9) hold, is provided for each k in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal triad. The probability of default is denoted as Prob and the debt ratio as B/V_L. ROA is computed as $(\mu_Z^* - V_L)/(10 \times V_L)$. $LOSS$ is an agency costs measure, that is, $(\mu_Z^U - \mu_Z^*)/\mu_Z^U$. Suppose $\alpha = 0.175$ and $\mu_Z^U = 50$.

Table 6 simulates the effect of μ_Z^U. μ_Z^U is changed from 35.0 to 70.0 with $\alpha = 0.175$ and $k = 0.4$. An increase in μ_Z^U is associated with increases in μ_Z^*, σ_Z^*, and L^*. It is easy to confirm that these are homogeneous of degree one with respect to μ_Z^U. Then, the debt ratio and ROA remain constant. Under the assumption of Equation (9), the effect of μ_Z^U upon them is neutral.[9]

From the above simulation results, we can point out the three most interesting characteristics of the model in this paper. First, the optimal capital structure of this model is appropriate for actual financial leverage when the agency costs are considered as $\alpha \neq 0$. This α has much influence on optimal capital structure. Second, this model shows a negative correlation between earnings and debt. Although there are a few cases where the correlation is obscure, no positive correlation as in the bankruptcy cost model is found. Third, $LOSS$, which quantifies the ex post agency costs, is not as serious as we expected.

Table 6: Agency Costs of Debt: The Effect of Changes in μ_Z^U

μ_Z^U	μ_Z^*	σ_Z^*	L^*	Prob	S_L	B	V_L	B/V_L	ROA	$LOSS$
35.0	33.38	17.16	9.26	0.080	8.38	4.85	13.23	0.367	0.152	0.046
40.0	38.15	19.60	10.59	0.080	9.57	5.55	15.12	0.367	0.152	0.046
45.0	42.92	22.06	11.91	0.080	10.77	6.24	17.01	0.367	0.152	0.046
50.0	47.68	24.51	13.23	0.080	11.96	6.93	18.90	0.367	0.152	0.046
55.0	52.45	26.96	14.55	0.080	13.16	7.63	20.79	0.367	0.152	0.046
60.0	57.22	29.41	15.88	0.080	14.36	8.32	22.68	0.367	0.152	0.046
65.0	61.99	31.86	17.20	0.080	15.55	9.01	24.57	0.367	0.152	0.046
70.0	66.76	34.30	18.52	0.080	16.75	9.71	26.46	0.367	0.152	0.046

This table presents simulation results in the case of considering the agency costs of debt. When μ_Z^U is changed from 35.0 to 70.0, an optimal triad, μ_Z^*, σ_Z^*, and L^*, which maximizes V_L and S_L and which makes Equation (9) hold, is provided for each μ_Z^U in the table. The equity value S_L, the debt value B, and the firm value V_L are computed under the optimal triad. The probability of default is denoted as Prob and the debt ratio as B/V_L. ROA is computed as $(\mu_Z^* - V_L)/(10 \times V_L)$. $LOSS$ is an agency costs measure, that is, $(\mu_Z^U - \mu_Z^*)/\mu_Z^U$. Suppose $\alpha = 0.175$ and $k = 0.4$.

6. APPLICATION TO ACTUAL FIRMS

6.1.Validity of the Calibration

The valuation of equity and debt was derived from the CAPM as a function of three variables: L, μ_Z, and σ_Z. If we suppose the behavior of investors and of the manager as described in Section 4, then these variables are endogenous, and the equity value S_L and the debt value B can be reformulated into the functions of two exogenous variables, μ_Z^U and α. In any case, data for S_L and B are available for actual firms. S_L is obtained by multiplying a share price by the outstanding number of shares, and B is debt on the balance sheet as a proxy. Here Equations (10) and (11) are rewritten as

$$S_L = S_L(\mu_Z^U, \alpha), \tag{10}$$

$$B = B(\mu_Z^U, \alpha). \tag{11}$$

[9] The homogeneity with respect to μ_Z^U depends on Equation (9). If instead we assume another equation, $\mu_Z = \mu_Z^U - \alpha L^2$, the homogeneity disappears. This shows that an increase in μ_Z^U leads to a decrease in the debt ratio.

When the values of S_L and B are given, these equations construct a simultaneous equation system with unknown variables, μ_Z^U and α. The estimation of μ_Z^U and α is to calibrate them as a solution of the system.

If this model is to fit an actual firm, the calibration should be made successfully from data, and the computation results must also be appropriate. We have chosen firms listed on the Tokyo Stock Exchange 1st section, and examine their computed values of μ_Z^U, α, L^*, μ_Z^*, and σ_Z^*. All the firms we have selected belong to manufacturing industries.

In this paper, two periods are used in testing the model. One is 10 years from fiscal year 1974 to 1983, and the other is 10 years from 1984 to 1993. The former is denoted as period[1] and the latter as period[2]. The data for S_L is a share price multiplied by the number of shares outstanding, and the data for B is interest-bearing debt. For each firm, an average over the period is used for each item. The debt on the balance sheet is the book value. The market value of debt is not available, and we follow the convention that the book value of debt is used in computing the debt ratio.

It is impossible to estimate an appropriate value of the bankruptcy costs parameter k for each firm. Here, k is assumed to be 0.3 for all firms. The corporate income tax rate τ is 0.45. We calculate λ from capital market data about $\mathrm{E}(\tilde{R}_M)$, $\sigma(\tilde{R}_M)$, and R_F over periods[1] and [2]. The value of $cov(\tilde{R}_M, \tilde{Z})$ is converted from the beta coefficient for each firm over the two periods.

In making the above assumptions, we compute five parameters, μ_Z^U, α, μ_Z^*, σ_Z^*, and L^* through this model. The number of firms we analyze is 515 in period[1] and 592 in period[2]. Among them there are 471 firms in period[1] and 578 firms in period[2] for which the computation is successful. These correspond to 91.5% of the total in period[1] and 97.6% in period [2]. The results prove that this model is able to fit well behavior of actual firms.

Table 7: Summary of the Computation

	the number of firms	
	period[1]	period[2]
firms we examined (A)	515	592
success in the computation (B)	471	578
percentage (B)/(A)	91.5%	97.6%

Period[1] is 10 years from 1974 to 1983. Period[2] is 10 years from 1984 to 1993.

Next, we investigate whether the estimates are similar to actual numbers. Panel (A) in Table 8 summarizes cross-section statistics for the estimates of the 471 firms in period[1] and the 578 firms in period[2], which were successful in the computation of this model. Panel (B) tabulates some values from financial reports.

$\mu_Z^* - V_L$ and σ_Z^* in Panel (A) of Table 8 are cross-section averages for a mean and a standard deviation of earnings estimated using the model. $L^* - B$ is the average of the model's interest payment. This model considers 10 years as one period. For example, $\mu_Z^* - V_L$, which was estimated from the model, is a lump sum over the 10 years. To compare this with values from a financial report, we have to allocate the lump sum to every year. The figures in the table are

those that were allocated. In any case, α and $LOSS$ are the quantitative measures of the agency costs. Their validity will be investigated in the next subsection.[10]

Table 8: Cross Section Statistics for the Estimates and Real Values

	period[1]				period[2]			
	Mean	S.D.	Min.	Max.	Mean	S.D.	Min.	Max.
Panel (A)	Calculated values from the model							
$\mu_Z^* - V_L$	0.2203	0.4602	0.0092	4.9007	0.4232	0.7609	0.0194	8.7035
σ_Z^*	0.0959	0.1725	0.0056	1.6655	0.1955	0.3532	0.0095	3.6280
$L^* - B$	0.0635	0.1429	0.0004	1.5879	0.0540	0.1129	0.0006	1.2014
$\rho_B B$	0.0572	0.1361	0.0004	1.5401	0.0496	0.1027	0.0005	1.0974
α	0.2811	0.0691	0.0997	0.4124	0.2523	0.0299	0.1551	0.3161
$LOSS$	0.0781	0.0292	0.0051	0.1490	0.0363	0.0162	0.0028	0.0689
Panel (B)	Data from financial reports							
$ave(EBITDA)$	0.1704	0.3705	0.0023	4.3286	0.2463	0.5600	0.0011	8.5347
$std(EBITDA)$	0.0525	0.1084	0.0018	0.9317	0.0603	0.1102	0.0023	1.4171
$INTPAY$	0.0562	0.1362	0.0008	1.6046	0.0434	0.0966	0.0006	1.0275
DBR	0.4605	0.2106	0.0218	0.8406	0.2490	0.1317	0.0141	0.6385
$RDAD$	0.1129	0.1577	0.0000	1.4723	0.1224	0.1567	0.0000	1.4868
$GROW$	0.0597	0.0402	-0.0633	0.2469	0.0165	0.0356	-0.1134	0.1806
$SIZE$	-0.4711	1.1574	-2.9820	3.5171	0.0467	1.1624	-3.2579	3.8837

Period [1] is 10 years from 1974 to 1983. Period [2] is 10 years from 1984 to 1993. Sample size is 471 firms in period [1] and 578 firms in period [2]. Panel (A) summarizes estimates of the model's parameters. $\mu_Z^* - V_L$ is an expected value of firm earnings. σ_Z^* is a standard deviation of the earnings. $L^* - B$ is an interest payment on the model. $\rho_B B$ is another approximation to model's interest payment. These are converted from a lump sum to a one-year value. α and $LOSS$ are the quantitative measures of agency costs. Panel (B) summarizes real data calculated from financial reports. $ave(EBITDA)$ and $std(EBITDA)$ are an average and a standard deviation over the period for a sample firm's EBITDA. $INTPAY$ is an interest payment. DBR is a debt ratio, which is (interest bearing debt)/(firm value). $RDAD$ is the ratio of intangible to tangible assets. $GROW$ is the growth rate of firm's assets. $SIZE$ is a logarithm value of firm's sales.

[10] We allocate a lump sum to every year using the coefficient ADJ defined as $ADJ = \frac{R}{(1+R)^N - 1}$, where one period is N years and R is a one-year discount rate. By multiplying $(\mu_Z^* - V_L)$ and $(L^* - B)$by ADJ, we can obtain one-year values calculated from the model. The discount rate R used here is the required rate of return, which is also estimated from the model.

Table 9: Correlations between Real Values and the Model's Estimates

Panel (A)

dependent variable: $\mu_Z^* - V_L$

	period[1]	period[2]
const.	0.016	0.103
	(2.32)	(3.31)
$ave(EBITDA)$	1.197	1.300
	(3.10)	(2.00)
$\bar{R}^2$	0.928	0.915

Panel (B)

dependent variable: σ_Z^*

	period[1]	period[2]
const.	0.018	0.017
	(5.09)	(2.00)
$std(EBITDA)$	1.475	2.948
	(5.15)	(10.29)
$\bar{R}^2$	0.859	0.845

Panel (C)

dependent variable: $L^* - B$

	period[1]	period[2]
const.	0.005	0.004
	(4.65)	(6.72)
$INTPAY$	1.041	1.150
	(1.62)	(6.38)
$\bar{R}^2$	0.984	0.970

Panel (D)

dependent variable: $\rho_B B$

	period[1]	period[2]
const.	0.001	0.004
	(1.75)	(7.31)
$INTPAY$	0.993	1.047
	(0.35)	(2.23)
$\bar{R}^2$	0.986	0.970

This table presents correlations between real values and the model's estimates. In order to ascertain the extent of any correlation, we attempt to regress the model's estimates on real values. $\mu_Z^* - V_L$ is an expected value of firm earnings. σ_Z^* is a standard deviation of the earnings. $L^* - B$ and $\rho_B B$ are an interest payment on the model. These are model's estimates. Real values are $ave(EBITDA)$, $std(EBITDA)$, and $INTPAY$. $ave(EBITDA)$ and $std(EBITDA)$ are an average and a standard deviation over the period for sample firm's EBITDA. $INTPAY$ is an interest payment. Parentheses give a t-value for a test that a coefficient is equal to 0 for a constant or to 1 for an independent variable. Period[1] is 10 years from 1974 to 1983. Period[2] is 10 years from 1984 to 1993. There are 471 firms in period[1] and 578 firms in period[2].

On the other hand, the actual values that are to be compared with earnings calculated through the model are statistics concerning the EBITDA in financial reports. The EBITDA in this paper is computed by adding an interest payment, income taxes, and depreciation to after-tax earnings. We compute a mean and a standard deviation of the EBITDA over the period for each firm. Then, $ave(EBITDA)$ and $std(EBITDA)$ are sample averages of the means and the standard deviations. $INTPAY$ is the interest payment that is calculated in the same way. Panel (B) in Table 8 summarizes these cross-section statistics for the sample firms. The other variables, DBR, $RDAD$, $GROW$, and $SIZE$, will be addressed in the next subsection. DBR is a debt ratio,

$RDAD$ is an intangible-tangible asset ratio, $GROW$ is the growth rate of firm's assets, and $SIZE$ is a logarithm of firm's sales.

Compare Panel (A) with Panel (B) in Table 8. In terms of a cross-section average, the estimates from the model are bigger than those from financial reports for the means and the standard deviations in earnings. $\mu_Z^* - V_L$ is larger than $ave(EBITDA)$ by 30% in period[1] and by 70% in period[2]. σ_Z^* is 2 times as large as $std(EBITDA)$ in period[1] and 3.3 times as large in period[2]. For the interest payment, however, the model values are almost the same as the actual ones. $L^* - B$ is 0.064 and 0.054 over periods[1] and [2], and $INTPAY$ is 0.056 and 0.043. If the model's interest payment is considered as $\rho_B B$, where ρ_B is a required rate of return on debt, the estimated values are closer to the actual ones.

The cross-section averages show that the estimated values of earnings appear overestimated. There are several definitions of earnings constructed from a financial report. It is clear that we cannot easily decide which definition is the best. Thus, let us ignore the difference in cross-section averages of earnings. More important is the model's fit. In order to examine this, we look at correlations between actual earnings and the model's estimates for the sample firms. Independent variables for regression equations are the actual values from financial reports, and dependent variables are those computed from the model. If the model's computations are appropriate, the fit of the regression must be good. Table 9 summarizes the regression results.

In Panel (A) of Table 9, a dependent variable is the expected earnings computed from $\mu_Z^* - V_L$ and its regressor is $ave(EBITDA)$. Since $\bar{R}^2$ is greater than 0.9, the fit of the regression is very good. In Panel (B), a dependent variable is the standard deviation of earnings computed from σ_Z^* and its regressor is $std(EBITDA)$. $\bar{R}^2$ is above 0.8. Panels (C) and (D) are the results of the regressions of the interest payments from the model on $INTPAY$. $L^* - B$ is used in Panel (C) and $\rho_B B$ in Panel (D). In these cases $\bar{R}^2$ is 0.97 and 0.98 respectively, so the fit is very good.

From the regression results we conclude that this model is sufficiently adequate to mimic actual firm's behavior. The model's values for each firm are highly correlated with the actual ones. There remains a problem in that some differences in level exist between the model's estimates and the actual earnings.

6.2. Validity of the Measure of the Agency Costs

This model provides us with the quantitative measures of the agency costs, α and $LOSS$, for each firm. How do we know whether these are appropriate? We compare the model's estimates with past empirical research into capital structure. In corporate finance there are many studies to find out which variables are statistically correlated with a debt ratio. When interpreting regression results, the manner of thinking that depends on agency costs is now becoming conventional wisdom. We test whether the model's estimates are consistent with this.

Table 10 shows regression results. Their dependent variable, DBR, is a debt ratio that is computed using interest-bearing debt divided by a market firm value. There are three independent variables: $RDAD$, $GROW$, and $SIZE$. $RDAD$ is the ratio of intangible to tangible assets. Intangible assets are the sum of research, development, and advertisement expenditure. Tangible assets are the sum of fixed assets. $GROW$ is firm's growth, which is the growth rate of its total assets. $SIZE$ is firm's size, which is the logarithm of its sales. The values used are averages over each period ([1] and [2]) for each firm. We attempt cross-section regression for the sample firms. This method of estimation is the most standard in empirical studies of capital structure.

Table 10: Regression of the Debt Ratio

dependent variable: DBR					
period	const.	$RDAD$	$GROW$	$SIZE$	$\bar{R}^2$
[1]	0.667	-0.419	-2.377	0.036	0.391
	(44.31)	(-7.44)	(-10.4)	(5.28)	
[2]	0.293	-0.271	-0.726	0.019	0.177
	(41.36)	(-8.38)	(-4.55)	(4.15)	

This table shows regression results to see how debt ratios are correlated with some variables. The variables we examine are $RDAD$, $GROW$, and $SIZE$. DBR is a debt ratio, which is (interest bearing debt)/(firm value). $RDAD$ is the ratio of intangible to tangible assets. $GROW$ is the growth rate of firm's assets. $SIZE$ is a logarithm value of firm's sales. Parentheses give a t-value. Period[1] is 10 years from 1974 to 1983. Period[2] is 10 years from 1984 to 1993. There are 471 firms in period[1] and 578 firms in period[2].

The results are normal and very typical, compared with past studies. All the explanatory variables are significant. $RDAD$ and $GROW$ have negative coefficients and $SIZE$ has a positive one. The most significant is $GROW$ in period[1] and $RDAD$ in period[2]. $\bar{R}^2$ in period[2] is half that in period[1].

It has now become a conventional viewpoint that the negative coefficients of $RDAD$ and $GROW$ are highly significant due to the effect of agency costs. When $RDAD$ increases, it is more difficult for investors to monitor firm's behavior because its assets get more intangible. Then, the incentive of asset substitution is stronger, which leads to greater agency costs. In order to avoid this loss, a firm tends to reduce its debt. So firms with high values of $RDAD$ decrease their debt ratios. This hypothesis, proposed by Long and Malitz (1985), has been the most popular in empirical studies of capital structure. We designate it as Hypothesis 1.

The next hypothesis is about $GROW$. Since a high growth firm has a lot of investment opportunities, which provide it with high earnings, it is likely that the firm will fall into under-investment. Thus, firms that grow faster have greater agency costs owing to their debt overhang than those that grow slowly. So firms with high growth tend to have less debt, and growth and debt are negatively correlated. Jensen (1986) and Stulz (1990) emphasize this correlation in their models, and Lang, Ofek, and Stulz (1996) is the most famous empirical research in this regard. Here, this is designated as Hypothesis 2.

The coefficient of $SIZE$ is positive because a large firm incurs much debt as it can reduce the probability of bankruptcy by diversifying its assets. Among empirical studies, it was Bradley, Jarrell, and Kim (1984) who first supported this. Although their thinking has nothing to do with agency costs, it still remains popular today. By associating it to agency costs, we develop the following hypothesis: The agency costs of debt premise the possibility of firm's bankruptcy. If it is not probable that a firm will go bankrupt, no agency costs of debt will occur for that firm. This means that a larger firm will incur lower agency costs because it can reduce its bankruptcy probability, so it can depend to a significant extent on debt. Here, this constitutes Hypothesis 3.

Table 11: Correlation between Variables

		dependent variable	
		α	$LOSS$
Hypothesis 1	$RDAD$	$+$	$-$
Hypothesis 2	$GROW$	$+$	$-$
Hypothesis 3	$SIZE$	$-$	$+$
	DBR	$-$	$+$

This table shows correlations between agency costs measures and some variables.

How do these hypotheses relate to α and $LOSS$? When a firm faces large agency costs of debt, a significant economic loss might come about owing to an increase in debt, which means that the firm experiences a large marginal effect of the agency costs, α. Since the hypotheses predict that an increase in the agency costs of debt decreases the debt ratio, the firm depends less on debt to avoid the agency costs, which might bring about a decline in $LOSS$. Thus, if an explanatory variable has a positive correlation with the agency costs, it is positively correlated with α and negatively correlated with $LOSS$. Table 11 summarizes correlations of α and $LOSS$ with the explanatory variable that represents each hypothesis. It is also easy to understand the correlations with the debt ratio; DBR has a negative correlation with α and a positive one with $LOSS$.

If the values of α and $LOSS$ computed from the model are valid, they must be correlated with the variables in the hypotheses the way Table 11 shows. In order to test these correlations, we estimate some regression equations.

$$\alpha g(DBR, RDAD, GROW, SIZE) + \varepsilon$$

$$LOSS = g(DBR, RDAD, GROW, SIZE) + \varepsilon$$

The function $g(\cdot)$ is a linear regression equation. ε is a disturbance. The results of the regression over periods[1] and [2] are summarized in Table 12. Among the explanatory variables, we separate DBR and others, and attempt two regression equations.

Table 12: Regression Results Using the Quantitative Measures of Agency Costs

	dependent variable: α				dependent variable: $LOSS$			
	period[1]		period[2]		period[1]		period[2]	
const.	0.424	0.219	0.306	0.243	0.025	0.101	0.006	0.042
	(178.4)	(39.75)	(372.0)	(152.9)	(14.68)	(54.46)	(20.13)	(49.57)
DBR	-0.310		-0.215		0.116		0.121	
	(-58.50)		(-72.41)		(31.25)		(87.67)	
$RDAD$		0.108		0.057		-0.052		-0.034
		(6.75)		(7.84)		(-6.58)		(-8.59)
$GROW$		0.779		0.153		-0.289		-0.081
		(10.23)		(4.27)		(-9.05)		(-4.12)
$SIZE$		-0.803		-0.427		0.040		0.217
		(-3.28)		(-3.87)		(0.44)		(3.82)
$\bar{R}^2$	0.893	0.323	0.895	0.151	0.694	0.291	0.974	0.167

This table presents regression results using quantitative measures of agency costs. α and $LOSS$ have correlations that the hypotheses claim to observe. α and $LOSS$ are the quantitative measures of agency costs. DBR is a debt ratio, which is (interest bearing debt)/(firm value). $RDAD$ is the ratio of intangible to tangible assets. $GROW$ is the growth rate of firm's assets. $SIZE$ is a logarithm value of firm's sales. Parentheses give a t-value. Period[1] is 10 years from 1974 to 1983. Period[2] is 10 years from 1984 to 1993. There are 471 firms in period[1] and 578 firms in period[2].

Regressing α and $LOSS$ on DBR shows similar results over periods[1] and [2]. DBR is negatively correlated with α and positively correlated with $LOSS$. The coefficients are highly significant, and DBR explains α and $LOSS$ well. These correlations are stronger in period[2] than in period[1]. We conclude that the values of α and $LOSS$ computed from the model are consistent with the hypotheses under which, while facing large agency costs of debt, a firm intends to depend less on debt to avoid the loss caused by the agency costs.

The next step is to regress α and $LOSS$ on $RDAD$, $GROW$, and $SIZE$. The only insignificant coefficient is that of $SIZE$ in period[1] for the $LOSS$ equation. Other regressors are significant enough to reject at the 1% level. The signs of the coefficients correspond with Hypotheses 1, 2, and 3. We confirm that $RDAD$ and $GROW$ have a positive correlation with α and a negative correlation with $LOSS$, and that $SIZE$ has a negative correlation with α and a positive correlation

with $LOSS$. The regression results show that α and $LOSS$ have the correlations that the hypotheses claim to observe. The only exception is Hypothesis 3 over period[1]. Therefore, the quantitative measures of the agency costs of debt calibrated from the model are almost perfectly consistent with past empirical research into capital structure. We conclude that the model is adequate for actual firm behavior.

7. CONCLUSION

Although agency costs are currently well known, there are few studies that have tried to quantify them. How serious is the effect of agency costs on the loss of firm's earnings? How strongly do the agency costs of debt influence firm's capital structure? In order to embody the quantity of agency costs, the model constructed in this paper provides measures for them and investigates their effect on capital structure. This model extends the traditional bankruptcy cost model by considering agency costs, and we conclude that it is very well suited to capture financial behavior of actual firms.

Simulation helps to clarify the features of this model. First, the model realizes optimal capital structure that resembles an actual firm. This model overcomes the difficulty that the bankruptcy cost models did not resemble an actual debt ratio. Second, this model shows a negative correlation between firm's earnings and its debt ratio. Empirical studies have observed that they were negatively correlated. Third, the agency costs of debt strongly influence the optimal debt ratio, while the loss derived from agency costs might not be very serious.

Next, using firm data, we investigate whether the model fits actual behavior. Debt ratios observed from market share prices can be optimized in terms of this model. As for unknown parameters, which are to be estimated from the model, these estimates are highly correlated with data that are observed in financial reports. The quantitative measures of agency costs are fully compatible with past empirical studies of capital structure.

Appendix A: The Assumption of Equation (9)

We assume Equation (9) in this model. This is based on the premise that more debt leads to a decline in μ_Z due to over-investment and/or under-investment. It is now well-known why the investment distortion arises through two kinds of incentive; debt overhang and asset substitution. In this appendix, instead of making another model, numerical examples which depend on this model confirm that μ_Z is a decreasing function of L.

A.1: Debt Overhang

We show the debt overhang, which brings about under-investment; the investment which should be executed cannot be implemented.

Firm's business is considered as many projects which affect its earnings. A more profitable project has higher priority. We take up four marginal projects which are the least profitable. Projects from a to d in Table 13 are marginal ones a firm faces. Earnings on the firm is assumed to be 293 if no marginal project is executed. A symbol O denotes this like μ_Z^O. Table 13 shows an increase in earnings when a project is carried out. Each project requires an expenditure of 2. For example, Project a raises firm's earnings by 9 if the firm spends 2 as an initial outlay.

Table 13: Earnings on a Project: Case 1

	Projects				
μ_Z^O	a	b	c	d	μ_Z^U
293	9	7	6	5	320

Numbers are increases in the expected value of firm's earnings from Projects a to d. μ_Z^O is the expected earnings in the case where the firm does not implement any of these projects. μ_Z^U is the one when all of them are executed.

We assume that these marginal projects have a positive NPV, and that all of them are executed when the firm is unleveraged. If only Project a is adopted, the value of expected earnings of the firm μ_Z is 302, which consists of μ_Z^O and Project a. In order to exclude the effect of asset substitution, a standard deviation of earnings σ_Z is assumed to be proportional to its expected value. Provided σ_Z^O is set to 28.95 in the case of no marginal project, σ_Z becomes 29.84 when only Project a is executed. $\Delta S_L(L, \mu_Z, \sigma_Z)$, an increase in an equity value due to a project, is equal to firm value increment for an unleveraged firm. From the column of $L = 0$ in Table 14, Project a increases a firm value by 3.87, and its NPV, which is the difference from investment of 2, proves to be positive.

Next is the case where the firm implements Project b in addition to Project a. μ_Z is 309, and σ_Z is 30.54. Since under no debt ($L = 0$) an equity value rises by 3.01, Project b has a positive NPV. When Project c is added, an increase in the equity value is 2.58. This is 2.15 for Project d besides. They are larger than an expenditure of 2, and Projects c and d have a positive NPV. The firm does not have any other investment opportunity. As long as all these projects are carried out, the firm expects earnings of 320 and a standard deviation of 31.62. These values are μ_Z^U and σ_Z^U for the unleveraged firm. A superscript * in Table 14 denotes that a project should be executed.

Table 14: Examples of the Debt Overhang

				$\Delta S_L(L, \mu_Z, \sigma_Z)$					
Projects	I	μ_Z	σ_Z	$L = 0$	$L = 265$	$L = 272$	$L = 283$	$L = 287$	$L = 289$
O+a	2	302	29.84	3.87*	3.20*	2.87*	2.26*	2.02*	1.90
O+a+b	2	309	30.54	3.01*	2.70*	2.50*	2.09*	1.92	1.83
O+a+b+c	2	315	31.13	2.58*	2.42*	2.28*	1.99	1.86	1.79
O+a+b+c+d	2	320	31.62	2.15*	2.07*	1.98	1.78	1.68	1.63

The most left column indicates projects executed under which μ_Z is an expected value of firm's earnings and σ_Z is a standard deviation. $\Delta S_L(L, \mu_Z, \sigma_Z)$ is an incremental equity value when Projects a to d are executed in addition. These are equal to an increase in a firm value only for

an unleveraged firm ($L = 0$), and the NPV is the difference between$\Delta S_L(0, \mu_Z, \sigma_Z)$ and an investment outlay I. The expected earnings under no marginal projects is $\mu_Z^O = 293$, and a standard deviation is $\sigma_Z^O = 28.95$.

When the firm is leveraged, an increase in an equity value is smaller than that in a firm value because some of the increase in a firm value leaks to debt. Even if the increase in a firm value is more than an investment outlay, the increase in an equity value is not always more than it. If the incremental equity value is less than the expense for a positive NPV project, carrying it out harms the wealth of shareholders. It is ordinary that the increase in the equity value gets smaller for a more leveraged firm. Table 14 shows that more debt converts the marginal projects into unprofitable for shareholders. The incremental equity values for $L = 265$ are less than those for $L = 0$, but still larger than the outlay of 2. As the result that all the projects are carried out, μ_Z is the same as $\mu_Z^U = 320$.

On the other hand, when debt grows to $L = 272$, the increase in equity for Project d is less than the outlay of 2. Since the firm executes Projects a to c, but not d then, μ_Z decreases from μ_Z^U to 315. In the case of $L = 283$, Project c becomes unprofitable, and Projects$a$ and b are executed. Then μ_Z declines more to 309. Furthermore, $L = 287$ changes Project b into unprofitable and unexecutable one, and μ_Z is equal to 302. Eventually $L = 289$ makes the incremental value for Project a smaller than the outlay, which induces that no marginal project is implemented and $\mu_Z = 293$. Because of the increase in L with more debt, projects which have bad profitability gradually drop out, and the expected value of firm's earnings decreases.

Although μ_Z is a decreasing function of L, it is obvious that its function form depends on investment opportunity a firm faces. The function is assumed to be linear in terms of its approximation so that it is easily applied to any firms. It is true that Equation (9) to determine μ_Z is superficial and ad hoc. We have tried another function for several firms. A quadratic relation between L and μ_Z leads to the same arguments as this paper. Further research must bring out an effect of function forms on our estimation.[11]

A.2: Asset Substitution

This section discusses the over-investment which means that a project which should not be executed is adopted through the asset substitution. Examples for simulation are Projects A to D in Table 15. If a firm substitutes its assets into more risky ones, its equity could rise in value without regard to their profitability.

[11] In order to construct a system for μ_Z, we have to model business activities that include investment a firm executes. The investment decision-making depends on its opportunity, which is very different between firms. Equation (9) is, as it were, a reduced form of our model. It is more practical to depend on a reduced form equation than to dwell on a structural form system. More important is that values of α can be estimated for actual firms. Parameter estimates in this paper adopt complicated procedure of nonlinear simultaneous equations. If the effect of L on μ_Z were irrelevant, it would be impossible to obtain a convergent α.

Table 15: Earnings on a Project: Case 2

	Projects			
μ_Z^U	A	B	C	D
320	-5	-10	-15	-20

Numbers are increases in the expected value of firm's earnings from Projects A to D. μ_Z^U is the expected earnings for the unleveraged firm.

We suppose that an unleveraged firm implements all the projects which have a positive NPV, and that its expected value and a standard deviation of earnings are $\mu_Z^U = 320$ and $\sigma_Z^U = 31.62$. The above examples of the asset substitution are the projects which make the firm more risky and which are of negative effect on its earnings. Project A affects μ_Z by -5 and its execution has $\mu_Z = 315$. Then the risk is assumed to get three times as large as a proportion in scale. The standard deviation in Table 16 is 93.39, which trebles 31.13. When σ_Z is proportional to μ_Z, its value is 31.13($= 31.62 \times 315/320$). The risk for each of Projects B, C, and D is derived from the same way. But damage to earnings gets more and more serious. Project B reduces earnings by 10 into $\mu_Z = 310$. From Project C, μ_Z is 305 with 15 down, and Project D brings down $\mu_Z = 300$.

In the debt overhang examples, we posited that investment was cumulative; Project b was executed in addition to Project a, and Project c was done in addition to Projects a and b. Here we suppose that each of Projects A to D is added to the unleveraged firm μ_Z^U. Though it is easy to make another example of the asset substitution the way projects are cumulatively carried out, this is not so meaningful because projects to accumulate are unprofitable. $U + A$ to $U + D$ in the most left column of Table 16 represent that each project is executed. These four projects require an initial outlay of 2. The increase in an equity value is calculated as $S_L(L, \mu_Z, \sigma_Z) - S_L(L, \mu_Z^U, \sigma_Z^U)$. The NPV of a project is the difference between the incremental value of equity for $L = 0$ and the investment expense of 2. We can easily confirm that NPVs of these projects are negative.

Table 16: Examples of the Asset Substitution

				$S_L(L, \mu_Z, \sigma_Z) - S_L(L, \mu_Z^U, \sigma_Z^U)$				
Projects	I	μ_Z	σ_Z	$L = 268$	$L = 288$	$L = 300$	$L = 305$	$L = 310$
U+A	2	315	93.39	-0.76	2.50*	3.92*	4.34*	4.65*
U+B	2	310	91.90	-2.07	1.38	2.92*	3.39*	3.74*
U+C	2	305	90.42	-3.34	0.31	1.97	2.49*	2.89*
U+D	2	300	88.94	-4.57	-0.71	1.07	1.63	2.09*

The most left column represents a project which is executed. μ_Z is an expected value of firm's earnings under the project, and σ_Z is a standard deviation. $S_L(L, \mu_Z, \sigma_Z) - S_L(L, \mu_Z^U, \sigma_Z^U)$ is an incremental equity value for each of Projects A to D. I is an investment outlay. $\mu_Z^U = 320$ and $\sigma_Z^U = 31.62$ are assumed in the case of the unleveraged firm.

In the case of a leveraged firm, debt of $L = 268$ which leaves the incremental values of equity negative does not make the firm implement Projects A to D. When debt amounts to $L = 288$, however, the incremental value for Projects A to C becomes positive. In particular, the one for Project A is larger than 2. If Project A is carried out, the wealth of shareholders increases. Since $L = 300$ makes the incremental equity value larger than the outlay for Project B as well as Project A, Projects A and B can be implemented. A bad project gets more feasible with more debt. Project C can be implemented under $L = 305$. $L = 310$ makes all these projects executable. We assume that in the examples each project has its own standard deviation for $L = 268$ to $L = 310$; σ_Z is 88.94 for Project D without regard to L. Project D, which should not be implemented, can be of benefit to shareholders with a large amount of debt. As the results μ_Z decreases due to more debt.

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