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**Article**

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## **Macroeconomic effects on D.J.S.I.-World Returns**

**Sariannidis Nikolaos<sup>1</sup>, Koskosas Ioannis<sup>2</sup>, Kartalis Nikos<sup>3</sup>, Konteos George<sup>4</sup>**

### **Abstract**

*One of the best known and highly regarded Socially Responsible Investing (SRI) indexes is the Dow Jones Sustainability Index World (D.J.S.I.-World). By using the model of Generalized Autoregressive Conditional Heteroskedasticity (GARCH), the relation between D.J.S.I.-World returns to 10 year bond returns and Yen/U.S. dollar exchange rate is investigated. Research results show that 10 year bond value affects positively the value of D.J.S.I.-World. However, there is a negative relation between Yen/U.S. dollar exchange rate and D.J.S.I.-World with a month delay. According to our results, the total return of D.J.S.I.-World is affected by such macroeconomic factors as the value of 10 year bond, the Yen/U.S. dollar exchange rate and the general economic environment. In this way, investors can understand better the function of SRI market. Additionally, a new channel of information is created and better evaluation of D.J.S.I.-World is enabled.*

**Keywords:** Corporate Social Responsibility, Socially Responsible Investment, GARCH.

**JEL Classification Codes:** M14, G15, C22

### **1. Introduction**

In recent years there is an emphasis on the concepts of Corporate Social Responsibility (CSR), as the growth of its body increases every year. In 1990 there were only 7 environmental and social reports, while in 2001 these reached the number of 583, (Figure 1).

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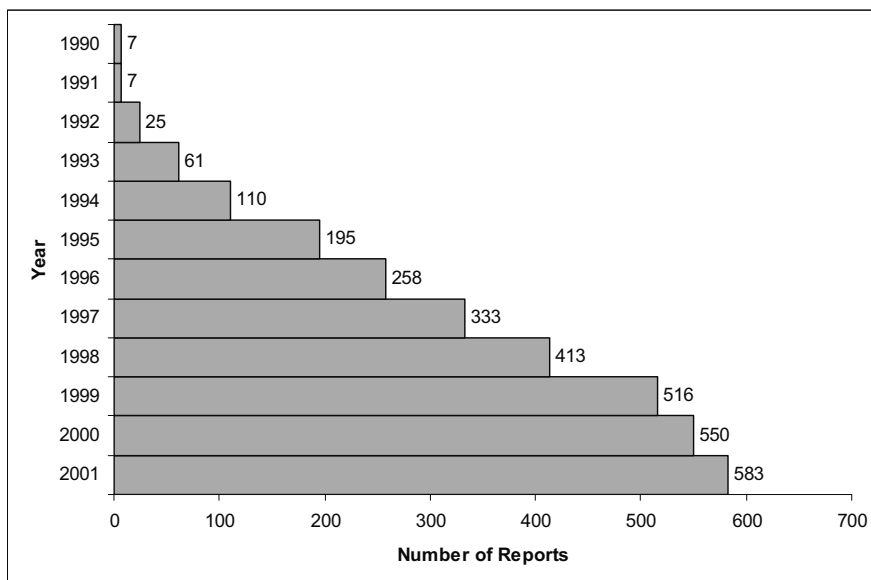
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Figure 1: Number of environmental and social reports produced between 1990 and 2001 based on 3411 reports



Source: Corporate Register<sup>1</sup>

The main concept of CSR is whether companies are willing to comply only with the legitimacy or they will move beyond the compliance to legitimacy. The Commission of the European Communities (2001) defines CSR as ‘*a concept whereby companies integrate social and environmental concerns in their business operations and in their interaction with their stakeholders on a voluntary basis*’. There are plenty of references on the advantages of the companies that integrate CSR. For example, Business for Social Responsibility<sup>2</sup> states the following benefits:

- improved financial performance
- reduced operating costs
- enhanced brand image and reputation
- increased sales and customer loyalty
- increased productivity and quality
- increased ability to attract and retain employees
- reduced regulatory oversight, and
- access to capital.

<sup>1</sup> Data available at: <http://www.corporateregister.com>

<sup>2</sup> <http://www.bsr.org>

Regarding the SRI, it is much closer to the CSR concept and it is referred as the process of identifying and investing in companies that meet certain standards of CSR, (SIF, 2006). There are various SRI market indexes which investors take into account so as to identify and invest in companies that meet CSR standards; one of them is Dow Jones Sustainability Index (D.J.S.I.). The concept of CSR is attractive to investors as it aims to increase the shareholder value in the long-term D.J.S.I.

The theoretical background of SRI along with a description of the D.J.S.I. and the GARCH model are illustrated next. A description of the data and the methodology used for the purposes of this research follow along with the presentation and analysis of the results. Finally, a discussion of the results and some concluding remarks are provided.

## 2. Literature Review

### 2.1. Social Responsible Investing (SRI)

SRI has attracted significant interest for several years around the world, as many non governmental organizations, governments, scholars and practitioners are involved in its promotion. As in the case of CSR, SRI is a vague conception and various definitions have been proposed.

Some of the main approaches in the international literature are: social investing, socially aware investing, ethical investing, mission-based investing, double-bottom line investing, green investment and sustainable investment, (SIF, 2003; Rapson et al., 2007). The President of KLD Research and Analytics, Inc., Kinder (2005), stated that since 1983 SRI is the incorporation of the investor's social or ethical criteria in the investment decision-making process. According to SIF (2006), *'SRI is an investment process that considers the social and environmental consequences of investments, both positive and negative, within the context of rigorous financial analysis. It is a process of identifying and investing in companies that meet certain standards of Corporate Social Responsibility'*. Another definition is stated by Mansley (2000), who defines SRI as the *'investment where social, environmental or ethical considerations are taken into account in the selection, retention, realization of investments, and the responsibility in use of rights (such as voting rights) attaching to investments'*. The CSR Europe (2003) mentions the SRI in order to *'describe investment decisions informed by CSR considerations. SRI combines investors' financial objectives with their concerns about social, environmental and ethical issues'*. Finally, Sparkes (2002) states the concepts of CSR and SRI as identical:

*'...CSR and socially responsible investing are in essence mirror images of each other. Each concept basically asserts that business should generate wealth for society but within certain social and environmental frameworks. CSR looks at this from the viewpoint of companies, SRI from the viewpoint of investors in those companies'*.

In this context, the meaning of SRI is similar to SIF (2006). SRI is reported in the supplying of funds in companies that apply CSR standards, whatever form these funds have.

The origin of SRI is placed by some researchers in 1940, when unions and government agencies avoided investments with companies perceived to be engaged in unfair labour practices (Martin, 1986), while Lydenberg (2000) and Schueth (2003) place the origin of SRI in 1960 due to socio - political environment in the U.S. Nowadays the interest in SRI is intense in almost all markets of the world. It is worth noting that the total European SRI assets in 2002 were estimated to 19.8£ billion (Sparkes, 2002) and in the mid of 2004, 354 SRI funds existed in the European markets, 13% more compared to 2003 (Avanzi SRI Research, 2004). As far as the SRI assets of the U.S. are concerned, these are estimated to exceed 2\$ billion in 2001 (Sparkes, 2002; Laufer, 2003). More than one out of every nine dollars under professional management in the U.S. today is involved in socially responsible investing and \$2.3 trillion out of \$24.4 trillion are in professionally managed portfolios utilizing one or more of the three core strategies that define socially responsible investing: screening, shareholder advocacy, and community investing (SIF, 2006). Finally, the study of Deni Greene Consulting Services (2004) identified \$21.5 billion SRI assets in Australia as of June 2004.

Numerous SRI indexes have been established in order to support and promote SRI. In this way, SRI investors can avoid companies that produce externalities to society or the environment. In Table 1, 24 SRI indexes created between 1990 and 2007 are presented.

Table 1: Presentation of SRI indexes

<b>Index / -family</b>	<b>Year</b>
1. Domini 400 Social Index	1990
2. Ethinvest Environmental Index	1996
3. Natur-Aktien-Index (NAI)	1997
4. D.J.S.I.-World	1999
5. Jantzi Social Index	2000
6. Calvert Social Index	
7. <u>ASPI</u>	2001
8. D.J.S.I. STOXX	
9. KLD Broad Market Social Index	
10. KLD Dividend Achievers Social Index	
11. KLD Large Cap Social Index	
12. FTSE4GOOD	
13. ECPI Index Family	2002
14. Ethibel Stainability Index (ESI)	
15. UBAI - UmweltBank- AktienIndex	
16. KLD Select Social Index	2004
17. D.J.S.I. North America	2005
18. KLD Global Climate 100 Index	
19. HVB Nachhaltigkeitsindex	
20. DAXglobal Alternative Energy	2006
21. Global Challenges Index (GCX)	2007
22. GreenTec Climate 30	
23. ÖkoDax	
24. DAXglobal Sarasin Stainability	

Source: Sustainable Business Institute<sup>3</sup>

<sup>3</sup> <http://www.sustainablebusiness.org>

Finally, investors prefer to invest in companies that meet CSR standards not only because of their CSR sensitivity but also due to the positive relation between CSR and financial performance, making the SRI more attractive. Margolis and Walsh (2001) examined ninety five studies in order to evaluate Corporate Social Performance (CSP) as an outcome of financial performance and concluded that 68% of the studies indicate a positive relationship between CSR and financial performance. Additionally, they focused on eighty studies in order to evaluate whether CSR contributes to Corporate Financial Performance (CFP), and concluded that 58% of the studies show positive relationship between the two concepts. Similarly, Waddock and Graves (1997) indicated that not only does CSP follow CFP but also CSP drives CFP. Generally, SRI funds have lower volatility or Beta compared to unscreened funds (Hamner and Longa, 2003).

## **2.2. Dow Jones Sustainability Indexes (D.J.S.I.)**

The Dow Jones Sustainability Indexes (D.J.S.I.) state the term of corporate sustainability as a business approach that creates long-term shareholder value by embracing opportunities and managing risks deriving from economic, environmental and social developments.

Generally, the term of corporate sustainability is often quite closely related to concepts such as CSR (Clarkson, 1995) and CSR, (Carroll, 1999; Holme and Watts, 2000). Specifically, the adoption of CSR can contribute to a sustainable development. Despite the differences existing for the CSR concept there is a consensus that CSR is closely connected to the concept of sustainable development; corporations should integrate the financial, social and environmental effect in their operations.

The D.J.S.I. conclude five benchmarks; the global, the European, the Eurozone, the North American and the U.S. The D.J.S.I. are the first global indexes tracking the financial performance of the leading sustainability-driven companies worldwide. These indexes were created by the cooperation of Dow Jones Indexes, STOXX Limited and SAM<sup>4</sup> which provide asset managers with reliable and objective benchmarks to manage sustainability portfolios. The family of these indexes was first launched on September 8<sup>th</sup> 1999.

As stated in D.J.S.I., these indexes satisfy both private and institutional investors providing a global, rational, consistent, flexible and most importantly, investable index to benchmark the performance of their investments.

The D.J.S.I.-World covers the top 10% of the biggest 2,500 companies in the Dow Jones World Index in terms of economic, environmental and social criteria. In order to assess the D.J.S.I.-World, there is a set of criteria (with their weights) for the opportunities and risks deriving from economic, environmental and social developments for the eligible companies. Both general and industry criteria exist with each factor weighting 50%, while each of the economic, environmental and social criteria weights 33% (D.J.S.I., Presentation – Annual Review, 2007). In reference to the general criteria corporate governance, human rights, supply chain management, risk and crisis management are encapsulated, while industry criteria concern the characteristics of specific industries (D.J.S.I. Guide, 2006).

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<sup>4</sup> <http://www.sam-group.com>

A presentation of the three dimensions along with their weightings follows (D.J.S.I.):

1. Economic criteria: corporate governance (6.0), risk and crisis management (6.0), codes of conduct/compliance/corruption and bribery (5.5) and specific criteria to industry (depends on industry).
2. Environmental criteria: environmental performance (eco-efficiency) (7.0), environmental reporting (3.0) and specific criteria to industry (depends on industry).
3. Social criteria: human capital development (5.5), talent attraction and retention (5.5), labor practice indicators (5.0), corporate citizenship/philanthropy (3.5), social reporting (3.0) and industry specific criteria (depends on industry).

No industry is excluded from the selection and composition of the D.J.S.I.-World as

is the case of other SRI indexes (see Jantzi Social Index<sup>5</sup> and Calvert Social Index<sup>6</sup>). In order to provide investors with filters against certain sectors, there are five subset indexes excluding alcohol, ex gambling, ex tobacco, ex armaments and firearms and, ex alcohol, tobacco, gambling, armaments and firearms indexes.

In order to assess companies, there are four sources of information (D.J.S.I. Guide, 2006):

- company questionnaire
- company documentation as sustainability reports, environmental reports, health and safety reports and so on
- media and stakeholders reviewing all document over the past twelve months
- contact with companies, if it is necessary, for any misunderstanding point of the company's operations

Each year, the investable stocks' universe is reviewed based on market capitalization of the D.J.S.I.-World components (D.J.S.I. Guide, 2006). In September 6<sup>th</sup> 2007, SAM announced the results of the 2007 annual review where 42 new company additions and 33 company deletions were reported in the D.J.S.I.-World (D.J.S.I. Press Release, 2007). According to the D.J.S.I. Review (2007), the D.J.S.I. World is constituted by companies deriving from Australia, Belgium, Brazil, Canada, Denmark, Finland, France, Germany, Hong Kong, Ireland, Italy, Japan, Malaysia, the Netherlands, Norway, South Korea, Spain, Sweden, Switzerland, Taiwan, Thailand, the UK and the USA.

### **3. Empirical Methodology**

The autoregressive conditional heteroskedasticity (ARCH) model, introduced by Engle (1982) and its extension to the Generalized Autoregressive Conditional Heteroskedasticity (GARCH) model (Bollerslev, 1986) have the advantage of taking into account not only the varying conditional variances but the volatility clustering as well. An important weakness of the ARCH and GARCH model though, is that volatility reactions are accounted in positive and negative changes (shocks) in a symmetric way.

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<sup>5</sup> <http://www.jantzisocialindex.com>

<sup>6</sup> [http://www.calvert.com/sri\\_calvertindex.html](http://www.calvert.com/sri_calvertindex.html)

A solution was given by the asymmetric models which are capable of capturing the asymmetric features of the data. According to Engle and Ng (1993), who analyzed various models for the daily Japanese stock returns, the best parametric model is the GJR-GARCH one, introduced by Glosten et al. (1993). The diagnostic tests they applied provided evidence that the E-GARCH model, introduced by Nelson (1991), can also capture most of the asymmetry, but it expresses the variability of the conditional variance in a higher than normal level. Another advantage of the GJR-GARCH model is that it has fewer parameters which need to be estimated. The GJR-GARCH is strongly preferred by many researchers who study the impact of various factors on the stock prices volatility in various countries (Brailsford and Faff, 1996; Antoniou et al., 1998; Pan and Hsueh, 1998; Tay and Zhu, 2000; Pilar and Rafael, 2002; Bologna and Cavallo, 2002).

## 4. Empirical Results

### 4.1. Data Collection

Log of monthly D.J.S.I.-World prices from December 1993 to October 2007 are applied in this paper. The monthly return data is the first difference of the log of D.J.S.I. prices. In addition, the monthly returns of the 10 year bond and Japan/U.S. foreign exchange rate is used, so that any potential external factors, affecting D.J.S.I.-World, could be estimated.

Regarding the data of the D.J.S.I.-World, these have been obtained from the web site of Dow Jones Sustainability Indexes.<sup>7</sup> The data of the 10 year bond return are available from Yahoo – Finance<sup>8</sup> (BOND), while the Federal Reserve Bank of St. Louis is a source of the Yen/U.S. dollar exchange rate<sup>9</sup> (ER).

As shown in Table 2, the correlation of the D.J.S.I.-World returns of the 10 year bond returns is positive while the lag returns of the Japan/U.S. foreign exchange rate are negative.

Table 2, Correlation of returns

	D.J.S.I <sub>t</sub>	BOND <sub>t</sub>	ER <sub>t-1</sub>
D.J.S.I <sub>t</sub>	1.000	0.201	-0.138
BOND <sub>t</sub>	0.201	1.000	0.030
ER <sub>t-1</sub>	-0.138	0.030	1.000

### 4.2. Results

Applying the appropriate model presupposes empirical verification of the underlying assumptions. Table 3 provides some statistics for the D.J.S.I.-World returns. Monthly returns of the D.J.S.I.-World tend to have high excess kurtosis of 4.5.

<sup>7</sup> [http://www.sustainability-indexes.com/djsi\\_protected/djsi\\_world/data/SAM\\_DJSI\\_World\\_U.SD.xls](http://www.sustainability-indexes.com/djsi_protected/djsi_world/data/SAM_DJSI_World_U.SD.xls)

<sup>8</sup> <http://finance.yahoo.com/q/hp?s=%5SETNX>

<sup>9</sup> <http://research.stlouisfed.org/fred2/series/EXJPUS/downloaddata?cid=95>



The mean return of the above index is close to zero, namely 0.009, thus we cannot reject the null hypothesis that the mean return at the 5% level is zero. Furthermore, by using the Jarque – Bera (JB) statistics, we came up to the conclusion that essential departures from normality had occurred while the series had been negatively skewed and leptokurtic. In our attempt to test the hypothesis of independence, we employed the Ljung – Box statistics to estimate the D.J.S.I.-World return series  $\{R_t\}$ ,  $\{R_t^2\}$  reported in Table 4. The autocorrelations showed that although there is not statistically significant first moment, the second moment of the sequence of returns is statistically significant showing significant time dependence. In addition, as shown in Figure 2 the variability of returns varies over time and appears in clusters. Also, the application of the Dickey-Fuller test for unit roots shows that the return series of the D.J.S.I.-World is stationary (Table 3).

Table 3: Summary statistics of D.J.S.I.- World returns

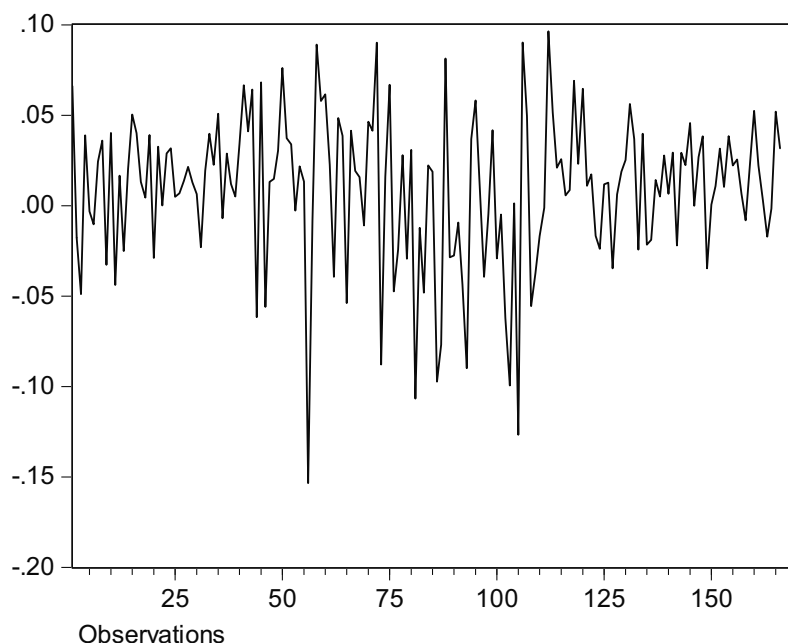
Statistics	D.J.S.I.-World
Observations	166.00
Mean	0.009
Median	0.014
Maximum	0.10
Minimum	-0.15
Std. Dev.	0.04
Skewness	-0.89
Kurtosis	4.50
Jarque-Bera	37.33
Augmented Dickey-Fuller (ADF)	-12.75

Table 4: Test for serial dependence in first and second moments

Returns				Squared Returns			
Lags	Autocorrelation	Partial Correlation	LB(n)	Lags	Autocorrelation	Partial Correlation	LB(n)
1	0.001	0.001	0.0001	1	0.086	0.086	1.254
2	-0.025	-0.025	0.1064	2	0.209	0.203	8.6258
3	0.043	0.043	0.4253	3	0.035	0.003	8.8369
4	-0.034	-0.035	0.6243	4	-0.02	-0.069	8.9074
5	0.06	0.063	1.2504	5	0.018	0.017	8.966
6	0.123	0.12	3.8935	6	0.162	0.188	13.506
12	0.079	0.077	8.7925	12	0.092	0.032	18.509
24	0.121	0.098	24.618	24	-0.01	-0.006	35.361
34	-0.043	-0.044	32.166	34	-0.081	-0.059	52.166
44	-0.063	-0.044	46.784	44	-0.106	-0.083	64.272

*Notes:*  $LB(n)$  are the  $n$ -lag Ljung-Box statistics for  $R_t$  and  $R_t^2$  respectively.  $LB(n)$  follows chi-square distribution with  $n$  degree of freedom; the sample period contains 165 monthly returns. The null hypothesis of strict white noise is not rejected in most cases.

Figure 2: Monthly returns of D.J.S.I.-World



Bearing in mind the international literature, the preliminary results cited above provide evidence of satisfactory modeling of the D.J.S.I.-World return volatility.

The equations used for our model are the following:

**Mean equation**

$$DJSI_t = b_1 + b_2 BOND_t + b_3 ER_{t-1} + u_t \quad (1)$$

where,

$BOND_t$  is a variable reflecting the returns of the 10 year bond, and

$ER_{t-1}$  is a variable which reflects the previous monthly returns of Yen/U.S dollar exchange rate.

**Variance equation**

$$\sigma_t^2 = a_0 + a_1 \sigma_{t-1}^2 + a_2 u_{t-1}^2 + a_3 S_{t-1}^- u_{t-1}^2 \quad (2)$$

where,

$u_t \sim GED(0, \sigma_t^2)$ , i.e. residuals which we assume to follow the GED (generalized error distribution). We employ the GED due to its ability to accommodate fatter tails and peaked ness.

The indicative dummy  $S_{t-1}^-$  takes the value 1 if  $u_{t-1} < 0$  and 0 otherwise.

The leverage effect occurs when  $\alpha_3 > 0$ , which means that negative news have a greater effect on volatility.

Diagnostic tests on the residuals reveal that the GJR-GARCH(1,1) model is appropriate to describe the first and second moments of the return series of the D.J.S.I.-World. Specifically, the results show that the GJR-GARCH (1, 1) fits the data, given that the LB statistics for the standardized residuals are not significant and the LB test for the standardized squared residuals (Table 5) show that the autocorrelation of the second moment disappears when the conditional variance is assumed to follow the above GARCH process.

In addition, absence of serial correlation in the standardized squared residuals implies that there is no need to encompass a higher order GARCH process. Furthermore, the coefficient estimation  $v=1.35$  for tail thickness regulator with 0.022 standard error, confirms the adoption of the GED assumption. Specifically, the assumption of normal distribution is rejected, a fact that verifies the very first observation of the thick tails in the D.J.S.I.-World returns which have been observed in the descriptive statistics. An LR test of the restriction of  $v=2$  (for  $v=2$  GED distribution is essentially the normal distribution) against the unrestricted models clearly supports this conclusion.

Table 5: LB test for the standardized residuals of the GJR-GARCH (1, 1) model

Standardized residuals				Squared standardized residuals			
Lags	Autocorrelation	Partial Correlation	LB(n)	Lags	Autocorrelation	Partial Correlation	LB(n)
1	-0.026	-0.026	0.114	1	-0.032	-0.032	0.173
2	0.036	0.036	0.335	2	0.017	0.016	0.2219
3	-0.022	-0.02	0.417	3	-0.024	-0.022	0.3154
4	-0.044	-0.047	0.753	4	-0.079	-0.081	1.3858
5	0.064	0.064	1.46	5	-0.033	-0.038	1.5753
6	0.066	0.072	2.21	6	0.035	0.035	1.7909
12	0.069	0.077	5.53	12	0.069	0.058	3.2275
24	0.097	0.106	16.58	24	-0.02	-0.01	9.3257
34	-0.008	-0.046	24.9	34	-0.095	-0.072	34.483
44	-0.069	-0.057	37.4	44	-0.04	0.023	43.124

*Notes: LB(n) are the n-lag Ljung-Box statistics for the residual series. LB(n) follows chi-square variable with n degree of freedom; the series of residual contains 164 observations.*

The results presented in Table 6 show that the 10 year bond returns exert statistically significant positive influence on the mean return of the D.J.S.I.-World index. Table 6 also indicates that the coefficients of Yen/U.S dollar exchange rate at lag one are significant at 10% providing evidence of the dependence of D.J.S.I.-World index on the factors affecting the exchange rate.

In Table 7 the results for the variance equation are presented. The value of  $\alpha_1$  coefficient (0.867), reflects the influence of  $\sigma_{t-1}^2$ , showing for example that older information (residuals  $u_{t-2}$ ,  $u_{t-3}$ , ...), is statistically significant proving that volatility shocks (information) are slowly assimilated. Also, the results indicate that the lagged squared error term ( $a_2$ ), which correlates the price variation of the present month to the price variation of the previous month, and the coefficient  $a_3$ , which allows the

conditional variance to respond asymmetrically to positive and negative shocks, are not statistically significant. This implies that despite the fact that strong past shocks affect the conditional volatility of D.J.S.I.-World for a prolong time, each one of these shocks does not affect individually the conditional volatility of D.J.S.I.-World (since coefficient  $\alpha_2$  is not significant).

Table 6: Mean Equation  $DJSI_t = b_1 + b_2 Bond_t + b_3 ER_{t-1} + u_t$

$b_1$	$b_2$	$b_3$
0.0150*	0.0962***	-0.1971**
(0.0026)	(0.0052)	(0.092)

*Notes: Standards errors are shown in parentheses. \*indicates statistical significance at the 1% level. \*\*indicates statistical significance at the 5% level. \*\*\*indicates statistical significance at the 10% level.*

Table 7: Variance Equation  $\sigma_t^2 = a_0 + a_1 \sigma_{t-1}^2 + a_2 u_{t-1}^2 + a_3 S_{t-1}^- u_{t-1}^2$

$a_0$	$a_1$	$a_2$	$a_3$
0.000014	0.867*	0.23209	-0.1456
(0.000048)	(0.082)	(0.164)	(0.1375)

*Notes: Standards errors are shown in parentheses. \*indicates statistical significance at the 1% level.*

## 5. Discussion of the results

The bond value effect on total return of D.J.S.I.-World can be explained through interest rates. Generally, interest rates affect the level of investments in the economy and are considered to be a measurement of the borrowing cost. When interest rates decrease, companies operate in a stable environment where unexpected negative conditions are limited, whereas the increasing trend of interest rates leads to a more insecure financial environment, which can even lead to bankruptcies (Bautista, 2003). It is well known that there is a negative relationship between interest rates and investment; when interest rates decrease the present value of the returns of investments is expected to increase, so specific investments, which were rejected as inappropriate, would be appropriate for realization. Additionally, when interest rates decrease, the cost of borrowed money is becoming cheaper. The insecure financial environment seems to affect the value of D.J.S.I.-World.

The U.S. economy is regarded as the leading economy in the world and plays a substantial role to all economies. For example, a change in the U.S. interest rate causes usually a consequence not only the change in the interest rate policy of developed economies but also in the evaluation of general business risk globally. This means that even the non U.S. international oriented companies that participate in D.J.S.I.-World are affected from changes in the U.S. economy. Thus, changes in the interest rates in the U.S. affect most of the companies.

In reference to the interpretation of the relation between the Yen/U.S. dollar exchange rate and the D.J.S.I.-World with a month delay there are different explanations.

Many economic indexes are affected by the movements of exchange rates and cause two different effects on investment. When the U.S. dollar is depreciated the price of imported inputs is increased, while the domestic goods become more attractive since they become cheaper than imported goods. Foreign companies are affected by the weak dollar since they can not sell their products easily, as they cost more, and this affects their profits. There are not many studies examining the link between investments and exchange rates and even in those the results are mixed (Cushman, 1985; Cushman, 1988; Bénassy-Quéré et al. 2001 and Harchaoui et al., 2005). U.S. and foreign multinational firms have developed various strategies in order to hedge the risks of changes in the exchange value of the dollar, so that the level of direct investments does not depend too strongly on the depreciation of the dollar (Jackson, 2007).

As stated earlier, when the U.S. dollar is weak, raw material imports are expensive. One of the most important imported raw materials for the U.S. economy is oil, which leads to an uncertain environment for firms' operations and generally for investment actions. Another explanation that interprets the negative relation between the Yen/U.S. dollar exchange rate and D.J.S.I.-World is that traders and investors seek to operate and invest their money in stable economies with stable currency and stable returns and they are oriented to long-term profits (Kwek and Koay, 2006). A weak dollar means that the values of returns from U.S. assets are reduced (Bloningen, 2005), creating uncertain conditions for the U.S. dollar and the economy. Finally, the U.S. dollar is the biggest traded invoice currency, so it is considered as the predominant currency (McKinnon and Schnabl, 2002). The majority reserve of currency is in U.S. dollars, which means that each time the U.S. dollar depreciates, the owners of U.S. dollars loose money, creating a negative environment for investments.

It is important to mention that the Yen is one of the currencies of carrying trade (borrowing cheap currencies in Yen and placing them in values with high returns). When the Yen is becoming stronger investors must pay off the loans in higher price, thus there is need for higher capital in order to pay off the loans. It is obvious that the D.J.S.I.-World is affected at the same time both from the opposite changes of the U.S. dollar and the Yen.

Regarding the effect of the monthly time delay of the Yen/U.S. dollar exchange rate on the D.J.S.I.-World, this is justified by the fact that this exchange rate is treated as transitory, as Harchaoui et al. (2005) state '*...when the exchange rate variability is very high, firms may be uncertain about the persistence of exchange rate movements. As a result, the corresponding changes in the output demand and the price of imported investments are treated as transitory. Firms delay their adjustment process*'. This means that investors are not sure about the new level of the exchange rate and wait a period in order to be sure about the new level and then decide on their actions.

## 6. Concluding remarks

This paper aims at exploring the relationship between the D.J.S.I.-World returns to the 10 year bond value and the Yen/U.S. dollar exchange rate. According to the findings, a positive relation between the 10 year bond value and D.J.S.I.-World index exists as it is explained by the relationship of the 10 year bond evaluation and interest rate, which affects the general business risk. When the dollar is changed the prices of raw materials and the values of returns from U.S. assets are affected, then negative relationship exists between the Yen/U.S. dollar exchange rate and the D.J.S.I.-World with a month delay. Other explanations that interpret the aforementioned negative relation are provided by the effects caused by the changes of the Yen value, because it is one of the currencies of carrying trade, as the U.S. dollar is considered the predominant currency and each time the U.S. dollar depreciates, the owners of U.S. dollars loose money and generally from the risks of changes in the exchange value of the Yen/U.S. dollar. This paper concludes that these macroeconomic variables affect the stock returns of companies that integrate CSR standards in their operations, even though these companies can identify better emerging issues.

## References

- Antoniou, A., Holmes, P., Priestley R., (1998), 'The effects of stock index futures trading on stock index volatility: an analysis of the asymmetric response of volatility to news', *Journal of Futures Market*, Vol. 18, No. 2, pp. 151-66.
- Avanzi SRI Research (2004), Green, Social and Ethical funds in Europe 2004, Group SIRI, Milan, available at: [www.siricompany.com/pdf/SRI-Funds-Report2004.pdf](http://www.siricompany.com/pdf/SRI-Funds-Report2004.pdf)
- Bautista, C.C., (2003), Interest rate – exchange rate dynamics in the Philippines: a DCC analysis, *Applied Economics Letters*, Vol. 10, No. 2, pp. 107 – 111.
- Bénassy-Quéré, A., Fontagné, L., Lahreche-Revil, A., (2001), Exchange-rate strategies in the competition for attracting foreign direct investment, *Journal of the Japanese and international Economies*, Vol. 15, No. 2, pp. 178-198.
- Blonigen, A.B., (2005), A Review of the Empirical Literature on FDI Determinants, *Atlantic Economic Journal*, Vol. 33, No. 4, p. 383-403.
- Bollerslev, T., (1986), Generalized autoregressive conditional heteroskedasticity, *Journal of Econometrics*, Vol. 31, No. 3, pp 307-327.
- Bologna, P., Cavallo L., (2002), Does the introduction of stock index futures effectively reduce stock market volatility? Is the 'future effect' immediate? Evidence from the Italian stock exchange using GARCH, *Applied Financial Economics*, Vol. 12, No. 3, pp. 183-92.
- Brailsford, T.J., Faff, R.W., (1996), An evaluation of volatility forecasting techniques, *Journal of Banking and Finance*, Vol. 20, No. 3, pp. 419-38.

- Carroll, A., (1999), 'Corporate social responsibility: evolution of a definitional construct', *Business and Society*, Vol. 38, No. 3, pp. 268–295.
- Clarkson, M., (1995), 'A stakeholder framework for analyzing and evaluating corporate social performance', *Academy of Management Review*, Vol. 20, No. 1, pp. 92–117.
- CSR Europe (2003), Investing in Responsible Business: The 2003 Fund Managers, Financial Analysts and Investor Relations Officers, CSR Europe, Brussels, Belgium, available at: [www.csreurope.org/pages/en/investing\\_in\\_responsible\\_business.html](http://www.csreurope.org/pages/en/investing_in_responsible_business.html)
- Cushman, D.O., (1985), 'Real exchange rate risk, expectations and the level of direct investment', *Review of Economics and Statistics*, Vol. 67, No. 2, pp. 297-308.
- Cushman, D.O., (1988), 'Exchange rate uncertainty and foreign direct investment in the United States', *Review of World Economics*, Vol. 124, No. 2, pp. 322-336.
- Deni Greene Consulting Services (2004), Socially Responsible Investment in Australia, Benchmarking Survey conducted for the Ethical Investment Association, available at: [http://eia.org.au/files/MNJLXB5Z5K/2004% 20SRI% 20benchmarking.pdf](http://eia.org.au/files/MNJLXB5Z5K/2004%20SRI%20benchmarking.pdf)
- Dow Jones Sustainability Index (2007), Annual Review - Components (by Country), available at: [http://www.sustainability-index.com/djsi\\_protected/Review2007/Components/DJSI\\_World/DJSI\\_Review07\\_World\\_ComponentsByCountry.pdf](http://www.sustainability-index.com/djsi_protected/Review2007/Components/DJSI_World/DJSI_Review07_World_ComponentsByCountry.pdf)
- Dow Jones Sustainability Index (2006), Guide, available at: [www.sustainability-indexes.com/D.J.S.I\\_pdf/publications/Guidebooks/D.J.S.I\\_Guidebook\\_World\\_80.pdf](http://www.sustainability-indexes.com/D.J.S.I_pdf/publications/Guidebooks/D.J.S.I_Guidebook_World_80.pdf), version 8.0, August.
- Dow Jones Sustainability Indexes (2007), Presentation - Annual Review, available at: [http://www.sustainability-index.com/djsi\\_pdf/publications/Presentations/SAM\\_Presentation\\_060906\\_Review.pdf](http://www.sustainability-index.com/djsi_pdf/publications/Presentations/SAM_Presentation_060906_Review.pdf)
- Engle, R.F., (1982), 'Autoregressive conditional Heteroscedasticity with estimates of the variance of United Kingdom inflation', *Econometrica*, Vol. 50, No. 4, pp. 987-1007.
- Engle, R.F., Ng, V.K., (1993), 'Measuring and testing the impact of news on volatility', *Journal of Finance*, Vol. 48, pp. 1749-78.
- European Commission (2001), Green Paper: Promoting a European framework for Corporate Social Responsibility, Brussels.
- Glosten, L., Jahannathan, R., Runkle, D., (1993), On the relation between the expected value and the volatility of the nominal excess return on stocks, *The Journal of Finance*, Vol. 48, No. 5, pp. 1779-1801.
- Hamner, B., Longa, E., (2003), Criteria used by Socially Responsible Investment funds in the Private Sector: Classification and use in Peru, *CIES Proyecto PM 31*, Universidad del Pacifico.
- Harchaoui, T., Tarkhani, F., Yuen, T., (2005), The effects of the exchange rate on investment: Evidence from Canadian manufacturing industries, *Working Paper, Bank of Canada*, available at: [www.bankofcanada.ca/en/res/wp/2005/wp05-22.pdf](http://www.bankofcanada.ca/en/res/wp/2005/wp05-22.pdf)

- Holme, R., Watts P., (2000), Corporate Social Responsibility: Making Good Business Sense, World Business Council of Sustainable Development, available at: <http://www.wbcds.org/DocRoot/IunSPdIKvmYH5HjbN4XC/csr2000.pdf>
- Jackson, J.K., (2007), Foreign Direct Investment: Effects of a ‘Cheap’ Dollar, CSR Report for Congress, Prepared for Members and Committees of Congress, available at: <http://fpc.state.gov/documents/organization/85620.pdf>
- Kwek, K.T., Koay, K.N., (2006), ‘Exchange rate volatility and volatility asymmetries: an application to finding a natural dollar currency’, *Applied Economics*, Vol. 38, No. 3, pp. 307 – 323.
- Kinder, D.P., (2005), Socially responsible investing: an evolving concept in a changing world, President of KLD Research and Analytics, Inc., available at: [www.resourcesaver.org/file/toolmanager/CustomO16C45F65148.pdf](http://www.resourcesaver.org/file/toolmanager/CustomO16C45F65148.pdf)
- Laufer, W.S., (2003), Social Screening of Investments: An Introduction, *Journal of Business Ethics*, Vol. 43, No. 3, pp. 163–165.
- Lydenberg, D., (2000), La inversión socialmente responsable: pasado, presente y futuro, *Foro sobre Economía y Responsabilidad Social Empresarial*, Saragossa.
- Mansley, M., (2000), Socially Responsible Investment: A Guide for Pension Funds and Institutional Investors, Monitor Press, Sudbury.
- Margolis, J.D., Walsh J.P., (2001), ‘People and Profits: The Search for a Link between a Company’s Social and Financial Performance’, Erlbaum, Mahwah, N.J.
- Martin, J., (1986), ‘Happy Returns for Do-gooders’, *Financial World*, Vol. 18, pp. 32–33.
- McKinnon, R., Schnabl, G., (2002), Synchronized business cycles in East Asia: fluctuations in the yen/dollar exchange rate and China’s stabilizing role, *Working Paper, Stanford University*.
- Nelson, D.B., (1991), ‘Conditional heteroskedasticity in asset returns: a new approach’, *Econometrica*, Vol. 59, No. 2, pp. 347-370.
- Pan, M.S., Hsueh P.L., (1998), ‘Transmission of stock returns and volatility between U.S. and Japan: evidence from stock index future markets’, *Asia-Pacific Financial Markets*, Vol. 5, No. 3, pp. 211-225.
- Pilar, C., Rafael, S., (2002), Does derivatives trading destabilize the underlying assets? Evidence from the Spanish stock market, *Applied Economics Letters*, Vol. 9, No. 2, pp. 107-10.
- Rapson, D., Shiers, D., Roberts, C., Keeping, M., (2007), Socially responsible property investment (SRPI) An analysis of the relationship between equities SRI and UK property investment activities, *Journal of Property Investment and Finance*, Vol. 25, No. 4, pp. 342-358.
- Schueth, S., (2003), Socially Responsible Investing in the United States, *Journal of Business Ethics*, Vol. 43, No. 3, pp. 189–194.



- Social Investment Forum – SIF (2003), 2003 Report on Socially Responsible Investing Trends in the United States, Washington DC.
- Social Investment Forum – SIF (2006), 2005 Report on Socially Responsible Investing Trends in the United States 10-Year Review, Washington DC.
- Sparkes, R., (2002), *Socially Responsible Investment: A Global Revolution*, Wiley, New York.
- Tay, N., Zhu, Z., (2000), Correlations in returns and volatilities in Pacific – Rim stock markets, *Open Economic Review*, Vol. 11, No. 1, pp. 27-47.
- Waddock, S.A., Graves, S.B., (1997), The corporate social performance-financial performance link, *Strategic Management Journal*, Vol. 18, No. 4, pp. 303-319.