Value at Risk and expected shortfall of firms in the main European Union stock market indexes from 2000 until nowadays: a detailed analysis by economic sectors and geographical situation

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Abstract

We have analyzed extreme movements of the main stocks traded in the Eurozone in the 2000-2012 period. Our results can help future very-risk-averse investors to choose their portfolios in the Eurozone for risk management purposes. We find two main results. *First,* we can clearly classify firms by economic sector according to their different estimated VaR values in five of the seven countries we analyze. In special, we find sectors in general where companies have very high (telecommunications and banking) and very low (petroleum, utilities, energy and consumption) estimated VaR values. *Second,* we only find differences according to the geographical situation of where the stocks are traded in two countries: (1) all firms in the Irish stock market (the only financially rescued country we analyze) have very high estimated VaR values in all sectors; while (2) in Spain all firms have very low estimated VaR values including in the banking and the telecommunications sectors. All our results are supported when we study also the expected shortfall of the firms.

Key words: Pareto tail thickness parameter; GARCH-type models; Value-at-Risk; Extreme value theory; Heavy tails. Stock indexes. Eurozone.

JEL classification: C12; C13; C22; G01; G11; G15; G32.

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1 Introduction

Although diversification in the portfolio is a well-known strategy to reduce risk, this is not a guarantee to avoid losses specially in crisis periods. All this motivates the need to have rigorous measures of risk, and in special, during extreme events. Both academics and practitioners have been trying to find determinants of extreme behaviors. For example, Cutler, Poterba and Summers (1989) in fact conclude that extreme values for returns happen during periods where there are no news with special relevance. This is very important for the financial stability (see e.g. Agénor and Pereira da Silva (2012)). The concept of financial risk is directly linked with the one of losses; however, there are different measures of risk. Value at Risk (VaR) has its origin in Riskmetrics, that was developed by JP Morgan. Moreover, VaR became a very important measure of risk specially since the Basel Committee on banking supervision declared that banks should be able to cover losses in their portfolios (see for example Dowd (1999), Linsmeier and Pearson (2000), Alexander and Baptista (2003), Bali and Cakici (2004), Rossignolo, Fethi and Shaban (2012) and Kaplanski and Levy (forthcoming) as examples of the relevance of VaR in practice).

VaR has been applied in many different situations. This article analyzes extreme movements of the main stocks traded in the Eurozone by sectors in the period 2000-2012. European stocks have been analyzed deeply in the literature (see e.g. Corhay, Tourani and Urbain (1993), Osborn and Savva (2008), Ñíguez (2008) and Laopodis (2009)), however, the main objective in this paper is to study their VaR behavior by economic sectors and if there are differences by countries. Although knowledge of the past does not guarantee future events, we show the performance of value at risk of the main firms traded in the main European stock market indexes from 2000 until nowadays and this can help future very-risk averse investors to choose their portfolios in the Eurozone for risk management purposes. In the tables provided in this paper, the readers can find the estimated VaR measure for all firms traded in the main European stock markets. Iglesias and Lagoa-Varela (2012) have studied only the 2000 decade for the fifty companies traded in the Eurostoxx50, and they found that firms can be classified by economic sectors but not by geographical situation. We want to extend this analysis to study over 300 firms that belong to the main European stock market indexes and to find out if the results change.

There are two distinct VaR measures, one dealing with the unconditional distribution and one with the conditional distribution. The former provides risk managers with information on different worst case scenarios dealing with market risk occurring over long periods. In contrast, the latter measure details the present risk facing investment managers conditional on the present risk and return environment of a futures contract (see e.g. Sheu and Chen (2012) for an example analyzing conditional VaR). In this paper we are interested in providing measures of unconditional risk based on the 2000-2012 period (see Jansen and de Vries (1991), Kearns and Pagan (1997), Iglesias and Linton (2009), Iglesias (2012) and Iglesias and Lagoa-Varela (2012) as empirical examples where unconditional VaR estimates are provided). However, in order to study the robustness of our results, we also provide the expected shortfall estimates for each of the firms (see e.g. Christoffersen and Goncalves (2005), Inui and Kijima (2005), Bali, Demirtas and Levy (2009), So and Wong (2012) and Ardia and Hoogerheide (2013)). The results from the expected shortfall (ES) estimates (we provide the historial estimates) confirm the same results we obtain from the estimated VaR.

Moreover, since we have a not very large sample size, we need a method that can provide reasonable VaR estimates. Many alternative estimators of unconditional Value at Risk can be found. The most traditional one was proposed by Hill (1975), where the existence of generalized autoregressive and conditional heteroskedastic (ARCH) effects (very important when modelling financial returns; see e.g. Engle (1982) and Bollerslev (1986) for more details) can be implicitly acknowledged. Hill (2010) has shown that the Hill (1975) estimator is robust to the existence of GARCH effects; however, there exists clear evidence in the literature of its poor finite sample properties (see e.g. Kearns and Pagan (1997) and Wagner and Marsh (2005)). In this paper, we use also an alternative estimator that is shown to have improved finite sample properties under some assumptions and it is based on the work of Stărică and Pictet (1997), Berkes, Horváth and Kokoszka (2003) and it has been generalized to the case of the GJR-GARCH model of Glosten, Jagannathan and Runkle (1993) by Iglesias and Linton (2009). The reason for the improved finite sample properties of the Iglesias and Linton (2009) estimator of tail thickness is that it converges at rate $\sqrt{T}$ to a normal distribution (where T is the sample size). In order to do that, it is necessary first to fit a GARCH-type volatility model to the time series. This is a very reasonable assumption since there are many papers such as Teresiene (2009), Aktan, Korsakiene and Smaliukiene (2010) and Christensen, Dahl and Iglesias (2012) showing that GARCH type models are suitable to model returns in the stock market. Following Iglesias and Linton (2009), we also present Hausman type specification tests in the empirical results section to choose the VaR estimated value.

The plan of the paper is as follows. In Section 2 we present the data. Section 3 shows the model and the estimators and tests that are used, while Section 4 provides the empirical results. Section 5 finally concludes. All Tables are contained in the Appendix.

2 Data

We use daily data[1] of returns of all firms traded in the following seven main European countries from January 2000 until December 2012 (we use the value at the moment of the closing of each daily session following the literature such as Jansen and de Vries (1991), Kearns and Pagan (1997) and Iglesias and Lagoa-Varela (2012))

- The DAX 30 (Deutscher Aktien IndeX) is a blue chip stock market index consisting of the 30 major German companies trading on the Frankfurt Stock Exchange.

[1] http://es.finance.yahoo.com/ The data has been obtained from the finance-yahoo database.

- The IBEX 35 is the benchmark stock market index of the Bolsa de Madrid, Spain's principal stock exchange. Initiated in 1992, the index is administered and calculated by Sociedad de Bolsas, a subsidiary of Bolsas y Mercados Españoles (BME), the company which runs Spain's securities markets (including the Bolsa de Madrid). It is a market capitalization weighted index comprising the 35 most liquid Spanish stocks traded in the Madrid Stock Exchange General Index, which are reviewed twice annually.

- The CAC 40 is a benchmark French stock market index. The index represents a capitalization-weighted measure of the 40 most significant values among the 100 highest market caps on the Paris Bourse (now Euronext Paris).

- The AEX 25 index, derived from Amsterdam Exchange index, is a stock market index composed of Dutch companies that trade on Euronext Amsterdam, formerly known as the Amsterdam Stock Exchange. The index is composed of a maximum of 25 of the most actively traded securities on the exchange.

- The ISEQ is a benchmark stock market index composed of companies that trade on the Irish Stock Exchange.

- The FTSE MIB (Milano Italia Borsa) (the S&P/MIB prior to June 2009) is the benchmark stock market index for the Borsa Italiana, the Italian national stock exchange, which superseded the MIB-30 in September 2004. The index consists of the 40 most-traded stock classes on the exchange. The index was administered by Standard & Poor's from its inception until June 2009, when this responsibility was passed to FTSE Group, which is 100% owned by the Borsa Italiana's parent company London Stock Exchange Group.

- The FTSE 100 Index is a share index of the stocks of the 100 companies listed on the London Stock Exchange with the highest market capitalisation. It is one of the most widely used stock indices and is seen as a gauge of business prosperity.

We analyze in total over 300 firms[2].

[2] The reason to analyse the previous seven stock markets is that they are the only European ones where we can have firm-level data from 2000 in the finance-yahoo-database. Moreover, in January 2013 there are very important changes in the European financial markets. For example, in Spain since January 2013 some very important firms such as Bankia are not part of the IBEX anymore. Also, the Value Added Tax has increased, it is necessary to declare the accounts abroad to the government and the risk premium in Spain has changed significantly. The Gross Domestic Product (GDP) in France contracted 0.20 percent in the first quarter of 2013 over the previous quarter. France is the fifth largest economy in the world and the second largest in the Euro Area. The German economy expanded less than forecast in the first quarter of 2013 while France slipped into recession. Netherlands also is on edge of economic crisis in 2013 since unemployment surges as home prices collapse. That is why we have chosed December 2012 as the last data point in our analyzed period to avoid important structural breaks.

We analyze those firms that belong to each of the stock market indexes with the date January 1, 2013.

If we denote p_t the price of a stock at period t, then we construct the return as

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

where $t = 1, ..., T$. We construct the stock returns for all companies and we test for the stationarity of the series by using standard Augmented Dickey-Fuller (1979) test and Phillips-Perron (1988) tests. We reject at all standard significant levels the null hypothesis of the unit root for all returns. We have computed some descriptive statistics for the returns of all analyzed firms[3]. It is possible to check in those statistics that the Irish stock market is the one that presents higher unconditional variance in most of returns independently of the economic sector where they belong to.

3 Model and Theory

The traditional Hill (1975, 2010) estimator ($\widehat{\kappa}^+$), allows to obtain an estimate for the tail index parameter κ. The Hill (1975, 2010) estimator of κ does not use the GARCH structure at all. Ordering the data as $r_{1:T} \leq r_{2:T} \leq \ldots \leq r_{T:T}$, define

$$\widehat{\kappa}^+ = \frac{1}{m}\sum_{j=0}^{m-1}\left(\log r_{T-j:T} - \log r_{T-m:T}\right).$$

Here, $m = m(T)$ is a smoothing parameter that satisfies $m \to \infty$ and $m/T \to 0$. The estimator $\widehat{\kappa}^+$ was proposed by Hill (1975) and it is consistent and asymptotically normal for iid data with $\kappa > 0$. The Hill (1975) estimator of κ (the tail index parameter for each of the returns) satisfies

$$\sqrt{m}(\widehat{\kappa}^+ - \kappa) \Longrightarrow N(0, \Phi)$$

as $m = m(T) \to \infty$ for some Φ, under quite general conditions (Hill (2010)). Hill (2010) has shown that under the traditional GARCH(1,1) specification, the asymptotic variance $\Phi = \kappa^2$ is as if the process were i.i.d. with the same marginal distribution.

An alternative new estimator to Hill (1975) was proposed originally in Stărică and Pictet (1997), denoted by $\widehat{\kappa}$. Berkes, Horváth and Kokoszka (2003) provided the formal theory of the asymptotic normality of the estimator under the presence of GARCH effects and it was generalized to the case of the GJR-GARCH model of Glosten, Jagannathan and Runkle (1993) by Iglesias and Linton (2009).

A traditional GARCH model is given by for each return series by

$$r_t = \varepsilon_t \sigma_t \tag{1a}$$
$$\sigma_t^2 = \omega + \gamma r_{t-1}^2 + \beta \sigma_{t-1}^2, \tag{1b}$$

where ε_t is an iid process with conditional variance given by σ_t^2.

[3] The results are available in a supplementary appendix available from the author upon request.

If (1a)-(1b) is correctly specified, Mikosch and Stărică (2000) have shown that there exists a positive constant c_0 and tail index parameter κ such as

$$\Pr(\sigma_t, > x) \sim c_0 x^{-\kappa}, \quad \text{as } x \to \infty \tag{2}$$

$$\Pr(|r_t| > x) \sim E[|\varepsilon_t|^\kappa] \Pr(\sigma_t > x), \quad \text{as } x \to \infty. \tag{3}$$

Then, the Iglesias and Linton (2009) alternative estimator is constructed as follows. Let $(\widehat{\omega}, \widehat{\gamma}, \widehat{\beta})^\top$ be some $\sqrt{T}$ consistent estimator of $(\omega, \gamma, \beta)^\top$, such as the quasi-maximum likelihood estimator, and define the standardized residuals $\widehat{\varepsilon}_t = r_t/\widehat{\sigma}_t$, where $\widehat{\sigma}_t^2 = \widehat{\omega} + \widehat{\gamma} r_{t-1}^2 + \widehat{\beta}\sigma_{t-1}^2$, $t = 2, \ldots, T$ with $\widehat{\sigma}_1^2$ some initial value. Define also

$$\widehat{A}_t = \widehat{\gamma}\widehat{\varepsilon}_t^2 + \widehat{\beta}. \tag{4}$$

The estimator of tail thickness κ is any solution $\widehat{\kappa}$ to

$$\widehat{\Psi}_T(\widehat{\kappa}) = 0, \tag{5}$$

$$\widehat{\Psi}_T(\kappa) = \frac{1}{T}\sum_{t=1}^{T} \widehat{A}_t^{\kappa/2} - 1. \tag{6}$$

This can be computed by grid search over some suitable range. Berkes, Horváth and Kokoszka (2003) show that if the model is correctly specified as (1a)-(1b), then $\widehat{\kappa}$ is consistent and asymptotically normally distributed. This result has been generalized to the case that the correct model is the GJR-GARCH model of Glosten, Jagannathan and Runkle (1993) by Iglesias and Linton (2009). The asymptotically normal distribution theory can be used to provide a specification test of the underlying GJR-GARCH model based on a Hausman test. Under the traditional GJR-GARCH specification,

$$\frac{\widehat{\kappa} - \widehat{\kappa}^+}{\widehat{\kappa}^+/\sqrt{m}} \Longrightarrow N(0,1) \tag{7}$$

and one can reject for large or small values of this statistic. Moreover, Iglesias and Linton (2009) show that the Value at Risk is for small α

$$\alpha = \Pr[y_t > Var_\alpha] \equiv c_0 Var_\alpha^{-\kappa},$$

which gives

$$Var_\alpha = (c_0/\alpha)^{1/\kappa}.$$

Iglesias and Linton (2009) also show an estimator for c_0 and hence of Var_α given by

$$\widehat{c} = \frac{1}{2}\frac{1}{T}\sum_{t=1}^{T} |\widehat{\varepsilon}_t|^{\widehat{\kappa}} \frac{\frac{1}{T}\sum_{t=1}^{T}[\left(\widehat{\omega} + \widehat{A}_t\widehat{\sigma}_t^2\right)^{\widehat{\kappa}/2} - \left(\widehat{A}_t\widehat{\sigma}_t^2\right)^{\widehat{\kappa}/2}]}{[(\widehat{\kappa}/2)\frac{1}{T}\sum_{t=1}^{T}(\widehat{A}_t^{\widehat{\kappa}/2}\ln \widehat{A}_t)]}. \tag{8}$$

$$\widehat{Var}_\alpha = (\widehat{c}/\alpha)^{1/\widehat{\kappa}}. \tag{9}$$

When using the Hill estimator, it implies the alternative estimator of c_0 and hence of Var_α :

$$\widehat{c}^{+} = \frac{1}{Tm}\sum_{i=1}^{m} y_{T-i:T}^{\widehat{\kappa}^{+}} i. \tag{10}$$

$$\widehat{Var}_{\alpha}^{+} = (\widehat{c}^{+}/\alpha)^{1/\widehat{\kappa}^{+}} \tag{11}$$

as is known in the literature. These estimates both converge at the same rate as $\widehat{\kappa}^{+}$.

4 Empirical Results

We apply first to all returns the Hill (1975) estimator of κ[4]. Later, we also apply the Iglesias and Linton (2009) alternative estimator. In order to do that, we first fit the standard GJR-GARCH model proposed by Glosten, Jagannathan and Runkle (1993) where

$$r_t = \varepsilon_t \sigma_t = u_t, \tag{12a}$$

$$\sigma_t^2 = \omega + \gamma u_{t-1}^2 + \delta u_{t-1}^2 1\{u_{t-1} < 0\} + \beta \sigma_{t-1}^2. \tag{12b}$$

This is a model that has shown to be very useful in practice. We cannot reject the null hypothesis of absence of neglected serial correlation with the diagnostic tests of Ljung-Box (1978) in all (GJR)-GARCH models that were fitted[5] at the standard 5% level, where moreover, no conditional mean has been needed to be included except

- an AR(1) for the returns of ABERDEEN ASSET, ACCIONA, ALLIANZ, AXA, BANCO SABADELL, BEIERSDORF, BME, BOSKALIS, CAP GEMINI, DRAGON OIL, EADS, EDF, ENEL GREEN POWER, ENI, EXOR, FUGRO, FYFFES, G4S, INDUSTRIA DIS, INFINEON TECNOLOGIES, LINDE, DIA, MAPFRE, MERCK, OHL, PERMANENT TSB, PETRONEFT RES, PPR, RANDSTAT, REED ELSEVIER, RENAULT, ROYAL D. SHELL, SAINSBURY, SMURFIT KAPPA, TERNA, UNILEVER, UTV MEDIA

- an AR(2) for the returns of ADIDAS, APERAM, ARYZTA N, BP, DIAGEO, EXPERIAN, FRANCE TELECOM, PRUDENTIAL, TOTAL PRODUCE and VODAFONE

- an AR(3) for ASML, AVIVA, BANKIA, BNP PARIBAS, BT, DEUTSCHE POST, DEUTSCHETELEKOM, K+S N, LOREAL, LUXOTTICA, MEDIASET ESP, MORRISON SUPERMARKETS, PERNOD, TATE & LYLE, TESCO, VINCI

[4]The results are available in a supplementary appendix available from the author upon request.

[5]The results are available in a supplementary appendix available from the author upon request when using quasi-maximum likelihood as the estimation method.

- and an AR(4) for AKZO NOBEL, ALCATEL-LUCENT, DEUTSCHE BANK and PETRO-CELTIC.

There are cases for several companies such as EON, where we were not able to fit a parametric GARCH-type model where serial correlation can be removed. Moreover, there are other cases such as for ADIDAS where, although we can fit a GARCH-type model, later we cannot obtain an Iglesias and Linton (2009) estimate that is statistically significantly different from zero. We only take into account those cases where it is statistically different from zero and we choose the final VaR estimate with the Hausman test.

In Tables 1-5 we show the chosen estimated VaR values with Hausman test for each of the firms classified by economic sector and by geographical location of where they are traded. For example, in CONROY GOLD and KARELIAN DIAMOND, we do not obtain a Hill estimate that is statistically significantly different from zero and therefore we do not report it. We analyze in the following sections the results. Note that in Tables 1-5 we also provide the expected shortfall estimates for each of the firms and all our results obtained analyzing the VaR values are supported when we study the expected shortfall.

4.1 Consumption sector

Table 1 shows that, if we exclude Ireland, 78,38% of all firms that belong to the consumption sector have an estimated VaR lower than 0.35. Therefore, this is an economic sector that tends to be very attractive for very risk averse investors.

There are some exceptions. For example, firms that trade in the Irish stock market have very high estimated VaR in general. Also, ESSILOR in the CAC, CAMPARI in the Italian FTSEMIB and COMPASS GROUP in the FTSE are firms very high estimated VaR.

4.2 Financial services sector

Table 2 show that 75,81% of the firms in this sector have an estimated VaR higher than 0.35. Therefore this is a sector that in general, present very low estimated VaR values.

In the Spanish market, except for BANKIA, all banks and financial institutions have very low estimated VaR measures. BANKIA, AEGON, ALLIED I. BANKS, BANK OF IRELAND, FIRST DERIVATIVES, IFG GRP, PRIME ACTIVE CAP, PERMANENT TSB and UNICREDIT are firms that have in special very high estimated VaR values.

4.3 Petroleum and energy sector

Table 3 shows that, if we exclude Ireland, 77,5% of the firms in this sector have an estimated VaR lower than 0.35. Therefore this is a sector that in general, present very low estimated VaR values and it is very attractive for very risk averse investors. Clear exceptions are AMINEX, PETROCELTIC and PETRONEFT RES that present very large VaR estimates.

4.4 Technologies and telecommunications sector

Table 4 shows that 73,91% of all firms in this sector have an estimated VaR higher than 0.35. Also again, firms that trade in the Spanish IBEX present very low estimated VaR values in this sector also. TELECOM ITALIA is the firm with the highest estimated VaR in this sector.

4.5 Industry and construction sector

Finally Table 5 shows that 52% of the firms in this sector have an estimated VaR higher than 0.35. Therefore this is a very heterogenous sector and we cannot find a clear pattern for the VaR measure. TECHNIP, KENMARE RES. and ORMONDE MINING are firms that should be avoided by very risk averse investors.

5 Conclusions

We have analyzed extreme movements of the main stocks traded in the Eurozone in the 2000-2012 period. Our results can help future very-risk-averse investors to choose their portfolios in the Eurozone for risk management purposes. We find two main results. *First,* we can clearly classify firms by economic sector according to their different estimated VaR values in five of the seven countries we analyze. In special, we find sectors in general where companies have very high (telecommunications and banking) and very low (petroleum, utilities, energy and consumption) estimated VaR values. *Second,* we only find differences according to the geographical situation of where the stocks are traded in two countries: (1) all firms in the Irish stock market (the only financially rescued country we study) have very high estimated VaR values in all sectors; while (2) in Spain all firms have very low estimated VaR values including in the banking and the telecommunications sectors. These results can be very useful for investors for risk management purposes to construct their portfolios. All our results are supported when we study also the expected shortfall of the firms.

6 Appendix: Tables 1-5

Table 1: Consumption sector

Company	VaR	Stock market index	ES (historical)	Subsector
ADIDAS	0.2640	DAX	4.5761	Clothing and footwear
BAYER AG	0.4580	DAX	5.6228	Pharmaceuticals
BEIERSDORF	0.3355	DAX	4.5606	Personal products
DEUTSCHE POST	0.3594	DAX	4.9840	Logistics
FRESENIUS	0.2930	DAX	4.9799	Pharmaceuticals
FRESENIUS MED C	0.3390	DAX	4.5934	Pharmaceuticals
HENKEL	0.2193	DAX	3.6306	Personal products
DT LUFTHANSA	0.3335	DAX	5.1135	Airlines
MERCK	0.3351	DAX	4.9753	Pharmaceuticals
DIA	0.5724	IBEX	3.9401	Foods
GRIFOLS	0.2044	IBEX	4.4712	Pharmaceuticals
INT AIRLINES GROUP	0.1620	IBEX	5.3054	Airlines
MEDIASET ESP	0.2831	IBEX	5.6112	Media
ACCOR	0.2780	CAC	5.0622	Hotels
DANONE	0.2154	CAC	3.6369	Foods
CARREFOUR	0.2587	CAC	4.6953	Foods
ESSILOR	4.5582	CAC	12.3427	Medical supplies
LVMH	0.3322	CAC	4.5417	Clothing
MICHELIN	0.2953	CAC	5.1898	Tires
LOREAL	0.2082	CAC	3.9553	Personal products
PPR	0.3620	CAC	5.1705	Broadline retailers
PUBLICIS	0.3729	CAC	4.9638	Media
PERNOD	0.3277	CAC	4.3546	Distillers and vinters
SANOFI	0.2170	CAC	3.1662	Pharmaceuticals
VIVENDI	0.5428	CAC	6.3706	Entertainment
AIR FRANCE - KLM	0.2405	AEX	4.7841	Airlines

Table 1: Consumption sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
AHOLD	0.2085	AEX	3.2699	Food retailers
DE MASTER BLE	0.1996	AEX	3.7137	Beverages
HEINEKEN	0.1940	AEX	3.4181	Brewers
POSTLN	0.5151	AEX	5.0868	Delivery services
RANDSTAT	0.3797	AEX	6.3445	Business training
REED ELSEVIER	0.2814	AEX	4.3144	Publishing
TNT EXPRESS	0.7439	AEX	5.6861	Delivery services
UNIBAIL	0.3248	AEX	5.1001	Retail
UNILEVER	0.2230	AEX	3.4152	Food products
WOLTERS	0.1923	AEX	3.8662	Publishing
AER LINGUS	0.4412	ISEQ	6.5905	Airlines
MERRION	1.4129	ISEQ	14.5655	Pharmaceuticals
DATALEX	1.3404	ISEQ	14.5470	Retail
C&C GROUP	0.4343	ISEQ	6.4868	Food
CPL	1.2692	ISEQ	8.1288	Resources
DONEGAL	0.5391	ISEQ	7.1055	Food
ELAN	0.7403	ISEQ	10.0067	Pharmaceuticals
FYFFES	0.3745	ISEQ	7.0022	Food
GLANBIA	0.2433	ISEQ	5.0528	Food
ICON	0.7633	ISEQ	9.3206	Pharmaceuticals
INDEP NEWS	2.6606	ISEQ	12.4248	Media
IRISH CONTL UTS	0.3569	ISEQ	4.6342	Transport
KERRY GROUP	0.1884	ISEQ	3.6974	Food
ORIGIN ENTERPRISES	0.4871	ISEQ	6.2593	Food
PADDY POWER	0.2764	ISEQ	4.3161	Gambling
RYANAIR HOL	0.3609	ISEQ	5.8542	Airlines
SMURFIT KAPPA	0.4339	ISEQ	8.4899	Packaging
UTV MEDIA	1.5764	ISEQ	9.4692	Media

Table 1: Consumption sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
TOTAL PRODUCE	0.5045	ISEQ	7.9953	Food
ARYZTA N	0.5288	ISEQ	3.9060	Food
ZAMANO	30.751	ISEQ	29.9830	Internet
AUTOGRILL	0.2826	FTSEMIB	4.5261	Restaurants
ATLANTIA	0.3797	FTSEMIB	4.5549	Transportation
FERRAGAMO	0.2433	FTSEMIB	6.8880	Clothing
CAMPARI	1.4852	FTSEMIB	6.7811	Distillers and vinters
LOTTOMATICA	0.2869	FTSEMIB	4.2356	Gambling
LUXOTTICA	0.2632	FTSEMIB	4.3084	Clothing
MEDIASET	0.2963	FTSEMIB	5.2036	Entertaintment
PIRELLI	0.3058	FTSEMIB	5.5299	Tires
PARMALAT	0.2243	FTSEMIB	4.6137	Food
TOD´S	0.2524	FTSEMIB	4.6601	Footwear
ASSOC BRITISH FOODS	0.2540	FTSE	3.3039	Food
ASTRAZENECA	0.2493	FTSE	3.9991	Pharmaceuticals
BABCOCK INTL	0.4048	FTSE	4.1222	Services
BRIT AMER TOBACCO	0.3797	FTSE	3.9285	Tobacco
BUNZL	0.2021	FTSE	3.4399	Transportation
BURBERRY GROUP	0.3317	FTSE	5.6363	Clothing
B SKY B GROUP	0.5189	FTSE	5.1935	Transportation
COMPASS GROUP	1.2900	FTSE	7.0552	Food service
DIAGEO	0.2250	FTSE	3.3470	Beverages
EXPERIAN	0.2396	FTSE	4.4853	Services
G4S	0.2299	FTSE	3.7534	Services
GLAXOSMITHKLINE	0.1851	FTSE	3.5473	Pharmaceuticals
INTERNATIONAL CONS AIRL	0.2981	FTSE	5.9718	Airlines
INTERCONT HOTELS GROUP	0.2355	FTSE	4.9063	Hotels

Table 1: Consumption sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
IMPERIAL TOBACCO GROUP	0.2229	FTSE	3.7990	Tobacco
INTERTEK GROUP	0.2363	FTSE	3.9905	Services
ITV	0.5955	FTSE	6.4213	Media
KINGFISHER	0.2765	FTSE	5.2699	Retail
MORRISON SUPERMARKETS	0.2440	FTSE	3.7964	Supermarkets
MARKS AND SPENCER	0.3272	FTSE	4.7197	Supermarkets
NEXT	0.3314	FTSE	4.6542	Clothing
PEARSON	0.4202	FTSE	4.8812	Publishing
REED ELSEVIER	0.2866	FTSE	4.2422	Publishing
SABMILLER	0.2230	FTSE	4.2304	Beverages
SAINSBURY	0.2594	FTSE	4.5637	Supermarkets
TESCO	0.2588	FTSE	3.7739	Supermarkets
UNILEVER	0.2129	FTSE	3.7029	Consumer goods
SHIRE	0.3173	FTSE	5.3605	Pharmaceuticals

Table 2: Financial services sector

Company	VaR	Stock market index	ES (historical)	Subsector
ALLIANZ	0.4539	DAX	5.9805	Insurance
COMMERZBANK	0.5908	DAX	7.3945	Banking
DEUTSCHE BANK	0.4796	DAX	6.3927	Banking
DEUTSCHE BOERSE	0.3091	DAX	5.5419	Services
MUNICHRE (M)	0.4152	DAX	5.3715	Insurance
BBVA	0.3683	IBEX	5.0266	Banking
BANKIA	2.1279	IBEX	14.1676	Banking
BANCO POPULAR	0.3688	IBEX	5.0149	Banking
BANKINTER	0.3742	IBEX	4.8072	Banking
BME	0.2128	IBEX	4.5414	Banking
CAIXABANK	0.2840	IBEX	4.8112	Banking
MAPFRE	0.3426	IBEX	4.7812	Insurance
BANCO SABADELL	0.3204	IBEX	3.9983	Banking
SANTANDER	0.3764	IBEX	5.2386	Banking
CREDIT AGRICOLE	0.4172	CAC	6.4640	Banking
BNP PARIBAS	0.4711	CAC	5.9054	Banking
AXA	0.5495	CAC	6.5932	Insurance
SOCIETE GENERALE	0.4239	CAC	7.0260	Banking
NATIXIS	0.7040	CAC	6.7814	Banking
UNIBAIL	0.3422	CAC	4.8780	Housing
AEGON	1.1957	AEX	7.7215	Insurance
ING GROUP	0.6236	AEX	8.0833	Insurance
ALLIED I. BANKS	3.9435	ISEQ	13.6381	Banking
ABBEY	0.3610	ISEQ	4.1775	Banking
BANK OF IRELAND	2.9133	ISEQ	12.5628	Banking
FBD HOLDS	0.4174	ISEQ	5.1562	Insurance
FIRST DERIVATIVES	7.8120	ISEQ	7.9852	Investment
IFG GRP	1.0625	ISEQ	8.2945	Services

Table 2: Financial services sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
PRIME ACTIVE CAP	2.1938	ISEQ	20.9108	Services
PERMANENT TSB	17.167	ISEQ	30.9934	Services
BANCA MPS	0.3359	FTSEMIB	5.7512	Banking
AZIMUT HOLD	0.2562	FTSEMIB	5.5540	Services
BANCO POPOLARE	0.6073	FTSEMIB	6.1368	Banking
BCO POP EMILIA R	0.6505	FTSEMIB	4.5473	Banking
BCA POP DI MILANO	0.4390	FTSEMIB	6.2786	Banking
EXOR	0.8928	FTSEMIB	5.9925	Services
GENERALI	0.5777	FTSEMIB	5.8413	Insurance
MEDIOBANCA	0.3289	FTSEMIB	5.0022	Banking
MEDIOLANUM	0.3886	FTSEMIB	5.6571	Insurance
UBI BANCA	0.8080	FTSEMIB	6.2208	Banking
UNICREDIT	2.0474	FTSEMIB	10.4803	Banking
AVIVA	0.5885	FTSE	6.6022	Insurance
ABERDEEN ASSET	0.7102	FTSE	7.8509	Investment
ADMIRAL GROUP	0.3495	FTSE	4.8552	Insurance
BRIT LAND CO	0.3014	FTSE	4.7305	Housing
BARCLAYS	0.6797	FTSE	7.1355	Banking
CAP SHOP CENTRES	0.3587	FTSE	4.5293	Investment
HAMMERSON	0.2905	FTSE	4.6604	Investment
HARGREAVES LANSDOWN	0.2735	FTSE	5.2170	Investment
HSBC HOLDINGS	0.2948	FTSE	4.2765	Banking
LAND SECURITIES GROUP	0.2706	FTSE	4.2123	Housing
LEGAL AND GENERAL GROUP	0.6008	FTSE	6.8144	Services
LLOYDS BANKING GROUP	0.6907	FTSE	7.8287	Banking
MELROSE PLC	0.5042	FTSE	6.6732	Investment

Table 2: Financial services sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
PRUDENTIAL	0.7699	FTSE	8.6539	Insurance
RBS GROUP	0.5962	FTSE	7.9260	Banking
OLD MUTUAL	0.5245	FTSE	6.4943	Banking
RSA INSURANCE	0.3764	FTSE	5.9061	Insurance
RESOLUTION	0.2460	FTSE	3.2731	Insurance
SCHRODERS	0.3893	FTSE	5.9045	Investment
STANDARD LIFE	0.4726	FTSE	5.5283	Investment
STANDARD CHARTERED	0.5740	FTSE	5.9795	Investment

Table 3: Petroleum, utilities and energy sector

Company	VaR	Stock market index	ES (historical)	Subsector
EON	0.4482	DAX	5.2835	Electricity and gas
RWE	0.2562	DAX	4.6038	Electricity and gas
ENDESA	0.2505	IBEX	4.2666	Electricity and gas
ENAGAS	0.1652	IBEX	3.5320	Electricity and gas
GAS NATURAL	0.3317	IBEX	4.4663	Electricity and gas
IBERDROLA	0.3058	IBEX	4.1245	Electricity and gas
RED EL CORP	0.2849	IBEX	3.4480	Electricity and gas
REPSOL	0.3606	IBEX	4.8847	Petroleum
EDF	0.2473	CAC	4.7458	Electricity and gas
TOTAL	0.2145	CAC	3.9073	Electricity and gas
GDF SUEZ	0.8753	CAC	5.7247	Electricity and gas
VEOLIA	0.3591	CAC	5.3632	Water
FUGRO	0.2884	AEX	5.2723	Petroleum
ROYAL D. SHELL	0.2261	AEX	3.6753	Petroleum
AMINEX	1.5154	ISEQ	19.6054	Petroleum
DCC	0.2269	ISEQ	3.8769	Electricity and gas
DRAGON OIL	0.8932	ISEQ	9.9087	Petroleum
PETROCELTIC	3.0989	ISEQ	18.1294	Petroleum
PETRONEFT RES	1.1719	ISEQ	13.9694	Petroleum
PROVIDENCE RESOURCE	0.6649	ISEQ	9.1894	Petroleum
A2A	0.2793	FTSEMIB	4.9199	Electricity and gas
ENEL	0.2204	FTSEMIB	4.2590	Electricity and gas
ENEL GREEN POWER	0.2441	FTSEMIB	4.1387	Electricity and gas
ENI	0.2344	FTSEMIB	4.1235	Petroleum
SNAM RETE GAS	0.1324	FTSEMIB	3.0281	Electricity and gas
TERNA	0.1567	FTSEMIB	3.0806	Electricity and gas
AGGREKO	0.3750	FTSE	5.6407	Electricity and gas
AMEC	0.2691	FTSE	5.1547	Petroleum

Table 3: Petroleum, utilities and energy sector (cont.)

Company	VaR	Stock market index	ES (historical)	Subsector
BG GROUP	0.3297	FTSE	4.6988	Electricity and gas
BHP BILLITON	0.3243	FTSE	5.7420	Electricity and gas
BP	0.2258	FTSE	4.2374	Petroleum
CENTRICA	0.2419	FTSE	4.1227	Utilities
NATIONAL GRID	0.4231	FTSE	4.9478	Electricity and gas
PETROFAC	0.3852	FTSE	5.9635	Electricity and gas
ROYAL DUTCH SHELL	0.2589	FTSE	4.2792	Electricity and gas
SSE	0.1792	FTSE	3.4616	Electricity and gas
SEVERN TRENT	0.2163	FTSE	3.7873	Utilities
TULLOW OIL	0.5765	FTSE	6.2897	Petroleum
UNITED UTILITIES GROUP	0.4455	FTSE	3.7041	Utilities
WOOD GROUP	0.3033	FTSE	6.1565	Gas

Table 4: Technologies and telecommunications sector

Company	VaR	Stock market index	ES (historical)	Subsector
DEUTSCHETELEKOM	0.4878	DAX	5.6761	Telecommunications and others
INFINEON TECNOL.	0.6946	DAX	8.4352	Electronics/Software
SAP	0.6557	DAX	6.1527	Electronics/Software
AMADEUS HOLDING	0.1562	IBEX	3.6473	Electronics/software
INDRA	0.2852	IBEX	4.2625	Electronics/software
TELEFONICA	0.3507	IBEX	4.5939	Telecommunications and others
ALCATEL-LUCENT	0.5097	CAC	8.2663	Telecommunications and others
CAP GEMINI	0.4298	CAC	6.5552	Electronics/software
FRANCE TELECOM	0.6557	CAC	6.0206	Telecommunications and others
STMICROELECTRO.	0.3737	CAC	5.6813	Electronics/software
SCHNEIDER ELECT.	0.2852	CAC	5.1609	Electronics/software
ASML	0.5138	AEX	3.6753	Semiconductors
KPN	0.7468	AEX	6.6566	Telecommunications and others
PHILIPS	0.3885	AEX	5.8600	Electronics/software
TVC HOLDINGS	0.6921	ISEQ	7.7912	Electronics/software
ANSALDO	0.5389	FTSEMIB	5.5327	Electronics
PRYSMIAN	0.3155	FTSEMIB	5.9530	Electronics/software
STMICROELECTR.	0.3379	FTSEMIB	5.9795	Semiconductors
TELECOM ITALIA	1.1431	FTSEMIB	7.7010	Telecommunications and others
ARM HOLDINGS	0.5755	FTSE	7.8917	Semiconductors
BT GROUP	0.3386	FTSE	5.6586	Telecommunications and others
SAGE	0.5429	FTSE	5.9300	Electronics/software
VODAFONE	0.3834	FTSE	5.0548	Telecommunications and others

Table 5: Industry and construction sector

Company	VaR	Stock market index	ES (historical)	Subsector
BASF	0.4300	DAX	6.1527	Chemical
BMW	0.2801	DAX	5.1284	Automobile
CONTINENTAL	0.3847	DAX	6.0441	Automobile
DAIMLER	0.3368	DAX	5.5365	Automobile
HEIDELBERGCEMENT	0.4262	DAX	5.8938	Construction
LANXESS	0.4769	DAX	6.6267	Chemical
LINDE	0.3514	DAX	4.3834	Industrial gases
K+S N	0.3131	DAX	5.4731	Chemical
SIEMENS	0.4103	DAX	6.0423	Diversified industrials
THYSSENKRUPP	0.4580	DAX	6.2141	Diversified industrials
VOLKSWAGEN	0.5655	DAX	6.6450	Automobile
ABERTIS	0.5238	IBEX	4.0242	Construction
ACS	0.2092	IBEX	4.2711	Construction
ACERINOX	0.2313	IBEX	4.3497	Minerals/Metals/Transf.
ACCIONA	0.2822	IBEX	5.0960	Construction
ARCELORMITTAL	0.4758	IBEX	7.5637	Minerals/Metals/Transf.
FCC	0.2358	IBEX	4.8010	Construction
FERROVIAL	0.2921	IBEX	5.1131	Construction
GAMESA	0.3345	IBEX	6.1815	Manufacture
INDUSTRIA DIS	0.2825	IBEX	4.2199	Textile
OHL	0.2873	IBEX	4.9634	Construction
SACYR VALLEHERM	0.4718	IBEX	6.4868	Construction
TECNICAS REUNIDAS	0.2479	IBEX	5.7247	Construction
AIR LIQUIDE	0.2047	CAC	3.7545	Chemical
ALSTOM	0.1386	CAC	6.4364	Construction
VINCI	0.2876	CAC	4.3634	Construction
EADS	0.3343	CAC	5.7525	Aerospace

Table 5: Industry and construction sector (cont)

Company	VaR	Stock market index	ES (historical)	Subsector
ARCELORMITTAL	0.3922	CAC	6.0823	Minerals/Metals/Transf.
RENAULT	0.3403	CAC	6.0210	Automobile
BOUYGUES	0.3770	CAC	5.5288	Construction
LAFARGE	0.2991	CAC	5.2748	Construction
SUEZ ENV.	0.3122	CAC	4.6556	Water and residuals
SAINT GOBAIN	0.3720	CAC	5.7161	Construction
TECHNIP	8.3866	CAC	19.7788	Equipment
PEUGEOT	0.3008	CAC	6.0500	Automobile
VALLOUREC	0.3434	CAC	5.9806	Industrial machinery
AKZO NOBEL	0.3428	AEX	4.4492	Chemicals
APERAM	0.3473	AEX	6.9615	Iron and steel
BOSKALIS	0.3442	AEX	5.5356	Construction
DSM	0.2457	AEX	4.0593	Chemicals
ARCELORMITTAL	0.5237	AEX	8.2304	Minerals/Metals/Transf.
SBM OFFSHORE	0.3415	AEX	5.9386	Equipment
CRH PLC	0.2672	ISEQ	5.4259	Construction
GRAFTON GROUP	0.3867	ISEQ	5.9816	Construction
KENMARE RES.	1.0737	ISEQ	12.8855	Minerals/Metals/Transf.
KINGSPAN GROUP	0.3532	ISEQ	5.8744	Construction
ORMONDE MINING	1.2631	ISEQ	19.0870	Minerals/Metals/Transf.
OVOCA GOLD	0.7765	ISEQ	14.3408	Minerals/Metals/Transf.
BUZZI UNIZEM	0.2504	FTSEMIB	4.8991	Construction
DIASORIN	0.2341	FTSEMIB	4.2739	Equipment
FIAT	0.3555	FTSEMIB	5.7203	Automobile
FIAT INDUSTRIAL	0.2334	FTSEMIB	6.7350	Automobile

Table 5: Industry and construction sector (cont)

Company	VaR	Stock market index	ES (historical)	Subsector
SAIPEM	0.2913	FTSEMIB	5.5387	Equipment
TENARIS	0.3251	FTSEMIB	5.7768	Minerals/Metals/Transf.
FINMECCANICA	0.3227	FTSEMIB	5.5354	Defense
IMPREGILO	0.3749	FTSEMIB	6.0846	Construction
ANGLO AMERICAN	0.3374	FTSE	6.3011	Minerals/Metals/Transf.
ANTOFAGASTA	0.3899	FTSE	6.1867	Minerals/Metals/Transf.
BAE SYSTEMS	0.2396	FTSE	5.2478	Aerospace
CRODA INTERN.	0.3062	FTSE	4.4469	Chemical
EURASIAN N R C	0.5888	FTSE	9.5193	Minerals/Metals/Transf.
FRESNILLO	0.5111	FTSE	7.9333	Minerals/Metals/Transf.
GKN	0.4116	FTSE	6.2206	Components
EVRAZ	0.3589	FTSE	6.1278	Metals
IMI PLC ORD	0.4415	FTSE	5.3443	Minerals/Metals/Transf.
JOHNSON MATTHEY	0.2911	FTSE	4.7886	Chemical
MEGGITT	0.3334	FTSE	4.7159	Aerospace
POLYMETAL INTERN.	0.3816	FTSE	4.6340	Minerals/Metals/Transf.
RIO TINTO GROUP	0.4157	FTSE	6.5417	Minerals/Metals/Transf.
VEDANTA	0.4125	FTSE	7.7666	Metals
SMITHS GROUP	0.3720	FTSE	4.8359	Engineering
SMITH AND NEPHEW	0.3929	FTSE	4.3343	Equipment
TATE & LYLE	0.3157	FTSE	4.6787	Agribusiness
WEIR GROUP	0.3668	FTSE	5.5881	Engineering
WOLSELEY	0.4267	FTSE	6.0061	Construction

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