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Titre:

ESSAYS ON CORPORATE SOCIAL RESPONSIBILITY AND SOCIALLY RESPONSIBLE INVESTMENT

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Avertissement

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Résumé:

Notre thèse traite des thématiques de la responsabilité sociétale des entreprises (RSE), de sa relation avec la performance économique et financière de l'entreprise, et de l'investissement socialement responsable (ISR). Ces thématiques ont récemment gagné en popularité, favorisées par un contexte de crise économique et environnementale. Notre thèse se compose de quatre principaux chapitres. Notre premier chapitre est une revue de la littérature académique sur la RSE et l'ISR. Nous proposons une revue interdisciplinaire de la littérature académique partagée entre l'économie et les sciences de gestion (éthique appliquée aux entreprises, stratégie et finance). Notre second chapitre est une analyse empirique de la relation entre RSE et performance financière de l'entreprise sous l'angle du coût du capital. Nous nous intéressons à l'impact de la publication d'une notation de la politique de RSE d'une entreprise sur la liquidité de ses titres et la taille de sa base d'actionnaires. Nos troisième et quatrième chapitres sont des analyses des propriétés de portefeuilles d'ISR construits à l'aide de nouvelles méthodes d'allocations. Ainsi nous analysons comment des stratégies d'allocations basées sur le risque modifient la performance des portefeuilles d'actifs financiers émis par des émetteurs ayant une politique de RSE, et réciproquement comment un univers d'investissement composé uniquement d'émetteurs ayant une politique de RSE modifie les propriétés de ces allocations alternatives.

Descripteurs:

Base des investisseurs, coût du capital, diversification, investissement socialement responsable, liquidité, matrice de covariance robuste, performance, responsabilité sociétale de l'entreprise, stratégies d'allocation alternatives ("smart beta"), stratégies d'allocation basées sur le risque, taux de rotation.

Abstract:

Our thesis examines corporate social responsibility (CSR) and how it is linked to a firm's economic and financial performance, as well as socially responsible investment (SRI). With the current environmental and economic uncertainty, these issues are attracting increasing interest. Our thesis is organized in four main chapters. Chapter 1 is a literature review on CSR and SRI. We propose an interdisciplinary review of the academic literature in both economics and management sciences (ethics applied to business, strategy and finance). Chapter 2 is an empirical analysis of the relationship between CSR and a firm's financial performance in terms of cost of capital. We look at the impact of publishing an evaluation of the firm's involvement in CSR on the liquidity of its stocks and the size of its investor base. Chapter 3 and Chapter 4 are analyses of the characteristics of SRI portfolios built according to new allocation methodologies. We analyze how risk-based allocations impact the performance of the portfolios of financial products of issuers involved in CSR, and reciprocally, how a universe of investment composed of the financial products of issuers involved in CSR impacts the properties of these alternative allocations.

Keywords:

Alternative allocation strategies (”smart beta”), corporate social responsibility, cost of equity capital, diversification, investor base performance, liquidity, risk based allocation strategies, robust covariances matrix, socially responsible investment, turnover.

Main abbreviations

ASPI: acronym for Advanced Sustainability Performance Index. It is the former best-in-class (BIC) index proposed by VIGEO, a French rating agency. The latter evaluates level of involvement in corporate social responsibility (CSR) of issuers of financial instruments and their extra-financial performance.

BIC: acronym for Best-In-Class. It defines a form of selection of financial instrument issuers. The BIC selection process selects issuers that have the highest level of involvement in CSR and the best extra-financial performance compared to comparable issuers.

CAPM: acronym for Capital Asset Pricing Model. It was derived by Sharpe (1964), Lintner (1965a), Lintner (1965b), Treynor (n.d.) and Mossin (1966) (Perold 2004). The model is used to determine theoretically the required rate of return for an asset according to its level of systematic risk. It is based on the conclusions of Markowitz (1952).

CSP: acronym for Corporate Social Performance, similar to extra-financial performance. It has a multiplicity of meanings. In management sciences, it is the outcomes and effects on society of an organization's activities. In economics, it is sometimes used instead of CSR to mean a firm's set of beyond-legal-compliance behaviors in the interests of society. The two meanings can be matched : in economics, firms are assumed to comply with the law, and pro-social actions are assumed to benefit society. With these assumptions the definition from management science matches that proposed by economics: the social performance of firms is just the sum of their pro-social behaviors. Please refer to Chapter 2 of our thesis for more details.

CSR: acronym for Corporate Social Responsibility. It has a multiplicity of meanings. In our thesis we stick to the meaning commonly attributed by economics: CSR is a firm's set of beyond-legal-compliance behaviors in the interests of society. This implies that a firm involved in CSR has a policy on pro-social actions and that it realizes such actions to some extent. Please refer to Chapter 2 of our thesis for more details.

CW: acronym for Capitalization-Weighted, the mainstream allocation method, based on CAPM conclusions. Please refer to Chapter 5 and 6 of our thesis for more details.

ESG: acronym for Environmental Social and Governance. These are the three areas where level of involvement in corporate social responsibility (CSR) and extra-financial performance is evaluated by rating agencies such as VIGEO or Sustainalytics.

ERC: acronym for Equal Risk Contribution. It is one of the risk-based allocations. Please refer to Chapter 5 and 6 of our thesis for more details.

EW: acronym for Equally-Weighted. It is one of the risk-based allocations. Please refer to Chapter 5 and 6 of our thesis for more details.

FGLS: acronym for Feasible Generalized Least Square. This acronym defines one procedure for estimating coefficients of an econometric model with OLS estimators, where data is modified to correct for some issues that cause trouble for inference (i.e. within-individual error correlation or within-individual error heteroskedasticity) (Wooldridge 2009).

HAC: acronym for Heteroskedasticity and Autocorrelation Consistent. This acronym defines a form of estimator of the variance of estimators of coefficients of an econometric model. These estimators of variance are robust to heteroskedasticity and correlation of errors of the model (Cameron and Trivedi 2005, Wooldridge 2009, Cottrell and Lucchetti 2011). In a panel setting, Arellano (1987) proposes an estimator of variance that is robust to between-individual heteroskedasticity and within-individual correlation of errors of the model. In a time-series setting, Newey and West (1987) propose an estimator of variance that is robust to both heteroskedasticity and correlation of errors of the model.

HC: acronym for Heteroskedasticity Consistent. This acronym defines a form of estimator of the variance of estimators of coefficients of an econometric model. These estimators of variance are robust to heteroskedasticity of errors of the model (H. White 1980, Cameron and Trivedi 2005, Wooldridge 2009, Cottrell and Lucchetti 2011).

ISR: acronym for *Investissement Socialement Responsable.* It is a French translation of SRI. A recent definition from the *Association Française de Gestion* is: *L'ISR est un placement qui vise à concilier performance économique et impact social et environnemental en finançant les entreprises et les entités publiques qui contribuent au développement durable quel que soit leur secteur d'activité. En influençant la gouvernance et le comportement des acteurs, l'ISR favorise une économie responsable.* English translation : an investment that aims to balance economic performance with social and environmental impact by financing companies and public entitities that contribute to sustainable development, in any sector. By influencing governance and behavior, SRI promotes a responsible economy.

MCO: acronym for *Moindres Carrés Ordinaire.* It is a French translation of OLS.

MD: acronym for Maximum Diversification, sometimes referred to as MDP, which stands for Maximum Diversification Portfolio. It is one of the risk-based allocations. Please refer to Chapter 5 and 6 of our thesis for more details.

MEDAF: acronym for *Modéle d'Evaluations des Actifs Financiers.* It is a French translation of CAPM.

MV: acronym for Minimum Variance, sometimes referred to as GMV, which stands for Global Minimum Variance. It is one of the risk-based allocations. Please refer to Chapter 5 and 6 of our thesis for more details.

OLS: acronym for Ordinary Least Squares. One method to estimate the unknown parameters in a linear regression model.

RSE: acronym for *Responsabilité Sociétale de l'Entreprise.* It is a French translation of CSR.

SRB: acronym for Socially Responsible Behavior. It defines a type of activity that is costly to perform and mainly benefits others.

SRI: acronym for Socially Responsible Investment. It defines a type of investment in financial instruments. SRI consists either in investing in issuers that have the highest level of involvement in CSR, the best extra-financial performance compared to comparable issuers (positive or BIC SRI), or in excluding issuers involved in particular activities (negative or ethical SRI).

Chapter 1

General introduction in French

"It is too late for sustainable development ... It is essential now to put more emphasis on raising the resilience of the system"
Dennis Meadows[1]

"Peu importe la durée du voyage si la direction est la bonne"
Matthieu Ricard[2]

1.1 Résumé de la thèse

Notre thèse traite des thématiques de la responsabilité sociétale des entreprises (RSE), de sa relation avec la performance économique et financière de l'entreprise, et finalement de l'investissement socialement responsable (ISR). Ces thématiques ont récemment gagné en popularité, favorisées par un contexte de crise économique et environnementale. Notre thèse se compose de quatre chapitres.

Notre premier chapitre est une revue de la littérature académique sur la RSE et l'ISR. Nous proposons une revue interdisciplinaire de la littérature académique partagée entre l'économie et les sciences de gestion (éthique appliquée aux entreprises, stratégie et finance). Nous avons comparé les différentes définitions

[1] Conference at Smithsonian Institution Washington, DC − March 1, 2012
[2] Documentary broadcasted on Arte "Une voie bouddhiste" − September 8, 2013

de la responsabilité sociétale des entreprises, pour finalement nous concentrer sur la définition économique que nous adoptons dans le reste de notre thèse. Ainsi la RSE est l'ensemble des actions non requises par la loi réalisées par l'entreprise dans l'intérêt social (i.e. ensemble des actions pro-sociales). Puis nous avons listé les contributions académiques qui utilisent la définition économique de la RSE. Ainsi notre revue de littérature met en perspective la littérature économique et financière sur la responsabilité sociétale des entreprises et l'investissement socialement responsable avec la littérature issue d'autres disciplines. Nous nous sommes ensuite intéressés aux contributions qui traitent des relations entre responsabilité sociétale des entreprises et d'une part leurs performances financière et d'autre part leur performance extra-financière. Alors que la première relation est de mieux en mieux maitrisée, la seconde est encore méconnue. Enfin puisque la littérature sur l'investissement socialement responsable est proche de la littérature sur la RSE nous nous y sommes intéressés dans une dernière partie. L'ISR est en effet la sélection d'actifs financiers sur des critères financiers et des critères portant sur la politique de RSE des émetteurs[3]. A cet égard les questions de la performance financière et extra-financière des portefeuilles d'actifs financiers émis par des émetteurs ayant une politique de RSE apparaissent comme centrales. Sans surprise la question de la performance extra-financière est moins bien traitée que celle de la performance financière. Néanmoins cette dernière n'est que partiellement maitrisée. En particulier le fait que la relation entre performance extra-financière et performance financière au niveau des entreprises ne se traduise pas systématiquement par des portefeuilles d'ISR plus performants peut laisser perplexe. Il semble que la manière dont l'information extra-financière est intégrée ou non par les marchés joue un rôle clef. Cette dernière constatation est le fil conducteur de notre thèse.

Ainsi notre second chapitre de thèse se propose d'analyser empiriquement com-

[3]L'AFG vient de proposer début juillet 2013 une nouvelle définition pour l'ISR.

ment la publication d'information sur la RSE fournie par une entreprise peut modifier ses caractéristiques boursières. En particulier nous analysons comment l'initiation non sollicitée d'une notation de la politique de RSE modifie la liquidité et la taille de la base des actionnaires d'une entreprise. Grâce à un échantillon d'entreprises Européennes notées par l'entreprise VIGEO nous constatons qu'il existe une relation positive significative. Ainsi après une notation, la liquidité augmente et la base des actionnaires s'accroit. Nous remarquons que ces variations sont plus importantes pour les entreprises de petites tailles, ce qui est cohérent avec l'effet de délaissement (*neglected effect*) des actions des petites entreprises cotées. Ces résultats confirment empiriquement les propositions théoriques de récentes contributions académiques. Ainsi, il est possible de concevoir un enchaînement de mécanismes qui relient la RSE au coût du capital, par l'intermédiaire de la liquidité et de la reconnaissance des actions de l'entreprise. Le niveau de délaissement des actions de l'entreprise semble jouer un rôle clef. En mettant en évidence les mécanismes liant RSE au coût du capital, ces résultats ont également un intérêt pour les praticiens tels que les responsables financiers d'entreprises cotées et les gérants de portefeuilles.

Nos troisième et quatrième chapitres sont issus du même sous-projet de recherche. Dans ces deux chapitres, nous analysons comment des stratégies d'allocations basées sur le risque modifient la performance des portefeuilles d'actifs financiers émis par des émetteurs ayant une politique de RSE, et réciproquement comment un univers d'investissement composé uniquement d'émetteurs ayant une politique de RSE modifie les propriétés de ces allocations alternatives. Nous étudions quatre de ces stratégies d'allocations alternatives: l'équi-pondération, la diversification maximale, la variance minimale et l'équi-contribution au risque. Ces trois dernières stratégies utilisent des estimations de la matrice de variance-covariance (VCV). Pour nous assurer de la robustesse de nos analyses, nous avons utilisé quatre estimateurs de la matrice de VCV: la matrice empirique, la matrice de corrélation constante, la matrice empirique réduite vers la matrice de corrélation constante et la matrice empirique réduite vers la matrice du modéle de marché (estimateur *shrinkage*). Nous conduisons une étude empirique qui utilise l'historique des actions de l'EuroStoxx du 15 Mars 2002 au 1er Mai 2012, à partir duquel nous définissons également le sous-univers d'émetteurs ayant une politique de RSE et le sous-univers des autres émetteurs. Pour réaliser cette catégorisation nous retenons les entreprises présentes dans l'ASPI (l'*Advance Sustainibility Performance Index* de VIGEO) comme des entreprises ayant une politique de RSE relativement meilleure que leurs concurrentes (i.e. ces entreprises réalisent plus d'actions pro-sociales et de meilleure qualité).

Notre troisième chapitre est motivé par le constat que l'allocation par la capitalisation des entreprises (allocation *cap-weighted*) souffre en pratique d'une faible diversification et qu'elle favorise les grandes entreprises qui ne sont pas ou peu délaissées par les investisseurs. Ainsi nous soulevons la question de l'adéquation de l'allocation par la capitalisation pour la construction de portefeuille d'ISR pour deux raisons. Premièrement, la construction de ces portefeuilles exclut par définition une partie de l'univers d'investissement accentuant la problématique de diversification et deuxièmement, l'inefficience du marché est nécessaire pour pouvoir profiter systématiquement d'une analyse des politiques de RSE. La problématique de la faible diversification de l'allocation par la capitalisation a été récemment traitée par les recherches sur les stratégies d'allocations basées sur le risque, aussi connues sous le nom d'allocations "smart beta". Pour répondre à notre question nous analysons à l'aide de modèles multifactoriels les rendements de portefeuilles pondérés selon ces stratégies d'allocations alternatives. Nous avons trois principaux résultats. Premièrement, en accord avec la littérature et notre hypothèse, les stratégies d'allocations alternatives améliorent significativement la performance relative des portefeuilles d'ISR. Cela est intéressant pour les investisseurs dont les performances sont mesurées par rapport à des indices pondérés par la capitalisation. Deuxièmement, nous observons que l'univers d'ISR, d'une part, et les allocations d'équi-pondération, de diversification maximale et de variance minimale d'autre part, sont associés à des rendement anormaux positifs. Les deux types de facteurs à l'origine de cette plus-value financière tendent à interagir négativement. Cela est en accord avec la contrainte d'univers qu'impose la construction de portefeuille d'ISR. Enfin nous trouvons que l'allocation par la capitalisation appliquée à l'univers d'ISR est exposée aux grandes capitalisations, et nous trouvons que l'exclusion d'événements extrêmes négatifs est le facteur de sur-performance le plus significatif généré par la sélection d'ISR. Au total ces résultats montrent que les allocations alternatives peuvent avoir un intérêt pour les investisseurs qui adoptent l'ISR.

Notre quatrième chapitre est motivé par le fait que les allocations alternatives étudiées utilisent des estimations de la matrice de VCV. L'estimation de cette matrice est une problématique de recherche en-soi et différents estimateurs ont été proposés dans la littérature sans qu'une solution ne s'impose en particulier. Ainsi la littérature sur les allocations alternatives met en avant le risque d'estimation des paramètres. Cela entraine des problèmes de stabilité des allocations alternatives qui se caractérisent par un turnover important, ainsi que des problèmes d'optimalité des solutions qui se caractérisent par des performances *ex post* moindres. En parallèle, des travaux de recherche montrent que les entreprises n'ayant pas de politique de RSE sont considérées comme plus exposées à des événements extrêmes négatifs. L'échantillon de données de ce sous-projet de recherche illustre cette exposition. Notre intuition est alors que l'analyse des politiques de RSE permettrait d'améliorer l'estimation de la matrice de VCV, et dans tous les cas modifiera les caractéristiques des allocations alternatives. Afin d'explorer la deuxième partie de cette intuition nous analysons la composition, la diversification, le taux de rotation et la distribution des rendements des portefeuilles pondérés selon une allocation alternative. Ces analyses montrent que les allocations alternatives allouent moins de richesse sur les émetteurs ayant une politique de RSE. Cela s'explique par le biais taille introduit par la sélection ISR, ainsi que par les caractéristiques mathématiques des programmes d'optimisation à l'origine des allocations basées sur le risque. De plus les portefeuilles construits sur l'univers d'ISR ont des mesures de diversification différentes, et toutes choses égales par ailleurs, un taux de rotation supérieur. Cependant, leur erreur de suivi (*Tracking Error*) de l'EuroStoxx est plus faible. Au total ces résultats confirment que l'adoption d'un univers d'ISR n'est pas neutre et nécessite une attention particulière de la part de l'investisseur.

Avant de présenter en détail les différentes études réalisées dans le cadre de cette thèse, nous proposons une introduction détaillée de chacun des quatre chapitres la composant.

1.2 Résumé chapitre "A literature review of Corporate Social Responsibility and Socially Responsible Investment"

Dans le premier chapitre nous proposons une revue de la littérature académique associée au terme de Responsabilité Sociétale de l'Entreprise (RSE). L'objectif général de cette revue de littérature est de lister les contributions à trois questions différentes mais reliées sur la RSE et l'Investissement Socialement Responsable (ISR). Chaque partie peut être considérée comme une revue de littérature autonome, bien que reliée aux autres. Dans la première partie nous nous concentrons sur la première question: qu'est-ce que la RSE? Cette dernière étant traitée par différentes disciplines, nous nous sommes concentrés sur les approches économiques tout en introduisant les approches d'autres sciences. Pour ces dernières nous ne prétendons pas avoir effectué une revue exhaustive. Par exemple nous n'introduisons pas les contributions développées par la psychologie (Boddy et al. 2010), la sociologie, le droit (Hay et al. 2005), ... L'objectif de la première partie est de passer en revue différentes contributions afin de comprendre non seulement l'approche économique de la RSE mais aussi l'approche large de la RSE (principalement l'approche des sciences de gestion). Dans la seconde partie nous nous concentrons sur la seconde question: quelles sont les conséquences de la RSE sur l'entreprise et la société? Cette partie propose principalement une revue des contributions introduites dans la première partie sous l'angle de la thématique des conséquences de la RSE. L'objectif de cette seconde partie est de compulser les contributions qui évaluent la désirabilité de la RSE. Dans la troisième partie nous nous concentrons sur la troisième question: qu'est-ce que l'ISR? L'objectif de cette troisième partie est de passer en revue les contributions qui d'une certaine manière transposent les questions de la première et seconde partie au monde de la gestion d'actifs.

Dans une première partie notre revue de la littérature met en évidence une multiplicité d'approches et de définitions de la RSE. Ces diverses contributions travaillent sur un même objet qui est l'ensemble des relations entre l'entreprise et son environnement, et elles s'intéressent toutes à la question du rôle de l'entreprise dans la société. C'est d'ailleurs la complexité des relations entre l'entreprise et son environnement, ainsi que de l'aspect normatif de la question sur le rôle de l'entreprise dans la société qui causent la multiplicité d'approches et de définitions. Malgré cette multitude de définitions, notre revue de littérature met en évidence deux grands types d'approches. A l'inverse des approches du second type, les approches du premier type considèrent que l'entreprise a un ensemble de rôles plus large que le seul rôle de maximisation de l'utilité de ses propriétaires. Pour cette raison les approches du premier type sont les approches larges de la RSE (e.g. maximisation de l'utilité des parties-prenantes), et elles englobent les approches du second type qui se réduisent à l'approche économique de la RSE (i.e. maximisation de l'utilité des actionnaires). De plus, pour l'approche économique de la RSE, l'acronyme de RSE se comprend comme l'ensemble des actions pro-sociales réalisées volontairement (i.e. actions non requises par la loi) par l'entreprise. Pour les approches larges de la RSE, l'acronyme de RSE se comprend comme l'ensemble des rôles que l'entreprise endosse, et les actions pro-sociales sont la manifestation de ces différents rôles. Enfin notre revue de la littérature met en évidence des critiques à l'égard des actions pro-sociales réalisées volontairement par l'entreprise. La principale met en avant le risque d'obtenir une société monolithique dominée selon les auteurs, soit par les processus de marché soit par les processus politiques.

Après une présentation générale de la littérature, nous nous concentrons sur les contributions économiques. Nous mettons en évidence deux sous approches économiques. L'approche économique traditionnelle et l'approche économique moderne. Pour l'approche traditionnelle, l'entreprise n'a qu'un rôle: maximiser le profit sous contrainte de la loi et des coutumes. Dans le cas où des externalités et des inégalités résulteraient de ce processus, l'état est le seul légitime à corriger et à redistribuer la richesse selon la volonté de la majorité. Les économistes traditionnels avertissent qu'il y a un risque pour la liberté d'entreprendre et d'agir si les rôles des grands groupes constituant l'économie sont mélangés. Pour l'approche moderne, la RSE est l'ensemble des actions pro-sociales réalisées volontairement par l'entreprise, et l'unique rôle de l'entreprise est de maximiser l'utilité de ses propriétaires. Dans ce cadre ces actions de RSE peuvent être justifiées par l'utilisation de fonctions d'utilité plus complexes (cf. behavorial economics) intégrant en plus de la composante matérielle, des composantes altruiste et sociale. Enfin, bien que discutable, il est commun de distinguer la RSE stratégique, motivée par le profit, de la RSE altruiste, motivée par autre chose que le profit. Nous faisons remarquer que la RSE stratégique est la forme la plus largement étudiée.

Dans la seconde partie, nous révisons les contributions qui étudient les conséquences de la RSE sur l'entreprise et la société. Pour les conséquences de la RSE sur la performance financière de l'entreprise, il s'avère que cette question de recherche a été posée dans les années 70, en réponse aux critiques des sciences économiques (i.e. critiques de mauvaises allocations des fonds de l'entreprise). Ce champ de recherche reste d'actualité et s'est organisé autour de la littérature économique sur la RSE stratégique, et autour de la littérature financière sur le couple risque-rendement des entreprises ayant une politique de RSE. Notre revue de la littérature met finalement en évidence une relation neutre à positive entre la RSE et la performance financière de l'entreprise. Il semblerait qu'il y ait une boucle de rétroaction positive, avec la performance financière comme point de départ. Néanmoins, du fait de la complexité de la question, il faut noter qu'il existe encore certaines limites aux précédentes conclusions. Pour les conséquences de la RSE sur la performance extra-financière de l'entreprise et sur la société, à notre connaissance il s'avère qu'il y a peu de recherche sur le sujet.

Dans la dernière partie de notre revue de la littérature, nous révisons les contributions à la thématique de l'ISR. Nous nous intéressons à l'ISR à cause de ses liens très étroits avec la RSE. En effet les deux thématiques considèrent l'importance des relations complexes qui existent entre une entreprise et son environnement. Notre revue nous permet de distinguer deux principales formes d'ISR selon la méthode de sélection utilisée. La forme positive sélectionne les entreprises ayant une forte politique de RSE, et la forme négative exclue les entreprises ayant des activités interdites. Elles sont à la base de toutes les autres formes d'ISR qui peuvent être trouvées sur le marché. Il est possible de distinguer deux formes de performance: une performance financière, et une performance extra-financière. Cette dernière peut être également divisée en deux. La première est liée à la sélection, alors que la seconde est liée à l'impact sociétale de l'ISR. Nous faisons remarquer que cette dernière est difficile à mesurer, et qu'elle est donc incertaine. A propos de la performance financière, notre revue de la littérature met en évidence que la sous-performance des fonds ISR par rapport aux fonds classiques n'est pas systématique. Ainsi il est possible d'obtenir des rendements anormaux positifs en investissant dans des entreprises selon des informations publiques sur la quantité de RSE qu'elles fournissent. Une proposition d'explication serait que les marchés ne valorisent pas correctement l'information sur la RSE. Néanmoins en cohérence avec les résultats de la théorie moderne du portefeuille, il semble que la diminution des opportunités de diversification ait un coût.

En conclusion nous retenons trois grandes familles de questions de recherche: Qu'est-ce que la RSE et quelle est la relation entre les différentes approches identifiées? Quel est l'impact sociétale de la RSE? Quel est l'impact sociétale de l'ISR et quels sont les mécanismes qui mènent à une performance financière de l'ISR? Dans notre revue de littérature nous introduisons des éléments de réflexions originaux pour la première famille de question. Dans le reste de notre thèse nous proposons de contribuer à une meilleure compréhension des mécanismes à l'origine de la performance financière de l'ISR. D'une part en étudiant la relation entre performance extra-financière et caractéristiques boursières des titres d'entreprises cotées et, d'autre part en étudiant l'impact des méthodologies d'allocations sur la performance des portefeuilles ISR.

1.3 Résumé chapitre "Raising Companies' Profile with Corporate Social Performance"

Dans le second chapitre (Bertrand, Guyot, et al. Forthcoming) nous nous inscrivons dans la lignée de récents travaux de recherche empiriques sur la relation entre performance financière de l'entreprise et RSE (i.e. ensemble des actions pro-sociales réalisées par l'entreprise). Ces travaux s'intéressent à la relation entre le coût du capital et la politique de RSE des entreprises. Leur particularité est d'inscrire leurs analyses empiriques dans un cadre théorique financier. Ces éléments théoriques permettent de proposer des mécanismes qui relieraient la RSE fournie par une entreprise à la liquidité et à la reconnaissance de ses titres par les investisseurs présents sur le marché financier, puis finalement à son coût du capital.

L'objectif de ce chapitre est de vérifier empiriquement la première partie des mécanismes proposés par ces papiers. Ainsi la publication d'une notation de la RSE fournie par une entreprise pourrait augmenter la liquidité de ses titres du fait d'un effet information et d'un effet volume. L'effet information s'expliquerait par la publication de l'information contenue dans la notation, et l'effet volume s'expliquerait par la modification de la taille de la base des actionnaires. De plus la publication d'une notation de la politique de RSE d'une entreprise pourrait augmenter la reconnaissance de ses titres par les investisseurs du fait d'une réduction des coûts d'information et du signalement de l'entreprise auprès d'investisseurs préalablement ignorants. Ainsi dans ce chapitre nous posons trois questions de recherche. Premièrement, la liquidité des titres des entreprises notées est-elle plus importante après une notation qu'avant? Deuxièmement, la reconnaissance des investisseurs est-elle plus grande après une notation qu'avant? Troisièmement, l'amplitude de ces variations est-elle reliée au niveau de la notation reçue par les entreprises? Enfin comme le facteur information semble jouer un rôle déterminant dans le phénomène que nous essayons d'observer, nous prenons en compte la possibilité d'avoir une interaction du phénomène avec la visibilité de l'entreprise. Nous utilisons la taille de l'entreprise comme proxy pour sa visibilité.

Pour répondre à ces trois questions nous avons collecté diverses informations pour un échantillon de 478 entreprises Européennes, cotées et notées entre 1999 et 2010. Comme proxy pour la liquidité nous avons utilisé l'écart de prix, absolu et relatif, des actions à l'achat et à la vente (i.e. bid-ask spread). Nous avons également collecté diverses données de contrôles connues pour avoir une influence sur le bid-ask spread: la volatilité, le volume, le prix, la capitalisation. Nous avons calculé la moyenne de ces variables sur une période de 20 jours de marché avant la publication de la notation de la politique de RSE, et sur 4 périodes de 5 jours de marché après la publication de la note. Comme proxy pour la reconnaissance des investisseurs nous avons utilisé le nombre d'actionnaires identifiés. Cette information est trimestrielle, nous avons collecté les valeurs disponibles avant et après la notation. Nous avons ensuite calculé les variations des différentes variables explicatives et expliquées. Pour l'analyse de la liquidité nous obtenons un panel de 5 variations et 478 individus (i.e. une variations entre avant et le jour de notation, puis quatre variations entre avant et les 4 périodes de 5 jours de marché). Pour l'analyse de la reconnaissance des investisseurs nous obtenons un échantillon de 478 observations.

Nous procédons ensuite à notre analyse économétrique. Pour analyser la variation de la liquidité et son amplitude selon le niveau de la notation de la politique de RSE, nous estimons le modèle suivant en moyenne, avec deux estimateurs (i.e. Pooled OLS et Effet Aléatoire), et en médiane (i.e. Régression de quantile):

$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \Delta Ln(\text{Volume}_{it}) + \beta_2 * \Delta(1/\text{Price}_{it}) + \beta_3 * \Delta\sigma_{it} + \beta_4 * \Delta\text{Investors}_i + \beta_5 * \Delta Ln(\text{Market Capitalization}_{it}) + \beta_6 * Ln(\text{Rating}_i) + \beta_7 * Ln(\text{Market Capitalization}_{it}) + \sum_{t>1} \text{d}_{it} + \text{Controls}_i + \varepsilon_{it}$

Pour analyser comment la taille des entreprises interagit avec la variation de la liquidité et son amplitude selon le niveau de la notation de la politique de RSE nous estimons également le modèle suivant en moyenne (i.e. Pooled OLS) et médiane (i.e. Régression de quantile), à différentes valeurs de la capitalisation des entreprises:

$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \Delta Ln(\text{Volume}_{it}) + \beta_2 * \Delta(1/\text{Price}_{it}) + \beta_3 * \Delta\sigma_{it} + \beta_4 * \Delta\text{Investors}_i + \beta_5 * \Delta Ln(\text{Market Capitalization}_{it}) + \beta_6 * Ln(\text{Rating}_i) + \beta_7 * Ln(\text{Rating}_i) * Ln(\text{Market Capitalization}_{it}) + \beta_8 * Ln(\text{Market Capitalization}_{it}) + \sum_{t>1} \text{d}_{it} + \text{Controls}_i + \varepsilon_{it}$

Enfin nous estimons le modèle suivant en moyenne (i.e. Pooled OLS) et médiane (i.e. Régression de quantile):

$\Delta\text{Investors}_i = \beta_0 + \beta_1 * \text{Rating}_i + \beta_2 * \text{Rating}_i * Ln(\text{Market Cap}_{ib}) + \beta_3 * Ln(\text{Volume}_{ib}) + \beta_4 * \text{Price}_{ib} + \beta_5 * \text{Investors}_{ib} + \beta_6 * \text{Spread}_{ib} + \beta_7 * Ln(\text{Market Cap}_{ib}) + \beta_8 * \sigma_{ib} + \text{Controls}_i + \varepsilon_i$

Ces analyses nous permettent de conclure à une relation positive entre le niveau de la notation de la politique de RSE et la liquidité des titres des entreprises, ainsi qu'à une interaction de cet effet avec la taille des entreprises. De plus ces analyses nous permettent de conclure à une relation positive entre le niveau de la notation de la politique de RSE et la reconnaissance des titres des petites entreprises par les investisseurs, ainsi qu'à une relation négative entre le niveau de la notation de la politique de RSE et la reconnaissance des grandes entreprises. En conclusion ces résultats sont cohérents avec une réduction de la composante d'asymétrie informationnelle de la liquidité, ils sont cohérents avec une amélioration de la reconnaissance des titres des entreprises négligées, et enfin ils sont cohérents avec l'existence de préférences des investisseurs quant à la quantité de RSE fournie par les entreprises.

1.4 Résumé chapitre "Socially Responsible Investment Performance"

Dans le troisième chapitre (Bertrand and Lapointe 2013b) nous nous intéressons à la thématique de la performance financière de l'investissement socialement responsable. Il est maintenant démontré qu'à travers différents mécanismes, une politique de RSE peut mener à une meilleure performance financière et économique de l'entreprise. Ainsi en incorporant des critères extra-financiers à la construction de portefeuille de titres financiers, ceux-ci devraient générer des rendements ajustés du risque supérieurs. Cependant les résultats empiriques font apparaitre des performances des fonds et indices ISR tantôt supérieures, tantôt inférieures. Ce constat empirique laisse perplexe pour deux raisons opposées.

Premièrement, pour les supporters de l'ISR il est assez naturel de penser que la performance financière de l'entreprise est corrélée avec la performance boursière de ses titres. Ainsi ils s'attendent à ce que les fonds ISR sur-performent les fonds classiques. Cette première ambiguïté trouve néanmoins deux explications. Premièrement, les marchés sont efficients et incorporent toutes l'information pertinentes dans les prix en un court laps de temps. Ainsi comme il n'est pas possible de capturer systématiquement ces revalorisations, les rendements moyens obtenus de la détention de titres d'entreprises ayant une politique de RSE sont équivalents à leur niveau de risque systématique. Deuxièmement, la sélection sur des critères extra-financiers spécifiques est contre le modèle d'évaluation des actifs financiers (MEDAF), ainsi que contre le principe de diversification. Contre le MEDAF car l'ISR prend en compte des risques spécifiques et contre le principe de diversification car l'ISR réduit l'univers d'investissement et donc réduit les opportunités de diversification. En conséquence, dans le meilleur des cas la frontière efficiente de l'univers d'ISR est confondue avec celle de l'univers complet. Sinon la frontière efficiente de l'univers d'ISR est dominée de même que le portefeuille pondéré par les capitaux.

Deuxièmement, les opposants à l'ISR doivent admettre qu'en dépit des arguments précédents, les fonds ISR ne sous-performent pas systématiquement leurs homologues classiques. De même il a été montré qu'il est possible de construire des portefeuilles très performant à l'aide de règle de sélection extra-financière simple. Cette seconde ambiguïté trouve néanmoins deux explications. Premièrement les marchés ne sont pas parfaitement efficients, certains titres financiers sont délaissés et présentes des valorisations qui s'ajustent lentement lorsque des informations pertinentes sont rendues publiques. De même certaines informations peuvent être considérées comme non pertinentes à la date de la publication, avant d'être intégrées au prix après que leur pertinence ait été apprise par le marché. Dans ces deux cas, les investisseurs socialement responsables peuvent utiliser leurs compétences pour identifier systématiquement ces anomalies et ainsi générer des sur-rendements. Un dernier cas nécessitant une forme d'inefficacité des marchés est celui de l'amélioration de la valeur de marché d'une entreprise par la modification de la politique de RSE de l'entreprise sous l'impulsion d'un actionnariat socialement responsable. Deuxièmement, la pondération par la capitalisation n'est pas optimale en pratique. Elle souffre d'un manque de diversification et de biais, tel que le biais momentum ou croissance. Ainsi en dépit de sa sous-optimalité théorique, il est possible qu'un portefeuille d'ISR pondéré par les capitalisations soit aussi optimal que son homologue classique.

De ces remarques nous faisons l'hypothèse que la pondération par la capitalisation n'est pas l'allocation la plus adéquate pour construire des portefeuilles ISR et pour capturer la sur-performance qui pourrait être générée par l'analyse extra-financière, et nous posons la question suivante: est-il possible que les défauts de la pondération par la capitalisation annule l'effet positif de la sélection ISR? Pour répondre à cette question nous analysons comment de nouvelles méthodes d'allocation, basées sur le risque, modifient les performances absolues, relatives et ajustées du risque, des portefeuilles ISR.

Nos analyses portent sur quatre méthodes d'allocations basées sur les risques, l'équi-pondération, la diversification maximale, la variance minimale et l'équi-contribution au risque. Pour les allocations qui le nécessitent nous utilisons quatre estimateurs de la VCV. Nous utilisons un univers d'actions Européennes (i.e. EuroStoxx) du 15 Mars 2002 au 1 Mai 2012, et notre univers d'ISR est obtenu à l'aide de l'analyse extra-financière de VIGEO et de son indice ASPI. Nous estimons les rendements de ces différents portefeuilles ce qui nous permet de comparer les différentes performances absolues. Nous estimons également les rendements de portefeuille “long-short” afin d’étudier les performances relatives. La première analyse long-short porte sur la comparaison de tous les portefeuilles (i.e. allocations par la capitalisation et basées sur le risque) construits sur l’univers d’ISR au portefeuille pondéré par la capitalisation construit sur l’univers total. Cette comparaison nous permet de mesurer l’avantage des allocations basées sur le risque dans le cadre d’une gestion comparée à un indice pondéré par les capitalisations. La seconde analyse long-short porte sur la comparaison des allocations basées sur le risque à leur homologue construit sur les deux univers restants. En contrôlant pour l’effet allocation, cette comparaison nous permet de mesurer si certaines allocations semblent mieux capter une éventuelle sur-performance liée à la sélection ISR. Enfin nous estimons des modèles factoriels (i.e. OLS) afin d’étudier les performances ajustées du risque. Nous complétons cette dernière analyse par une régression des alphas (i.e. OLS) estimés sur des variables indiquant la méthode d’allocation, l’univers utilisé et d’autres variables de contrôle. Cette régression peut-être interprétée comme une décomposition des sources de l’alpha:

$$\alpha_i = \beta_0 + \beta_1 * \mathrm{D}_i^{ASPI} + \beta_2 * \mathrm{D}_i^{A\bar{S}PI} + \beta_3 * \mathrm{D}_i^{ERC} + \beta_4 * \mathrm{D}_i^{EW} + \beta_5 * \mathrm{D}_i^{MD} + \beta_6 * \mathrm{D}_i^{MV} + \beta_7 * \mathrm{D}_i^{ASPI} * \mathrm{D}_i^{Strategies} + \beta_8 * \mathrm{D}_i^{A\bar{S}PI} * \mathrm{D}_i^{Strategies} + \beta_9 * \mathrm{Size}_{it} + \varepsilon_{it}$$

En conclusion, ces analyses nous permettent de dire que selon la mesure de performance choisie, la pondération par la capitalisation annule l’effet positif de la sélection ISR. Ainsi pour des mesures de performance relatives, nous observons que le biais taille créé par la sélection ISR est amplifié par la pondération par la capitalisation et pénalise le portefeuille correspondant. Dans ce cas les allocations basées sur le risque apparaissent comme avantageuses. Au contraire pour des mesures ajustées du risque, nous trouvons que la pondération par la capitalisation et l’équi-contribution au risque ont l’alpha extra-financier le plus important. Les autres allocations basées sur le risque sont pénalisées par leurs caractéristiques mathématiques et la réduction de l’univers d’investissement sur des critères extra-financiers, et plus précisément par le biais taille ainsi crée. Ces résultats, en dépit des limites inhérentes aux exercices de test historique[4], montre que les allocations basées sur le risque peuvent avoir un intérêt pour l'ISR.

1.5 Résumé chapitre "Risk Based Strategies Properties"

Dans le quatrième chapitre (Bertrand and Lapointe 2013a) nous nous intéressons aux propriétés statistiques des allocations basées sur le risque. Ces allocations sont de plus en plus populaires dans l'industrie de la gestion d'actifs pour trois principales raisons. Premièrement, les allocations basées sur le risque ne nécessitent pas de prévision de rendement. Deuxièmement, les allocations basées sur le risque cherchent à améliorer le ratio risque/rendement en améliorant la diversification du risque. Troisièmement, des analyses historiques ont montré que les allocations basées sur le risque sur-performent l'allocation par les capitalisations.

Cependant ces allocations basées sur le risque ont des inconvénients. Le principal étant que les allocations alternatives utilisent des estimations de la matrice des variances-covariances. L'estimation de cette matrice est une problématique de recherche en-soi et différents estimateurs ont été proposés dans la littérature sans qu'une solution ne s'impose en particulier. Ainsi la littérature sur les allo-

[4]Par exemple nous avons mené une étude sur des données de performance extra-financière propriétaires, de janvier 2008 à juin 2013 sur l'EuroStoxx. Nous nous sommes concentrés sur les performance de portefeuilles pondérés par les capitaux et équipondérés. Les résultats de cette étude sont identiques pour les portefeuilles pondérés par les capitaux. Pour les portefeuilles équipondérés nous trouvons une surperformance significative des portefeuilles ISR. Cette différence de résultat peut s'expliquer par les différentes caractéristiques des univers d'ISR. L'univers ASPI est très restrictifs, il contient seulement 120 titres de l'EuroStoxx qui en contient plus de 300. De plus l'EuroStoxx est un sous-ensemble du STOXX Europe 600 obtenu selon des critères de liquidité. L'univers BIC propriétaire est moins restrictif. Il a pour objectif de retenir 2/3 du MSCI Europe qui en contient plus de 400. En conséquence le biais taille est plus marqué dans l'ASPI que dans l'univers BIC propriétaire. En moyenne sur les historiques respectifs, la capitalisation des entreprises retenues dans l'ASPI est 3.11 fois plus importantes que les entreprises non retenues. Celle des entreprises de l'univers BIC propriétaires est seulement 1.32 fois plus importantes. Il y a plus d'entreprises peu visibles dans l'univers BIC propriétaire ce qui rend l'équipondération plus intéressante d'un point de vue performance.

cations alternatives met en avant le risque d'estimation des paramètres. Cela entraine des problèmes de stabilité des allocations alternatives qui se caractérisent par un turnover important, ainsi que des problèmes d'optimalité des solutions qui se caractérisent par des performances *ex post* moindres. Pour minimiser cet inconvénient, les gérants d'actifs ont développé différentes implémentations pour chaque allocation basée sur le risque. L'investisseur doit alors choisir l'implémentation qui correspond le mieux à ses objectifs.

En parallèle, des travaux de recherche montrent que les entreprises n'ayant pas de politique de RSE sont considérées comme plus exposées à des événements extrêmes négatifs. L'échantillon de données de ce sous-projet de recherche illustre cette exposition. Notre intuition est alors que l'analyse des politiques de RSE permettrait d'améliorer l'estimation de la matrice de VCV et dans tous les cas modifiera les caractéristiques des allocations alternatives. Afin d'explorer la deuxième partie de cette intuition nous analysons la composition, la diversification, le taux de rotation et la distribution des rendements des portefeuilles pondérés selon une allocation alternative.

Comme précédemment nos analyses portent sur quatre méthodes d'allocations basées sur les risques, l'équi-pondération, la diversification maximale, la variance minimale et l'équi-contribution au risque. Pour les allocations qui le nécessitent nous utilisons quatre estimateurs de la VCV. Nous utilisons un univers d'actions Européennes (i.e. EuroStoxx) du 15 Mars 2002 au 1 Mai 2012, et notre univers d'ISR est obtenu à l'aide de l'analyse extra-financière de VIGEO et de son indice ASPI. Nous estimons les rendements de ces différents portefeuilles ce qui nous permet de comparer la composition, la diversification, le taux de rotation et la distribution des rendements des portefeuilles. Pour l'analyse de la composition, nous estimons les différences en poids et en composants pour chaque allocation alternative sur les univers d'investissement disponibles à chaque rebalancement des portefeuilles. Pour l'analyse de la diversification, dans un premier temps nous collectons des statistiques de risque et les poids pour chaque portefeuille à chaque rebalancement. Puis dans un second temps, nous estimons la différence moyenne relative (i.e. la DMR est mesure de concentration proche de l'indice de Gini) pour chacune de ces distributions à chaque rebalancement. Pour l'analyse du turnover, nous estimons les taux de rotation des poids et des composants pour chaque portefeuille à chaque rebalancement. Ces deux dernières analyses sont complétées par des régressions qui nous permettent d'estimer les relations qui existent entre différentes variables et les niveaux de diversification ou de turnover.

Pour la diversification, nous estimons (i.e. FGLS) le modèle suivant:

$$\text{DMR}_{it} = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{A\bar{S}PI} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{A\bar{S}PI} * \text{D}_i^{Strategies} + \beta_9 * \text{Controls}_{it} + \varepsilon_{it}$$

Pour le taux de rotation des composants, nous estimons (i.e. FGLS) le modèle suivant:

$$\text{Tc}_{it} = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{A\bar{S}PI} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{A\bar{S}PI} * \text{D}_i^{Strategies} + \beta_9 * \text{Controls}_{it} + \varepsilon_{it}$$

Pour le taux de rotation des poids, nous estimons (i.e. FGLS) le modèle suivant:

$$\text{Tw}_{it} = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{A\bar{S}PI} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{A\bar{S}PI} * \text{D}_i^{Strategies} + \beta_9 * \text{Controls}_{it} + \varepsilon_{it}$$

Enfin pour l'analyse des rendements des portefeuilles nous estimons différentes statistiques sur la période d'analyse complète.

Ces analyses montrent que les allocations alternatives allouent moins de richesse sur les émetteurs ayant une politique de RSE. Cela est causée par les caractéristiques mathématiques des allocations basées sur le risque et le biais taille introduit par la sélection BIC. Les allocations basées sur le risque favorisent les entreprise ayant un faible bêta, ce qui tend à favoriser les petites entreprises, alors que la sélection BIC favorise les grandes entreprises. Cela a des conséquences sur l'optimalité des allocations basées sur le risque selon l'univers utilisé. Ainsi les portefeuilles construits sur l'univers d'ISR ont des mesures de diversification différentes. Cependant, du fait du biais taille leur erreur de suivi (*Tracking Error*) de l'EuroStoxx est plus faible. Toutes choses égales par ailleurs les portefeuilles construits sur l'univers d'ISR ont un taux de rotation supérieur. Cela s'explique par le turnover de l'ASPI qui s'ajoute au turnover de l'allocation et celui de l'EuroStoxx. Enfin, tous les portefeuilles pondérés selon une allocation basée sur le risque et construits sur l'univers d'ISR ont des performances absolues supérieures au portefeuille pondéré selon les capitalisations. Cela est en ligne avec la littérature empirique sur le sujet. Ces résultats en dépit des limites inhérentes aux exercices de test historique confirment que les allocations basées sur le risque peuvent être modifiées par l'utilisation d'un univers d'ISR. L'adoption d'un univers d'ISR n'est pas neutre et nécessite donc une attention particulière de la part de l'investisseur.

Chapter 2

A literature review of Corporate Social Responsibility and Socially Responsible Investment

"Growth advocates change the justification for their paradigm rather than changing the paradigm itself."

Dennis Meadows

Conference at Smithsonian Institution Washington, DC – March 1, 2012

2.1 Three questions on Corporate Social Responsibility and Socially Responsible Investment

Corporate Social Responsibility (CSR) is a relatively ancient expression. Since introduction of businessmen responsibility by Bowen in 1953 (Carroll 1999), CSR acronym has been broadly used among different contributing disciplines from ethics to economics and from pure normative to positive contributions. When analyzing this diverse literature, it is possible to draw a field of research which analyses relationships between firms and society, and which is interested in the fundamental and ancient question of role(s)[1] of firms in society. Despite

[1] The role is the set of normative rules that an individual or an organization is expected to comply with to be accepted as a member of the society. Some of those rules are implicit

common underlying research question, complexity of the latter has led to a multiplicity of concepts and definitions all named CSR. Because of multiplicity of contributions, scope of our review has to be limited to some contributing disciplines.

The purpose of this literature review is to list contributions to three different but related questions on Corporate Social Responsibility and Socially Responsible Investment. Each section can be considered as a standalone literature review though they are obviously related. Hence in Section one we focus on first question: what is Corporate Social Responsibility? In Section two we focus on second question: what are the consequences of Corporate Social Responsibility on firms and society? This section mainly proposes a thematic review of contributions introduced in Section one. In Section three we focus on third question: what is Socially Responsible Investment (SRI)?

In Section one we present main concepts and definitions associated to CSR acronym, with a particular focus on concepts and definitions from economics. The main purpose of this section is to review different contributions so as to understand not only the economic literature on CSR but also the broad approach to CSR. Despite what seems to be fundamental differences between those approaches, we propose that an interdisciplinary way of defining CSR will refer to firm's beyond-legal-compliance behaviors in the social interest. Then we review economic literature about CSR, as it is defined by economic approach and those using similar definition. Finally in last sub-section we conclude this section on CSR.

In Section two we focus on consequences of beyond-legal-compliance behaviors on Corporate Financial Performance (CFP) and externalities of activities of the firm. Hence in first sub-section we focus on the relationship between beyond-legal-compliance behaviors and CFP. We review theoretical and empirical contributions to the question. In a second subsection we focus on the

(cultural norms) others are explicit (rights and laws) (Boudon and Bourricaud 1982).

relationship between beyond-legal-compliance behaviors and reduction of externalities of activities of the firm. Finally in last sub-section we conclude the section on the consequences of beyond-legal-compliance behaviors on CFP and externalities of activities of the firm. The purpose of section two is to review contributions that gauge the desirability of CSR.

In Section three we focus on financial extension of CSR: SRI. We detail negative, positive and other forms of SRI, their relationships with theoretical approaches of CSR, their justifications and we present the important research question about performances of SRI. The latter question is closely related to the literature on the consequences of Corporate Social Responsibility on firms and society. The purpose of section three is to review contributions that transpose questions reviewed in Sections one and two to the asset management world.

Finally, in Section four, we conclude and list questions that need further research according to this literature review.

2.2 What is Corporate Social Responsibility?

In this section we propose a review of researches associated to CSR acronym. In first sub-section we introduce a general presentation of research associated to CSR acronym. In second sub-section we focus on economic research associated to CSR acronym. Finally in third sub-section we review literature on CSR, as it is defined by economic approach.

2.2.1 A general presentation of research associated to Corporate Social Responsibility

Pursuing the objective of defining what is CSR, we find that there are plenty of approaches all named CSR and that the research associated to CSR is criticized.

Why is there a multiplicity of approaches associated to CSR acronym?

We have been able to identify a specific line of theoretical literature that is interested in analyzing multiplicity of approaches associated to CSR term. To our best knowledge main contributions are proposed by Garriga and Melé (2004), Windsor (2006) and Carroll (1999). Those articles propose explanations for such multiplicity. For Carroll (1999) this multiplicity of definition associated to CSR term is caused by the evolving nature of businesses and relationships between latter and society. For Garriga and Melé (2004) each CSR concept they have identified is focused on one specific function, of the AGIL sociological paradigm, of corporations in society while it implicitly includes assumptions on the three others. We point out that Garriga and Melé (2004) as well as Windsor (2006) are also interested in finding a way to aggregate the different approaches they identify (see Appendix A). Thanks to our literature review, we find that the different researches associated to CSR acronym analyze relationships between firm and different constituents of society and, that they are interested in the fundamental and ancient question of role(s) of corporations in society. Finally for some academics the multiplicity of approaches associated to CSR is such, that they speak of CSR as a field of research interested in the question of role(s) of corporations in society, rather than a closed concept or theory (Crane et al. 2008 Part I Chapter 1). In our research we do not follow this proposition and we will stick to the economic definition of CSR we will introduce later.

For us the multiplicity of concept and definition for CSR follows from the complexity of relationships between corporations and society. In details, the researches associated to CSR term analyze relationships between firm and society (see Figure 2.1). The set of relationships between firm and society is a complex object. It is complex because, it mixes moral considerations with physical considerations[2]. And, it is complex because you can also imagine as much relationships as stakeholders, which is a highly contextual concept (R. Edward Freeman 1984). Second, depending on researchers' approach, either positive or normative, you can have respectively a multiplicity of contributions[3] interested in explaining or describing relationships between firm and society or, you can have an infinity of subjective contributions interested in justifying roles for firms (see also Wood 2010). To sum up, multiplicity of definitions follows from researcher's theoretical approach, from which relationship between firm and stakeholders is studied and from which aspect (moral or physical) of the relationship.

At the end of the day, what is CSR?

At our best knowledge when it comes to select and review main recent approaches associated to CSR term, Garriga and Melé (2004) and Melé's chapter in Crane et al. (2008) are cited. The latter proposes to focus on four approaches, the Shareholders' Utility Maximization, the Corporate Social Performance (among others Wood 1991, Carroll 1979, Baron 2009), Corporate Citizenship and, Stakeholder Theory (among others R. Edward Freeman 1984, Jones 1995). Garriga and Melé (2004) note that these four approaches are all valid from a positive perspective. They are all able to describe and explain what are doing corporations. However from a normative perspective, because they come from different sciences, authors propose that they overlap, oppose or complete each others.

The shareholders' utility maximization under constraint of the law and customary ethics is the economic approach of the role of firm in society. Thanks

[2]It is sociological distinction between interdependence, where agents act independently, following their preferences and suffer/enjoy externalities from others' choices, and interaction, where agents act jointly regarding roles in presence, which are sets of normative rules. Some of them are explicit (rights and laws), others are implicit (cultural norms) (Boudon and Bourricaud 1982).

[3]Ostrom (2007) has discussed the phenomena of disciplinary blinkers which is at stake in explaining multiplicity of positive contributions associated to CSR term. The phenomenon of disciplinary blinkers is the implicit subjectivity created by theoretical choices of researcher. See also recent survey written by Orlitzky, D. Siegel, et al. (2011).

to our literature review, we find that the economic approach of CSR can be split in two branches, a traditional approach and a modern one, we will detail the two in next sub-section. According to Crane et al. (2008) (Part II Chapter 3), shareholders' utility maximization approach proposes that the only social responsibility of corporations is to make profit under constraint of the law. Because the only relevant stakeholder is the shareholder, the goal of the corporate is to maximize the shareholders' utility by maximizing the corporate economic value. This approach goes along with the Agency Theory (Jensen and Meckling 1976). Shareholders' utility maximization is the main model used in society, it is supported by the law and by 200 years of economic researches on efficiency (Jensen 2002). However shareholders' utility maximization is also criticized. It is a welfarist conception of well-being, indeed economic performance is not the whole public good (cf. Sen 1970). It is based on "unacceptable theories of property" (Donaldson and Preston 1995). In addition the invisible hand of Adam Smith that justifies the relationship between social benefits and shareholders' utility maximization may be destroyed by externalities, asymmetric information (Arrow 1973 in Crane et al. (2008) Part II Chapter 3) and by the effect of short-term bias (Bénabou and Tirole 2010b). We also note that Shareholders' Utility Maximization is based on a strict mono-functional way of organizing society and economy. The latter may be inappropriate to our actual global context where the state has lost a lot of its regulation power, possibly leading to a monolithic society denounced by Levitt (1958) (see Appendix C). Finally in a very recent working paper, Magill et al. (2013) formalize these different criticisms and show that when usual economics framework is modified to better fit the reality (i.e. the assumptions that firms are infinitesimal is released, large firms are authorized) the competitive equilibrium obtained by shareholders' utility maximisation is never Pareto optimal, and this equilibrium can be improved with a stakeholders' utility maximization objective. Despite these limits and this latter theoretical criticism, our researches will stick to the modern economic approach of CSR which is still the dominant approach.

The Corporate Social Performance (CSP) approach proposes that businesses, apart from wealth creation, have responsibilities for social problems created by activities or by other causes, beyond its economic and legal responsibilities. CSP is presented as a brother concept of CSR (Wood 2010) and it is proposed to be basically defined as the outcomes and effects on society of organization's activities regarding organization's responsibility. In details, Carroll 1979 defines Corporate Social Performance as a three elements concept. The latter are "a basic definition of social responsibility[4], a listing of issues in which social responsibility exists and a specification of the philosophy of response to social issues" (Garriga and Melé 2004). Relations between CSP and CSR is clear in previous definition, CSR is a basic component of CSP. Another related definition of CSP is proposed by Wood 1991. She proposed that CSP is "a set of descriptive categorizations of business activity, focusing on the impacts and outcomes for society, stakeholders and the firm itself" (see also Wood 2010). Improving CSP "means altering corporate behavior to produce less harm and more beneficial outcomes for society and people" (Wood 1991). Finally a recent definition of CSP has been proposed by Baron 2009. For him CSP is just the costly beyond compliance actions in the social interest. He adds that if CSP is motivated by moral duty, then it is CSR (See Annex D).

The Corporate Citizenship evolves from an equivalent of philanthropic responsibility to a general responsibility while firm is understood as a part of the society, as a citizen. Corporate Citizenship highlights the fact that corporations are a part of society. Hence it overcomes the narrow economic purpose proposed by economists. But it is a diffuse concept (cf. Crane et al. (2008) (Part II Chapter 3)). In addition if responsibilities are well documented, Crane et al. (2008) (Part II Chapter 3) ask about the rights of corporations.

[4] "Carroll considered that a definition of social responsibility, which fully addresses the entire range of obligations business has to society, must embody the economic, legal, ethical, and discretionary categories of business performance." Garriga and Melé (2004).

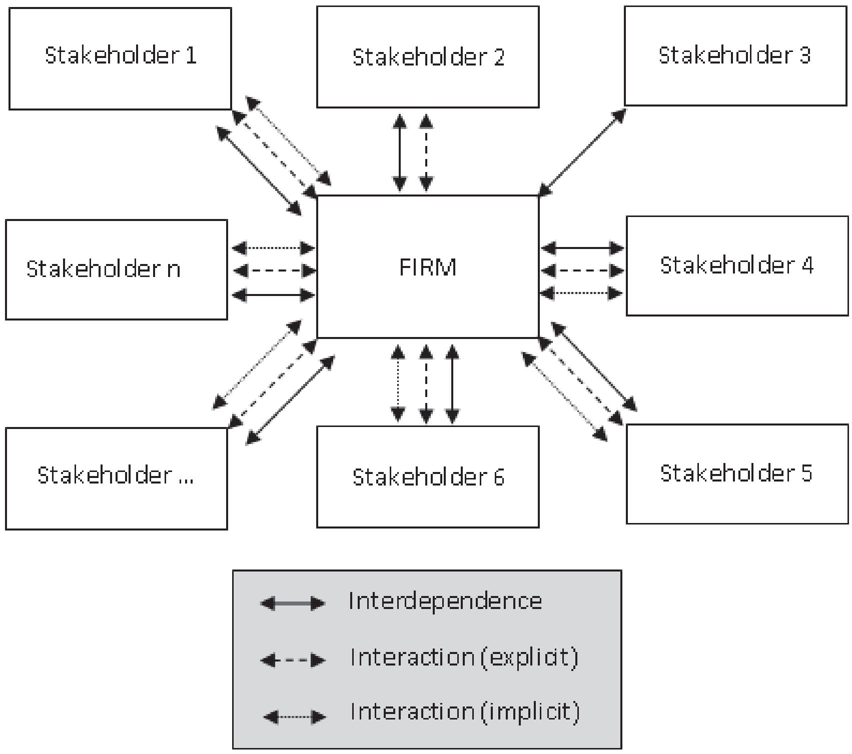
The Stakeholder Theory (R. Edward Freeman 1984) is presented as the dominant alternative approach to Shareholders' Utility maximization (cf. Crane et al. 2008 (Part II Chapter 3)). It proposes that "Corporations have an obligation to constituent groups in society other than shareholders and beyond that prescribed by law or union contract" (Crane et al. 2008). The authentic responsibility of corporations is to create value for stakeholders, without separating business from ethics (cf. Separation thesis in R. Edward Freeman 1994, Harris and R. E. Freeman 2008). Stakeholder Theory is said to be characterized by an ethical superiority to shareholder value theory regarding stakeholder rights and legitimate interests. It is also said to be a new approach of property rights, which recalls that rights create duties (Donaldson and Preston 1995), and a new approach of relationships between stakeholders, which recall advantages of cooperative rather than opportunistic behavior (Jones 1995). A negative aspect of Stakeholder Theory is that objective function is too complex or not specific enough to being maximized (Jensen 2002). This lack of specificity may create moral hazard (Jensen and Meckling 1976) for managers who can escape from any responsibility by invocating some stakeholders' interests (Tirole 2001). The recent paper of Magill et al. (2013) proposes elements of solution to these different issues.

To sum up, the Stakeholder Theory, the Corporate Citizenship and the Corporate Social Performance (except the recent definition of Baron (2009)) share a common point. They consider a broader set of roles for firm than the sole shareholders' utility maximization role. For these approach the acronym CSR means a firm's set of roles. This is why they are the broad approach of CSR. On the contrary the economic approach of CSR only consider the shareholders' utility maximization role. For this approach the acronym CSR means the costly beyond-legal-compliance behaviors in the social interest. Note that for the broad approach of CSR beyond-legal-compliance behaviors in the social interest are the manifestation of the implicit rules firms have to comply with.

This subtle and fundamental difference in roles of firm in society explains why Baron (2009), an economist, says that broad approach is normative. Finally we point out a recent paper of Porter and Kramer (2011) who develop the concept of shared value. This concept can be categorized in the economic approach of CSR and basically calls for the commoditization of civil society. We do not develop further the concept in our literature review because we do not know yet the importance of this approach in the field.

To conclude previous and current sub-section, Figure 2.1 presents the relationships between firm and society. As introduced in sub-section on multiplicity of definition of CSR, firm has a given set of stakeholder, this set depends on the firm which is under scrutiny. Usually main groups of stakeholders considered are: governments, investors, political groups, customers, communities (i.e. social environment in which the firm operates), employees, trade associations, suppliers (Donaldson and Preston 1995). Then depending on the context, the management of the firm has different kind of relationships with its stakeholders. By definition, all stakeholders have at least a physical relationship with the firm which are the set of positive or negative externalities enjoyed or suffered (i.e. interdependence). Then most of stakeholders have an explicit moral relationship with the firm which are rights and laws of the place where the relationship is occurring (i.e. explicit interaction). Finally stakeholders can have an implicit moral relationship with the firm which is the set of customs of the place where the relationship is occurring (i.e. implicit interaction). For broad approach of CSR, CSR is the whole set of explicit and implicit interactions, where interdependence creates implicit interaction. For economic approach of CSR, only implicit and explicit interaction with shareholders as well as explicit interaction with stakeholders matters (this is the case because they rely on state to regulate so as to create explicit interaction). In addition CSR is defined as the beyond-legal-compliance behaviors in the social interest. They are the manifestation of implicit interactions for broad approach of CSR.

Figure 2.1 – The object studied by research associated with CSR acronym



What are criticisms against involvement of firm into beyond-legal-compliance behaviors in the social interest?

The main critics is about the possible consequences on social welfare of involvement of firm into such behaviors: is it good or bad from consequentialist point of view? Beside traditional economic criticisms (Levitt 1958, Friedman 1970, Jensen 2002) which are developed in Appendixes B and C, it is possible to find criticisms from other disciplines. Hence in Crane et al. (2008) (Part III Chapter 7) Hanlon remarks that despite being introduced as a challenge for corporations, the involvement of firm into beyond compliance behaviors in the social interest may be seen as a commoditization of large part of civil society. Risk for society is therefore the one of living in an hyper capitalistic society. Interestingly this conclusion regarding a monolithic society driven by corporations is similar to the one of Levitt (1958). It is also similar to Friedman (1970) conclusion even if the latter raises the risk of a monolithic society driven by political process, which he presents as being socialism (see Appendixes B and C). A related and common criticism which brings insight on why such hyper capitalistic society might appear is the one of Kuhn and Deetz in Crane et al. (2008) (Part III Chapter 8). They remark that contemporary corporations are incredibly skilled to cope with challenges they face by reconfiguring them into a way which suits their interests (see section on Strategic CSR). Therefore they are skeptic regarding real effect of firms' beyond compliance behaviors in the social interest. Margolis and Walsh (2003) also introduced other references supporting the same skepticism about benefits of such behaviors. In the same vain but through the modern economic lens, Bénabou and Tirole (2010b) raise economic practical challenges for CSR seen as Delegated Philanthropy (concept detailed in next sub-section) and its final impact on social welfare. We detail consequences of CSR in second section.

We now turn to next sub-section about economic research associated to CSR term.

2.2.2 Presentation of economic research associated to Corporate Social Responsibility

In this sub-section we focus on economic research associated to CSR acronym. We first present traditional theoretical literature then we focus on modern theoretical literature, we conclude the sub-section with presentation of typology of costly beyond-legal-compliance behaviors in the social interest.

What is the traditional economic approach?

For traditional economics, which is well described by Friedman (1970), the only role of corporations in society is to create wealth the most efficiently possible under constraint of the law and customary ethics. The state is the unique social group legitimate to correct externalities and redistribute wealth regarding preferences of majority. There may be a risk for freedom and free entrepreneurship (i.e. capitalism) if roles of main groups constituting economy are mixed. Traditional economic approach challenges the legitimacy of broad approach of CSR[5]. Margolis and Walsh (2003) propose that the challenge comes in three distinct forms. First form is that "firms already advance social welfare to the full extent possible" This form is well represented by Jensen (2002). Second form is that "the only legitimate actors to address societal problems are freely elected governments". This is a part of the well-known criticism formulated by Friedman (1970). As introduced previously the latter also warned that applied rigorously, "social responsibility doctrine" would lead to a generalized political process to decide objectives to be served, which is basically socialism (see Appendix B). A similar but more developed point of view has been proposed by Levitt (1958), we develop his main points in Appendix C. Third and last form is that "if firms do get involved, managers must warn their constituencies so they can protect themselves from corporate misadventures" completed by the statement that market will ultimately selects best corporations. Authors proposed for the latter point are Easterbrook and Fischel (cf. Margolis and Walsh (2003)).

To sum up, traditional economic approach of CSR is based on Shareholders' Utility Maximization and dichotomy between state and market roles (Levitt 1958, Friedman 1970, Kitzmueller and Shimshack 2012, Bénabou and Tirole 2010b). This approach criticizes a broad set of roles for firm, and beyond compliance behaviors. Margolis and Walsh (2003) have summarized traditional economics criticisms as misappropriation and misallocation of funds of the firm. We now turn to recent contributions from economics.

What is the modern economic approach?

Thanks to our literature review, we find that because of the development of industry and academic approaches considering a broader set of roles for

[5]Broad approach of CSR is an approach which considers a broader set of roles for firm than sole shareholders' utility maximization. Where beyond-legal-compliance behaviors are a manifestation of implicit rules firm is expected to comply with.

firm, modern economic literature associated to CSR term seems to be more inclined to discuss the question than traditional economic literature previously reviewed. Nevertheless they share the same postulate regarding role of the firm in society. Utility maximization of shareholders is the only objective function of the firm and for managers. This common postulate has two consequences. First is that the modern economists define CSR following an approach very similar to Friedman's one. They relate CSR to profit and law to propose to define CSR as being "the corporate social or environmental behavior that goes beyond the legal (regulatory) requirements of the relevant market(s) and/or economy(s)" (Hay et al. 2005, Kitzmueller and Shimshack 2012, see also Lyon and J. W. Maxwell 2008). We note that there are refinements of this definition (see Appendix D).

Second consequence of this postulate is that modern literature is concerned by same issue than traditional one: What is the legitimacy of doing beyond compliance actions in the social interest? Difference is that issue is left open and investigated, leading to new issues. Hence interested economists investigate why some managers engage their firm in corporate social responsibility (i.e. CSR defined as costly beyond-legal-compliance behaviors in the social interest) while it seems incoherent with the objective function of the firm and general well-being, from point of view of economics. It appears that this counter intuitive behavior may be justified if complex set of preferences are assumed. These developments lead economists to distinguish types of beyond compliance actions according to their motivations and impacts on profit (Kitzmueller and Shimshack 2012, Lyon and J. W. Maxwell 2008, Baron 2001, implicitly in Friedman 1970). We now turn to presentation of typology of costly beyond-legal-compliance behaviors in the social interest.

How economists organize costly beyond-legal-compliance behaviors in the social interest?

First trend of typology finds its roots in Baron (2001) and Friedman (1970) contributions. In details, Baron (2001) proposes to distinguish CSR motivated by altruism, profit maximization and threats by activists. Related typology proposes two types of CSR: altruistic and strategic CSR[6]. The latter combines CSR motivated by profit maximization and threats by the activist. Regarding impacts on financial performance, Baron proposes that in the absence of opportunities for strategic CSR, a negative correlation between CSR and financial performance is consistent with altruism. Nevertheless in presence of opportunities, we detail latter in the part about strategic CSR, we have an ambiguous situation and a positive correlation is consistent with both profit maximization and altruism[7]. In same trend, Lyon and J. W. Maxwell (2008) present Friedman's typology. As introduced previously in traditional economic literature review, Friedman seems to distinguish unprofitable actions made in the social interest, which are proposed to be real CSR, from profitable ones, which are "hypocritical window-dressing" for self-interested actions (see also Appendix B).

Final contribution we have reviewed in this trend of typology is the one of Kitzmueller and Shimshack (2012). He proposes to distinguish CSR motivated by shareholders' social preferences and CSR motivated by profit-maximization based on stakeholders' social preferences. Related typology proposes respectively two types of CSR: Not For Profit and Strategic CSR. It is worth to be noticed that we understand that Not For Profit is not similar to Altruistic CSR. Actually the latter seems to be included in the first and Not For Profit CSR should be understood as CSR motivated by any extrinsic or in-

[6]Baron 2009 recently distinguished between morally motivated CSP, which is "true" CSR, and self-interested CSP, which is the former strategic CSR. It may be seen as the Friedman's typology.

[7]Baron 2009 recently developed further this proposition by stating that the financial performance is maximized only in the profit maximisation case.

trinsic incentive other than profit incentive. Regarding impacts on financial performance, Kitzmueller and Shimshack (2012) proposes four cases. It is important to note that Kitzmueller and Shimshack (2012) typology discuss the final level of profit, and assume that managers always maximize profit under diverse constraints. First case is when shareholders are purely monetary minded and stakeholders are socially/environmentally minded: it is strategic CSR case with profit maximization. Second case is the opposite: it is not for profit CSR case with negative effect on level of profit. There are additional costs that "cannot be rolled over to stakeholders" (Kitzmueller and Shimshack 2012), profit is maximized under additional constraints and is lower. Third case is when shareholders and stakeholders are both socially/environmentally minded: it is not for profit CSR case with ambiguous effect on level of profit. Fourth case is when shareholders and stakeholders have both purely monetary preferences: it is the no CSR case. Therefore it appears that not for profit CSR may lead to higher profit (i.e. third case). We note that this trend of typology is widely used. Consequently what is called strategic CSR is relatively well studied and as said before we will detail this literature in specific sub-section.

A second way to build a typology of CSR is proposed by Bénabou and Tirole (2010b): Long term profit maximization, delegated philanthropy and insider initiated CSR are proposed. We detail these three interpretations of CSR.

First Bénabou and Tirole (2010b) recall the CSR business case (Porter and Kramer 2006) that proposes that doing good can help firm to do well. Bénabou and Tirole (2010b) propose two interpretations of this CSR business case. First is that CSR is to do a long term profit maximization. Indeed they recall that firms suffer from a short-term bias which often causes inter-temporal loss of profit and negative externalities. CSR seen as long-term profit maximization is therefore a win-win situation which reduces negative externalities and improves inter-temporal profit. A sub-case of long-term profit maximization is strategic

CSR which has been previously introduced. Motivation for long term profit maximization is just long term profitability where shareholders understand their interest to behave responsibly toward society.

Second interpretation is that CSR is triggered by Delegated Philanthropy. In this approach some stakeholders have some demand for Social Responsible Behaviour (SRB) (Bénabou and Tirole 2006) that only firms can realize. Stakeholders are ready to pay for their realizations. This interpretation groups the different cases of the typology of Kitzmueller and Shimshack (2012). When firms cater an identified demand for SRB that is expressed by consumers it may be understood as a particular case of strategic CSR as defined by Baron (2001). When firms cater an identified demand for SRB that is expressed by employees it may be understood as an other particular case of strategic CSR (see next sub-section). When firms cater an identified demand for SRB that is expressed by shareholders it may be understood as the not for profit CSR previously introduced. Motivations for Delegated Philanthropy are found in stakeholders' motivations for SRB. The profit is maximized by managers under constraints imposed by stakeholders which support the additional costs (i.e. lower wage, higher price, lower profit).

Third interpretation is insider initiated CSR. It is when some managers, similarly to stakeholders, demand for SRB. They sacrifice funds of the firm for satisfying their own demand for SRB. This type of CSR is the one discussed by Friedman (1970). Motivations for insider initiated CSR is found in managers' motivations for SRB. Only this last interpretation of CSR may raise issues of corporate governance that may lead to a profit that is not maximized (Bénabou and Tirole 2010b). We understand the latter proposition of Bénabou and Tirole (2010b) as follows: assuming that only managers demand for SRB, they will impose on stakeholders a cost (higher price, lower wage or higher cost) that is not required by any of them and therefore profit is not maximized (lower demand, less skilled employee or lower profit). On the contrary assuming that other stakeholders demand for same SRB than managers we have ambiguous situation about profit maximisation. Finally the two last interpretations for CSR are triggered by complex set of motivations (Bénabou and Tirole 2006). We will review these motivations when analyzing not for profit CSR.

We have introduced modern economic theoretical literature, which basically recognizes complexity of relationship between firm and society but, with the help of complexity of human motivations, develops a strategic approach of CSR and denies any other responsibilities than maximization of shareholders utility under constraint of the law. We have also introduced the economic compatible definition for CSR which leads to a typology distinguishing not for profit and strategic CSR. Despite its limits (see Appendix E), this typology is the one commonly used by main economic contributions to CSR literature. It appears that this typology is also used by other literatures on CSR which adopt a similar definition for CSR. It is particularly true for strategic CSR which is studied in different disciplines. In next subsection we review the corresponding literature.

2.2.3 A review of literature on Corporate Social Responsibility as defined by economics

In this subsection we review literature of CSR when the latter is defined as beyond compliance actions made in social interest. We first briefly present general contributions on strategic CSR, and then we present and focus on some economic contributions on strategic CSR.

The Contributions about strategic Corporate Social Responsibility

About the general analysis of strategic CSR, involved researchers propose specific determinants for strategic CSR. We remark that they are all issued from economic theory which seems the best for studying strategic CSR. Nevertheless the way these economic factors are developed and treated is more focus on single firm behavior than economic approaches. Therefore listed by Orlitzky, D. Siegel, et al. (2011), some of them consider CSR as a product differentiation strategy and using management tools, resource based view of the firm, with supply/demand model find factors that influence level of investment in CSR when motivation is strategic (McWilliams and D. Siegel 2001). Similar supply/demand model have been conducted regarding investors preferences, it shows how CSR could influence market value of shares when there is a demand for such responsible investments (Mackey et al. 2007). On the same subject of market value of shares, empirical studies have shown that the intensity of CSR is negatively related to the implied expected cost of capital[8] (Dhaliwal et al. 2011 and Ghoul et al. 2011) through asymmetry of information and investors recognition (Merton 1987, Amihud and Mendelson 1986). Other researchers consider the issue of transaction cost between stakeholders and a specific firm, when ultimate goal is to increase stakeholder satisfaction. In this context CSR may increase trust and therefore it may reduce transaction costs (King (2007), Hosmer (1995), Jones (1995) reviewed in Orlitzky, D. Siegel, et al. (2011)). A last line of research is focus on "micro-level" relationships between CSR and individuals related to the firm, such as employees, decision makers. Some researchers have studied the impact of CSR on employees' involvement in the firm (Stites and Michael (2011) reviewed in Orlitzky, D. Siegel, et al. (2011), Cespa and Cestone (2007)), others have studied the impact of leadership behavior in CSR outcomes (Waldman, Siegel and Javidan (2006) reviewed in Orlitzky, D. Siegel, et al. (2011)). Finally Lundgren (2011) has summarized the different costs and benefits of investment in CSR using a private cost/benefits analysis and an investment model in goodwill capital. He obtains a formal model to analyze the investment behavior of firm regarding CSR.

[8]Stock's implied expected cost of capital is defined as the expected return that equates its current price to the present value of its expected future free cash flows. The latter is given by analyst forecasts.

About the economic analysis of strategic CSR, involved economists propose specific determinants for strategic CSR behavior. Listed by Cavaco and Crifo (2010), some of them consider CSR as a product differentiation strategy (among others, Besley and Ghatak 2007, Becchetti 2006, Manasakis et al. 2007, Baron 2009), others consider CSR as a private provision of a public good which is valued by consumers (among others, Baron 2009, Besley and Ghatak 2007, Bagnoli and Watts 2003) or as regulation preemption behaviors (among others, J. Maxwell et al. 2000, Baron 2003b, Lyon and J. W. Maxwell 2008, Calveras et al. 2007) and response to private activism threats (Baron 2001, Baron 2003b, Baron 2009). Out of this list but related to product differentiation strategy, Bazillier and Vauday (2010), Lyon and J. W. Maxwell (2011), discuss advertising aspect of CSR and the strategic behavior called greenwashing.

A similar list of determinants for strategic CSR is proposed by Kitzmueller (2008). He lists six relevant theoretic frameworks within which strategic CSR can arise. Labor markets, Product Markets, Financial Markets, Private activism, Public Policy and Isomorphism. We briefly focus on labor markets and isomorphism and let financial market for section on SRI. Some economists consider that CSR might affect interaction between employees and employers (Bowles et al. 2001, Brekke and Nyborg 2004, Besley and Ghatak 2005). Isomorphism is when there is no "social pressure group" but a pressure from institutional environment and commonly, locally, shared norms (Marquis et al. 2007). It has to be controlled when analyzing effect of regulation on strategic CSR (cf. Kagan et al. (2003)).

In details, product differentiation strategy has been treated through vertical and horizontal differentiation duopoly models. In these models firms produce a combined good which is compounded of a good or service part and a SRB part. It is sometimes presented as credence good (Bazillier and Vauday 2010). Horizontal differentiation models consider combined good production as a problem of firms' localization in space of social responsibility. They model impacts of competition and consumers' heterogeneous taste for SRB part on firms' localizations (Becchetti 2006). Vertical differentiation model consider combined good production as a problem of quality. They model impacts of competition and consumers' heterogeneous taste for quality (Manasakis et al. 2007). In the two cases the choice of practicing CSR is the optimal one. It improves profit and social welfare. Becchetti (2006) propose that price-location game has an agglomerated equilibrium decreasing while cost for CSR and taste uncertainty for CSR increase. In addition for a mixed oligopoly model (i.e. model with a non-profit firm competing with for-profit firm) fair-trader entry leads competitor to increase its level of CSR. These results find real world applications. Indeed it is possible to observe large firms imitating pioneers by proposing products with the same less stringent green label[9]. Finally Manasakis et al. (2007) propose a prediction for empirical testing, linking investment in CSR with higher profit.

We now turn to public good provision model and start with the hybrid model of Besley and Ghatak (2007). It mixes product differentiation with public good provision model. They propose to define CSR as a private provision of public good. In their model we have two types of consumers, neutral and caring consumers regarding this public good provision. They find that in a competitive market CSR is possible and desirable, as long as non caring consumers are neutral to public good provision. Provision level does not exceed optimal level and disappears if state provides required level of public good provision. We now focus on the public good provision model of Bagnoli and Watts (2003). They propose to study the level of provision "arising from companies seeking a competitive advantage in their products markets" assuming that consumers are willing to pay and to consume combined good. They find that private provision of public goods is inversely related to competitiveness of combined good

[9]Think to retail companies proposing range of product labeled with European organic label which is known to be less stringent than labels adopted by pioneers.

market. In addition provision is biased for "public goods for which consumers have high participation value".

We now turn to regulation preemption, or regulation shaping strategies. Private politics (i.e. activism for socially responsible corporation) opposed to public politics (i.e. democratic process to formal regulation) is studied by some economists. Lyon and J. W. Maxwell (2008), Baron (2003b) and J. Maxwell et al. (2000) present and discuss different strategic aspects of preempting future regulations (i.e. "taking enough action that the potential benefits of collective action no longer justify its cost" Lyon and J. W. Maxwell (2008)). And when preemption is impossible they discuss strategic aspects of shaping future regulation. In particular J. Maxwell et al. (2000) show that self-regulation is a Pareto improvement compared to statu quo situation and state regulation situation. In addition stringency of self-regulation increases while threat of state regulation increases, which may be so "because of reduction in consumers' informational and organizational costs"[10]. Nevertheless Calveras et al. (2007) discussed the potential negative overall effect of private politics on level of negative externalities. Indeed in a model where two types of agents, activist and non activist, buy a product which causes negative externalities. In a model where two types of politics, private and public, are available to determine the level of regulation regarding some negative externalities. Assuming that technology to diminish negative externalities is costly. The authors propose that if activists are sufficiently numerous but still in minority compared to non activists it is possible that private politics leads to free rider equilibrium. In this equilibrium, non activists decide for a softer formal regulation to obtain less costly good while they benefit from activists' consuming effort to reduce negative externalities.

We now turn to greenwashing and information factor. Indeed in previous

[10]This last result may explain why CSR, which may be seen as a self-regulation, is increasing in a world where information is cheaper. cf. introduction of Bénabou and Tirole (2010b).

model impact of asymmetry of information has not been studied explicitly (except Becchetti (2006)). When introducing asymmetry of information, since consumers are ready to pay more for combined goods, firms have an incentive to advertise for a social responsible behavior while doing no effective actions. This strategic behavior is the idea convey by concept of greenwashing. Bazillier and Vauday (2010) propose a modelling of greenwashing using a model of communication initially proposed by Dewatripont and Tirole. Using this model and empirical testing based on VIGEO data bases, they propose that "hard greenwashing", defined as an active communication with no CSR at all, is not a credible strategy. They propose the concept of "light greenwashing", defined as partly substituting communication to CSR. Lyon and J. W. Maxwell (2011) propose a modeling where firms disclose information regarding their environmental performance and non-governmental organizations (NGOs) may audit and penalize liars. They find that NGOs auditing may have a perverse effect and may induce particular firms to be reluctant to disclose any information on their environmental performance. Intuition behind this result is that firms which are claiming for good environmental behavior get more virulent attacks from NGO if an environmental failure happen[11]. In addition such self-promoting behavior may be perceived as good corporate image seeking (cf. Dark side of image concern in Bénabou and Tirole (2006)) and so they are labeled as greenwashing behavior by NGOs. Finally firms which are more incited to greenwash are "those with an intermediate probability of producing positive environmental and social outcomes". Finally Lyon and J. W. Maxwell (2011) remark that: "Activists often attempt to punish greenwashers, while giving other firms with less stellar environmental records a pass". They cite Baron (2003b) who proposes to model activists' behavior with a rule and not with an objective function since they may be "intransigent" type. Lyon and J. W. Maxwell (2011) conclude on the need to study more closely motivations

[11] Type of firm which are incited to such behaviour are therefore well performing firms but "not fully informed about the environmental impacts of their actions.".

of activists since they have a key role in controlling and punishing corporate greenwashing.

We finally conclude our review of strategic CSR with strategies within labor markets. Bowles et al. (2001) and Besley and Ghatak (2005) similarly study interaction between extrinsic and intrinsic incentives and their impacts on labor contracting. It appears that intrinsically motivated employees can provide a high level of effort with lowest monetary incentives if intrinsic incentives are provided. Brekke and Nyborg (2004) argue that CSR can help to reduce moral hazard in the labor market and can serve as a screening device to attract morally motivated employees. According to these contributions, CSR can be strategically used by employers to obtain more motivated employees at a lower monetary direct cost. A last line of literature reported by Kitzmueller (2008) develops the idea that CSR will be used by inefficient managers as a protection against dismissal (Cespa and Cestone 2007). This insurance can be cancelled out, leading to higher firm value, with explicit stakeholder protections such as ethical indexes and audits.

The Contributions about not for profit Corporate Social Responsibility

Having reviewed contributions on strategic CSR we turn to contributions on not for profit CSR. At our best knowledge analysis of not for profit CSR seems to be far less explicitly developed than analysis of strategic CSR. Hence we are only able to propose contributions from economics which involve contributions of Behavioral Economics. As discussed in annex E, it may be possible that not for profit CSR type is hiding self interested motivated cases of CSR which are at least partially overlapping with strategic CSR. The analysis of motivations behind such behaviour provides good explanation. Bénabou and Tirole (2006) (see also Bénabou and Tirole (2010b) and discussion in Kitzmueller (2008) or Kitzmueller and Shimshack (2012)) propose that motivations to engage in social responsible behavior are divided in three distinct forms. First is altruism, an intrinsic motivation, which may be sub-divided in pure altruism and impure altruism. Pure altruism is related to public good consumption while impure altruism is related to the "joy of giving". Second is material incentive, extrinsic motivation, which may be illustrated by money rewards or tax relieves. Third is self or social esteem, reputation motivation, combined with the assumption that agents want to appear intrinsically rather than extrinsically motivated. With this approach in mind and assuming the importance of corporate image in buying decisions (Friedrichsen 2013), it becomes less obvious than not for profit CSR is a complete distinct type of CSR, only motivated by intrinsic incentives.

2.2.4 Conclusion on Corporate Social Responsibility

In this section we reviewed literature associated to CSR term with a particular focus on economic contributions. By doing so, we have first understood that because of the complexity of relationships between firms and society, there are a multiplicity of approaches to CSR. We have also remarked that shareholders' utility maximization and stakeholder theory are the two dominant approaches for describing role(s) of firms in society. For shareholders' utility maximization the only role of corporations in society is to create wealth for the shareholders, the most efficiently possible, under constraint of the law. For stakeholder theory a broad set of roles for firm is proposed, where it has to maximize stakeholders' wealth. Then, after a brief discussion to try to disentangle the different definition of CSR, we have introduced a typology of CSR. It distinguishes not for profit CSR from strategic CSR. Not for profit CSR should be understood as CSR motivated by any extrinsic or intrinsic incentive other than profit incentive. Strategic CSR is CSR motivated by profit maximization. Despite ambiguity of this typology, caused by a paradox of ethics applied to economics, it appears to be widely used and we have reviewed main contributions on strategic CSR in the different strategic domain identified by

Kitzmueller (2008).

Our concluding thoughts regarding literature on CSR are, first, that CSR term does not bear the same signification for all researchers. To simplify, it may be the narrow and closed economic meaning, or it may be the broad and open meaning. This situation may be impossible to disentangle since it seems that two different viewpoints regarding role of firm in society are at stake. Second, when evaluating whether an action is good or not it is possible to rely either on motivations driving the action either on consequences of this action, it is the opposition between deontological and teleological ethics. Therefore we should not forget that strategic CSR is not an altruistic motivated social responsibility but a very profit maximizing motivated behavior. Then despite the fact that we have evidences that strategic CSR may be related to financial performance which, from a teleological and modern economic point of view, seems good, there are three concerns about its desirability. First, motivation is not altruistic but self-interested which is commonly perceived as bad (Bénabou and Tirole 2006), and therefore actions with such motivations may be bad from deontological point of view. Second, researchers working in the field frequently raise the weakly studied question about the final impact of strategic CSR on society, which echoes third concern where traditional economics and others researchers raise a possible dangerous consequence for freedom of such hypocritical window dressing. Finally, the question about the final impact of CSR on society is also common to beyond compliance behaviors in the social interest which are motivated by altruism.

Having reviewed what is CSR in general and in economics, having reviewed a typology for CSR as it is defined by economics, we have now enough material to turn to the second section of our thematic review and we focus on the consequences of beyond-legal-compliance behaviors on Corporate Financial Performance (CFP) and externalities of activities of the firm.

2.3 What are the consequences of Corporate Social Responsibility on firms and society?

In this section we propose a review of researches which bring elements to the question of the consequences of CSR (i.e. CSR defined as beyond-legal-compliance behaviors in the social interest). This section mainly proposes a particular review of contributions introduced in section one. In first sub-section we focus on impact of CSR on financial performance of the firm (i.e. CFP). In second sub-section we focus on impact of CSR on externalities of activities of the firm.

2.3.1 What is the relationship between Corporate Social Responsibility and Corporate Financial Performance?

In this sub-section we focus on literature interested in the relationship between CSR and CFP. We first present origin and history of the question, then in a second time we review empirical and theoretical contributions interested in analyzing relationships between CSR and CFP. Finally we present the actual answer to this question and its limits.

What is the origin of the question?

Thanks to our literature review, we find that the research on the relationship between CSR and CFP started in the seventies in response to traditional economics criticisms toward CSR (i.e. misallocation and criticism). This specific question still remains an hot topic because of the complex nature of research on the role(s) of firm in society. In details it is possible to compile a large empirical and theoretical literature interested in the relationship between corporate financial performance and CSR. Origin of this line of literature is described by Margolis and Walsh (2003) and Wood (2010). The two propose that in a context[12] where corporate social role of the firm was to maximize shareholders' utility, researchers interested in involvement of firms in society affairs studied the impact of CSR on profitability in order to investigate theoretical critics from traditional economists. Indeed the latter basically concluded to, at least, inefficiency of CSR regarding role of firms. As noticed by Guenster et al. (2011) result of these analysis is that "CSR proponents have put forward a long list of the advantages to corporate social responsibility" regarding profitability of firms (e.g. Strategic CSR, CSR business case, Porter hypothesis). Hence since the beginning of the seventies empirical and theoretical research on relationship between CSR and financial performance has grown. Because of various limitations affecting previous empirical research (McWilliams and D. Siegel 2000, Griffin and Mahon 1997) and because of multiplicity of theoretical contributions, this line of literature is still developing. Researchers are still working on the impact of level of CSR on financial performance and financial characteristics of the firm (e.g. Cavaco and Crifo 2010, Bauer and Hann 2010, Orlitzky, D. Siegel, et al. 2011). We note that the recent working paper of Magill et al. (2013) explains why researchers have been able to find strategic advantage to CSR, and it might also put an end to this line of literature by neutralizing its fundamental interest (i.e. is CSR misallocation of shareholders' funds?).

Is there a relationship between CSR and CFP? The theoretical literature.

The theoretical literature interested in linking CSR to CFP is basically literature on strategic CSR and financial literature on risk-return paradigm. In details, Guenster et al. (2011) propose a description of how theoretical literature on CSR/CFP relationships is organized. They propose that literature has developed into two independent lines of theoretical contributions, a line

[12] First contributions studying CSR/CFP links appeared in the seventies of last century, Bragdon and Marlin (1972), Moskowitz (1972) and first contributions on CSR appeared in the seventies, Carroll (1999).

presented as managerial, and a financial one.

In what they present as a managerial line of theoretical contributions, they propose to introduce as a whole, the contributions to the complex[13] debate between "Friedman's view" and strategic CSR approach, as well as the contributions of disciplines sharing the economic postulate about instrumental role of the firm. As we have previously introduced it exists a large theoretical literature explaining how investments in actions in the social interest (i.e. modern economic definition for CSR) may lead to profit: it is literature on strategic CSR (cf. previous section), on "Porter Hypothesis" (Porter and Kramer 2006) or on the "business case" for CSR (Wood 2010). Briefly as already discussed in subsection on strategic CSR, the latter may be studied as a trust enhancer between firm and its stakeholders and therefore reduces transaction costs. CSR may be seen as a way to reduce turnover and to substitute pride to wage, both reduce costs of employees. CSR may be seen as a product differentiation strategy leading to monopoly rent which increases profit. CSR may be seen as a regulation shaping strategy or regulation preemption, the two reduce threat of burdensome regulation. Finally CSR may be seen as a response to activists' threats.

In financial line of theoretical literature, Guenster et al. (2011) (see also Renneboog et al. (2008)) introduce that "Whether investors benefit from holding stocks of socially responsible companies depends on how financial markets value CSR". To discuss this proposition they present Hamilton et al. (1993) contribution about the response of market to corporate social responsibility. Three scenarios based on the risk-return paradigm are described. First is that market does not value CSR. A strong involvement in CSR is not linked to lower risk. Consequently, expected stock returns are independent from level of involvement in CSR. Second is that market does value corporate social perfor-

[13] As already introduced Friedman supports the fact that actions in the social interest can lead to profit. But he says that they are hypocritical window dressing for profit maximization and that only unprofitable actions in the social interest can be called social responsibility.

mance. A strong involvement in CSR is linked to a lower risk. Consequently, firms with a strong involvement in CSR present a higher value and a lower expected stock return than laggards. Assuming perfect information, difference in price is an equilibrium price. Third is that market does value involvement in CSR but there is imperfect information. Difference in price between leaders and laggards is therefore adjusting while information is spreading into the market. Derwall et al. (2005) find empirical evidence in favor of the undervaluation scenario with a price adjustment process for the environmental dimension of CSR. We have the same conclusion with the Bebchuk's study and governance dimension (Bebchuk et al. 2010). Dhaliwal et al. (2011) and Ghoul et al. (2011) find empirical evidences that implied cost of equity capital is negatively related to level of involvement in CSR (i.e. expected returns implied by financial analysts' forecasts is lower for firms involved in CSR). They justify this observation by two mechanisms driven by information: first, Merton (1987) shows that incompleteness of information lead to lower market value than the perfect information case. The smaller the investor base, the larger the difference is. Second, Amihud and Mendelson (1989) show the existence of a liquidity risk premium. The less liquid the stock, the larger the liquidity premium is. Finally in a demand and offer framework, where some investors value CSR per se, Mackey et al. (2007) theoretically advocate that firms that engage in CSR can experience increases in their market value even if CSR behaviors is a net cost for the firms. In particular these increases can occur when demand for such stocks is larger than offer.

What is the answer to the question?

The answer to the question is empirical. It is possible to find specific contributions interested in analyzing the large amount of empirical results obtained since the seventies. Those contributions are on the one hand literature reviews, and on the other hand meta-analyses.

Main literature reviews are proposed by Griffin and Mahon (1997), Margolis and Walsh (2003), Beurden and Gassling (2008) and Renneboog et al. (2008). Beurden and Gassling (2008) distinguish between two types of financial performance, the market-based measures and the accounting based measures. Market-based measures are stock performance, market return, market value to book value, Tobin's Q, price per share, share price appreciation, ... Accounting-based measures are profitability measures, growth, asset utilization such as ROA, ROE, ...

When market-based measures are used, Guenster et al. (2011) propose a description of how empirical literature on CSR/CFP relationships is organized. There are three subsets of empirical literature: "event studies that explore the immediate effects of social or environmental performance proxies on short-term stock price variability", "regression analyses that attempt to establish a cross-section relationship between CSR and stock returns", "portfolio studies that investigate the benefits of embedding CSR into investment decisions". We note the study of Gregory et al. (2011) that propose to link together this empirical literature that uses market-based measures of performance. They observe that companies involved in CSR have higher market valuations. They also point out that, if some empirical studies find that high CSR firms show high abnormal returns (e.g. Derwall et al. 2005, Bebchuk et al. 2010) these track records are difficult to reconcile with null or negative risk-adjusted performance of SRI funds. They note that the story of higher valuations, but lower funds' returns can be explained by findings of Dhaliwal et al. (2011) and Ghoul et al. (2011): firms involved in CSR have lower cost of capital. And they note that markets are too efficient to give the possibility to fund managers to exploit the same repricing that are caught in some historical studies. Huppé (2011) develops the same idea that out-performance of simple hedging portfolios is caused by assets repricing.

When accounting-based measures are used, empirical literature is mainly compounded of regression analyses more or less sophisticated. For instance we want to stress out two recent studies on relationship, at firm level, between involvement in CSR and financial performance (Cavaco and Crifo 2010) and on relationship between involvement in CSR, CFP and social pressure (Baron 2009). The first supports the existence of a "complementarity premium on specific CSR dimensions (human resources and business behavior towards customers and suppliers)" and that other practices "are relative substitutes (environment and business behaviors)". The second supports the absence of relationship between CSR and CFP or presence of a positive relationship for consumer industries and presence of a negative relationship for industrial industries. These results support the needs for a multidimensional analysis at the firm level.

Coming back to conclusion of the literature reviews, Margolis and Walsh (2003), Beurden and Gassling (2008) conclude on a majority of studies pointing to a positive link between CSR and CFP. The literature review of Renneboog et al. (2008) is focused on the relationship between CSR and CFP using market-based measure (stock price). It concludes first that "event studies show that news releases on corporate environmental performance / responsibility trigger significant share price reactions" (e.g. Krueger 2010) second that good corporate governance, sound environmental standards and care of stakeholder relationships are associated with higher shareholder value, third "investing in firms with sound environmental performance or good corporate governance produces superior abnormal returns for shareholders" (Derwall et al. 2005, Bebchuk et al. 2010). Fourth SRI funds do not outperform or under-perform mainstream funds. The two first conclusions are subjects to limits concerning causality and ambiguity of the effect, despite the recent study of Flammer (2013). We also point out that we can find contributions that criticize some of the methodological aspects of studies on relationship between financial performance and involvement in CSR (e.g. Griffin and Mahon 1997, McWilliams and D. Siegel 2000, see Appendix F). Others also remark that measure of extra financial performance shows limits (Chatterji, Levine, and Toffel 2009, Chatterji and Levine 2005). These two limits raise question regarding reliability of the overall empirical results (Orlitzky, D. Siegel, et al. 2011).

Main meta-analyses are proposed by Orlitzky, Schmidt, et al. (2003) and Margolis, Elfenbein, et al. (2007). They conclude on positive but weak correlation between involvement in CSR and financial performance. Margolis, Elfenbein, et al. (2007) conclude also by empirically connecting prior financial performance to subsequent involvement in CSR. Similarly Orlitzky (2005) has completed its previous work of 2003 by specifying that it seems to exist a virtuous circle between financial performance and involvement in CSR with financial performance being the starting condition since "it takes money to make money". We note that the recent study of Flammer (2013) very elegantly demonstrates that in its sample, involvement in CSR causes financial performance.

To sum up, we note that this is a controversial literature which is not supported by all the conceptual approach of the role(s) of firm in society. Nonetheless we have seen that it is possible to find a neutral to weak and positive correlation between measurement of involvement in CSR and CFP. Causality seems to be bidirectional with financial performance being the starting condition. Nevertheless we note that complexity at stake raised serious questions regarding reliability of this result. In particular reliability of measurement of involvement in CSR is challenged. This complexity induces the needs for more micro-analyses. We now turn to the relationship between CSR and reduction of externalities.

2.3.2 What is the relationship between CSR and reduction of externalities?

In this sub-section we focus on the question on relationship between CSR and reduction of externalities. Our literature review is mainly reduced to contributions already introduced in other part of this paper and just introduces the question of the reduction of externalities.

What is the origin and history of an open question?

Relation between involvement in CSR and reduction of externalities is an open question and needs to be urgently treated to see what is the impact for society. Despite the fact that CSR is sometimes proposed to be theoretically defines as a private provision of public good with desirable theoretical properties (Besley and Ghatak 2007, Heal 2005) its real impact has been, to our best knowledge, weakly studied. This conclusion is pointed out by several researchers which call for a better understanding of what are the impacts on society of CSR (Wood 2010, Margolis and Walsh 2003, Bénabou and Tirole 2010b, among others). We nonetheless point out a quite recent PhD work done by Maas (2009) that tries to treat the lack of research on the subject. The overall conclusion of this dissertation is that "social impact measurement is still in its infancy stage".

In any case the lack of studies on the impact of involvement in CSR is explained by the complexity of defining what is socially responsible (Bénabou and Tirole 2010b), by the complexity of measuring impact of involvement in CSR, and finally by the former and actual importance given to empirical studies of outcomes of involvement in CSR on firm itself[14], including the CSR/CFP link (Wood 2010, Margolis and Walsh 2003). Beside modern economic and broad approach call for more research on the relationship between involvement in CSR and reduction of externalities, traditional economic approach and researchers from others disciplines have a pessimistic opinion for

[14]Empirical literature which, itself, is driven by the original traditional economic criticism of misallocation and by modern theoretical analysis of strategic CSR.

corporate involvement in societal affairs. Their concern is not for corporations' profits (cf. strategic CSR or window-dressing for self-interested actions) but as presented in Appendices B and C, these authors stress the risk of creating a monolithic society if roles of main groups constituting economy are mixed (Friedman 1970, Levitt 1958, Crane et al. 2008 (Part III Chapter 7, 8), Margolis and Walsh 2003). The question is therefore to quickly evaluate what is the net benefit for society to involve corporation is societal affairs. Since we know it seems to pay for firms, does it pay also for society? Methods of cost-benefit analysis are helpful in this.

2.3.3 Conclusion on consequences of Corporate Social Responsibility on firms and society

In this section we reviewed what are the consequences of involvement in CSR. We first studied the research investigating relationship between involvement in CSR and CFP. We note that this research question has been launched in the seventies to respond to traditional economics misallocation criticism. It is still a lively research question because of its complexity and because of the development of research on strategic CSR. We have seen that theoretical literature interested in linking involvement in CSR to CFP is basically literature on strategic CSR and literature on risk-return financial paradigm. Those contributions are nonetheless criticized, notably by supporters of diversification and some researchers from broad approach of CSR. The actual answer to this question, which is subject to limitations, is that there is a neutral to slightly positive effect of CSR on CFP. The relationship presents complex features which necessitates an individual firm analysis. In a second time we have studied another and maybe more important question: the question of impact of involvement in CSR on society. We have reviewed that it is an open question that need to be urgently investigated. Having reviewed literature on impact of CSR on CFP and externalities of activities of firms we now turn to our last section about Socially Responsible Investment.

2.4 What is Socially Responsible Investment?

In this section we review what is Socially Responsible Investment (SRI). In first subsection we develop a general presentation of SRI. In second subsection we review main contributions associated to the term of SRI. Finally we conclude in third sub-section.

2.4.1 A general presentation of Socially Responsible Investment

In this subsection we introduce what is SRI. Generally speaking SRI is a process of financial investment, mainly in quoted stocks[15], where investors include other criteria than financial criteria (Renneboog et al. 2008, Juravle and Lewis 2008, Sandberg et al. 2008, Sparkes and Cowton 2004). These extra financial criteria may be moral, environmental, social or related to firm governance. It is common to distinguish at least two main trends among SRI (Brito et al. 2005, Renneboog et al. 2008).

What is Socially Responsible Investment? A typology.

Positive and negative SRI are the two main types of SRI and are the elementary components of various other approaches. Negative SRI also called ethical SRI, is a financial investment where the objective is extra-financial under constraint of financial performance. It is called negative SRI because it uses negative screening tools which eliminate from universe of investment firms which do not respect a given extra-financial framework. In negative SRI, extra-financial criteria are simple subjective criteria and analysis generally only depends on a good access to information. A famous example of negative screening is the exclusion of sin stocks whatever their financial performance is. Sin stocks

[15] There are now methods of SRI in corporate and state bonds.

are stocks of firms involved in game, alcohol, adult entertainment, weapon and tobacco industries. Beside criteria on activity, there are also criteria on practices, such as blackmail, discrimination, fiscal fraud... Negative SRI is the historical form of SRI (Renneboog et al. 2008). First funds are reported to be created in the twenties of last century in the United-States of America for religious congregations. Negative SRI still exists in its original form but it has also evolved into a modern form of SRI: positive SRI.

Positive SRI is based on academic contributions which propose that firms who respect extra-financial criteria will attain superior financial performance in the long-term (Section 2.3.1). It is mainly an operational discipline. Only classical investment part is strongly theoretically supported. In details positive SRI is a financial investment where the objective is financial performance under constraint of extra-financial criteria. Differently from negative SRI, positive SRI uses positive screening tools which select the best firms from universe of investment according to extra-financial criteria. In positive SRI, extra-financial criteria rely on more sophisticated bases and analyses.

The bases are intimately interrelated and they are the following:

- Sustainable development concept, and the triple bottom line.
- Stakeholder theory.
- Corporate governance concept.

Sustainable development is defined as a "development which meets the needs of the present without compromising the ability of future generations to meet their own needs." (Brundtland et al. 1987). Triple bottom line is application of sustainable development to corporations. The latter have to manage their economic, ecological and social impacts all together. Stakeholder theory has been previously introduced (Section 2.2.2). And finally corporate governance is the set of rules, institutions and practices that affect the way corporation is directed, administrated and controlled (Turnbull 1997).

Regarding the analyses, four inter-related operational types are identifiable (Brito et al. 2005):

- Managerial approach.
- Risks approach.
- Costs approach.
- Intangible value approach.

Managerial approach is to evaluate how a firm is managed regarding its economic, social and environmental objectives. Risks approach is to identify economic, social and environmental risks and to evaluate how well the management is mitigating them. Costs approach is based on the economic concept of externalities. This approach evaluates what externalities may be internalized by regulation, when internalization could occurs, how it may be internalized (e.g. taxes, quotas, pollution reduction laws) and its financial impact. Finally intangible value approach evaluates relationships between intangible value and extra-financial criteria.

Finally in their literature review Renneboog et al. (2008) propose two other forms of SRI. They are presented as third and fourth generation of SRI. Negative and positive screenings are respectively the first and second generation of SRI. In details the third generation of criteria combines negative and positive SRI, and the fourth generation of SRI combines third generation of SRI with shareholder activism. Shareholder activism is when investors use its voting right or engage in direct dialogue with management to influence company's actions (Sparkes and Cowton 2004). It may be possible to find other forms of SRI resulting from various mixes of positive and negative screenings.

Having introduced the main types of SRI, it appears that they have theoretical bases which present close relationships to CSR. We now discuss this remark.

What is the relationship between Socially Responsible Investment and Corporate Social Responsibility?

As already defined, SRI is a financial investment where investors decide on the basis of extra-financial and financial criteria. It is so because whatever form of SRI is considered, it relies on the proposition that firms have other relationships with society than the sole wealth creation role. These relationships induce impacts on society that may matter for investors from an ethical and/or financial point of view. Researches on CSR can be classified in two main trends, a broad one that considers a broad set of role for firm in society, and an economic one that calls for a unique role for firm in society but recognizing the strategic interest of being involved into beyond-legal-compliance behaviors in the social interest. Looking at the two definitions the relationship between SRI and CSR (broad and economic approaches) is relatively obvious and lies in the complex set of relationship between firms and society.

2.4.2 What is the performance of Socially Responsible Investment

In this subsection we develop academic contributions on the performance of SRI. Because of inclusion of extra-financial criteria besides financial criteria there are two types of performance that may interest investors. We first study extra-financial performance then we study financial performance.

The extra-financial performance of SRI is the performance of socially responsible investment regarding extra-financial dimension. As introduced previously there are two main types of extra-financial criteria and extra-financial approaches: the ethical criteria used in negative SRI (original approach), and the more sophisticated and economically rationalized ESG criteria used in positive SRI (modern approach Best In Class). Each type of criteria can lead to one type of extra-financial performance, and each of theses performance can be split in two parts. The first part is about quality of screening process: do the

SRI universe/funds fit the extra-financial framework defined with investors? The second part is about the impact of SRI on firms' behaviours and ultimately on their externalities: do firms modify their externalities? We obtain a 2-by-2 matrix (Table 2.1) where measurement of first type of extra-financial performance of SRI is easy in the case of negative screening, quite easy in the case of positive screening. The difficult part is second type of extra-financial performance of SRI. Difficulties are similar to those faced in measurement of impacts of CSR on externalities created by activities of the firm.

Table 2.1 – Extra-financial performances

	Negative screening	Positive screening
First type of performance	How universe/portfolio is exposed to ethical framework: Is company A in universe/ portfolio? Yes-No	How universe/portfolio is exposed to ESG framework: Is my universe BIC? Yes-No Is my portfolio less exposed to X than the benchmark? Yes-No
Second type of performance	Measurement of impacts of SRI on externalities. Is there a diminution in sin activities?	Is there a diminution in - externalities?

The question of extra-financial performance is important for SRI research since a part of investors seems to invest in SRI funds because they derive an intrinsic utility to do so (Renneboog et al. 2008, Brito et al. 2005). In that case intrinsic utility is a function of the different types of extra-financial performance. Investors that have self-image and impure altruism form of preferences derive utility from investing in funds that fit simple subjective criteria and a given ESG framework. Indeed for these easy cases, a "basic" type of extra-financial performance can be assured to the investors assuming good quality of information and of screening process[16]. But for investors that have pure altruism form of preferences, the utility they could derive from diminishing negative externalities is uncertain because measurement of social impact of SRI is uncertain. Nonetheless Renneboog et al. (2008) have reviewed contributions which analyze the impact of SRI on firms' behavior, and whether or not SRI may induce

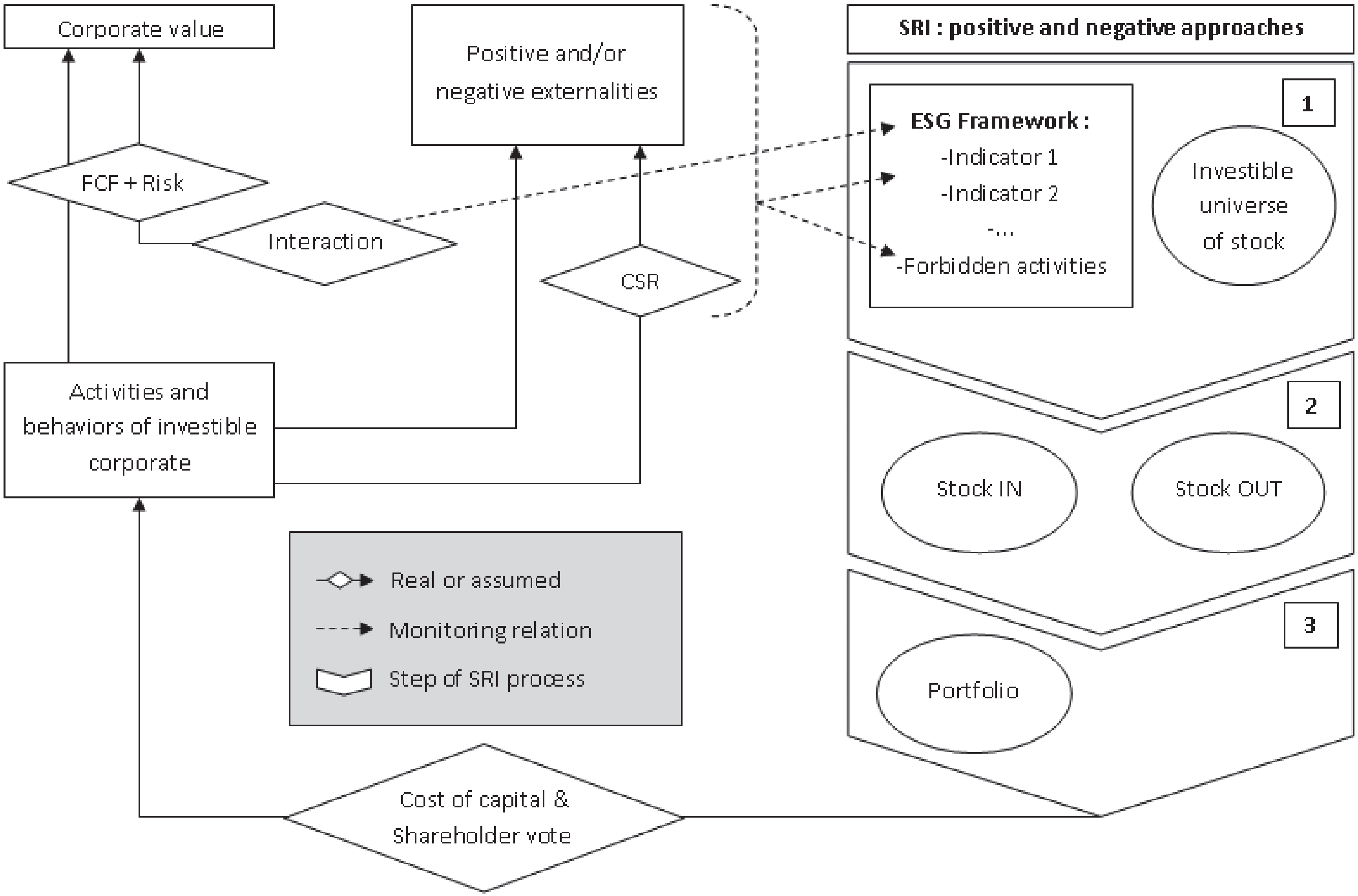
[16]In France there exist a label that certify a certain level of quality of analysis and of screening process. This label is managed by Novethic, a subsidiaries of the Caisse des Dépôts et Consignations, an institution of the French government. Note that this label does not verify the compliance at the universe level not at the portfolio level.

specific behaviors among firms. They listed several empirical and theoretical contributions giving evidence in favor of an impact of SRI screenings on the cost of capital of the firms, which may encourage responsible behaviors. They nonetheless remark that the question still needs further research to be closed. To develop a better knowledge about this second form of extra-financial performance is of first interest for investors choosing SRI funds for pure altruism, and for the others too when this limit of SRI will spread out diminishing the image benefits of choosing SRI funds.

The financial performance of SRI is performance of socially responsible investment regarding financial criteria. In the framework of SRI, financial performance is evaluate at portfolio level with market-based measures and should be risk-adjusted. It is embedded in the asset pricing theory where investment portfolios returns are proportional to risk (Sharpe 1964) and optimal portfolio is a well diversified one (Markowitz 1952), assuming an efficient market. As previously discussed, Renneboog et al. (2008) list issues that SRI reveals, and review empirical evidences about financial performance of SRI funds.

About issues revealed by SRI, if asset pricing theory framework holds, SRI funds cannot outperform conventional funds if the SRI screening process is based on public information (i.e. efficient market hypothesis). Therefore financial out-performance is only possible in two cases. Either SRI screenings process helps funds managers to select securities by revealing hidden information, such as information about the quality of management and the risk of incurring costs during social or environmental crisis. Either market are inefficient in the short run and missprice information on CSR while it leads to long-term financial and economic performance. In both cases the question of the sustainability of such out-performance is raised since the latter should diminish while conventional funds managers incorporate CSR information.

Figure 2.2 – Financial and extra-financial performance of socially responsible investment



About empirical evidences, it appears that there is no out-performance of SRI funds and that, restricting diversification possibilities induces a risk-return cost (Renneboog et al. 2008, Capelle-Blancard and Monjon 2011). These results are consistent with asset pricing theory and the hypothesis that some socially responsible investors derive intrinsic utility from responsible investment explaining why they are ready to sacrifice financial performance (see also Bénabou and Tirole (2010b)). However there is not an unequivocal under-performance of SRI funds compared to conventional funds and Renneboog et al. (2008) point out that it is unexplained and contrary to asset pricing theory "that investing in firms based on public information such as sound environmental performance or good corporate governance produces superior abnormal returns" as it is shown by research on relationship between CSR and CFP (Section 2.3.1). Contributions from Mackey et al. (2007) and in a different framework Gregory et al. (2011) and Huppé (2011) may introduce an explanation for such observations. The study of Gregory et al. (2011) proposes that high CSR firms are rewarded by higher valuations, and the historical studies might catch the repricing of these firms. The study of Huppé (2011) empirically defends the misspricing story.

Finally Figure 2.2 presents the process of socially responsible investment and how financial and extra-financial performance may be created. On the right part of the figure you have the three steps of SRI investment process. The first step is to define the extra-financial framework and the universe of investment. In practice the acronym ESG is used and stands for environmental, social and governance framework. The second step is to apply the ESG framework. It is the screening step. We obtain a group of issuers that fit the ESG framework. The rest of issuers are excluded. Assuming information collection is reliable, the screening step returns one part of the first type of extra-financial performance that is related to fitting the ESG framework. It might also returns financial returns by excluding some type of risks related to negative screening. The third step is to build a portfolio using the selected sub-universe of issuers. In general portfolios are weighted by capitalization and actively managed. This step returns the second part of extra-financial performance that is related to fitting the ESG framework, and it is expected to return financial performance as well as a second type of extra-financial performance which is to have an impact on positive and negative externalities of corporates' activities.

2.4.3 Conclusion on Socially Responsible Investment

We have seen that SRI is a particular way on investing in financial products that associates an extra-financial analysis with the conventional financial one. We have seen that depending on the extra-financial criteria used it is possible to describe different forms of SRI. It now appears that most prevailing form of SRI mixes negative and positive criteria. We have also seen that SRI and CSR have close relationships based on the fact that they both consider existence of complex relationships between firms and society which matter from an ethical and financial point of view. In the second sub-section on SRI we have reviewed contributions on the question of performance of SRI. Because of its multiple objective purposes, SRI performance is divided in two dimensions: the extra-financial performance of SRI, which is the performance of socially responsible investment regarding extra-financial criteria and, the financial performance.

About extra-financial performance we have seen that we may distinguish two types of extra-financial performance, one related to screening and one related to social impact. We have remarked that extra-financial performance related to social impact is difficult to measure and is uncertain. Further research is needed on the effect of SRI on firms' behavior.

About the financial performance, we have seen that there is not an unequivocal under-performance of SRI funds compared to conventional funds but it seems that under diversification induces risk-return costs. These results are in line with asset pricing theory and the derivation of intrinsic utility hypothesis. But we have also seen that there exists empirical result showing that investing in firms according to public information on CSR may lead to positive abnormal returns, which is a puzzling result. Recent empirical studies show that this is probably caused by a misspricing of CSR.

Our concluding though is about the remark that SRI and CSR both consider existence of complex relationships between firms and society which matter from an ethical and financial point of view. The latter remark may be used to differentiate ethical socially responsible investors from strategic socially responsible investors. The first are looking to do good and they are ready to pay for it while the second are looking for out-performance and base their strategy on empirical and theoretical findings on the relationship between CSR and CFP. Having reviewed literature on SRI we now turn to our last section and conclude our literature review of Corporate Social Responsibility and Socially Responsible Investment.

2.5 Conclusion

In this paper we propose our literature review of academic contributions associated to Corporate Social Responsibility (CSR) terminology. In the first part we have reviewed what is CSR. We have decided to focus on approaches from economics while introducing approaches from other sciences. Nevertheless, for the latter part, because of multiplicity of approaches, we do not claim any comprehensiveness. For instance we have not introduced direct contributions from psychology (Boddy et al. 2010, J. White et al. 2009, Maslow 1937), sociology, law (Hay et al. 2005)... In a second part, we have reviewed literature on consequences on firms and society of involvement of firms in society's affairs. And in a third part, we have reviewed literature on Social Responsible Investment (SRI), a brother concept of CSR.

Our conclusion from this literature review are the following:

About multiplicity of approaches associated to CSR term, we have seen that researches associated to CSR term work on relationships between firm and society and are interested in the fundamental and ancient question of role(s) of corporations in society. The multiplicity of concept and definition for CSR follows from the complexity of relationships between corporations and society. This situation has lead some researchers to consider Corporate Social Responsibility as a field of research interested in the question of role(s) of corporations in society, rather than a closed concept or theory. It appears that approaches associated to CSR term are diverse but, excepting economic approach, they share a common point. They consider a broader set of roles for firm than the sole shareholders' utility maximisation function (i.e. economic approach). Moreover for this broad approach of CSR, beyond-legal-compliance behaviours in the social interest are the manifestation of the implicit rules a firm is expected to comply with. We have also seen that Stakeholder Theory is proposed to be the dominant alternative approach to Shareholders' Utility maximisation. Both are therefore defining two approaches of CSR. Despite fundamental differences, we propose that a modern and interdisciplinary conceptualization of CSR is related to firm's beyond-legal-compliance behaviours in the social interest. The main criticism against such behavior which is raised by researchers from very different background, is based on the risk of obtaining a monolithic society.

After a general presentation of the literature, we have focused on contributions from economics. We distinguished traditional approach from modern economic approach. For the traditional economic research associated to CSR term, we have seen that the unique role of corporations in society is to create wealth the most efficiently possible under constraint of the law and customary ethics. Therefore managers' role in society is to maximize the long term wealth of shareholders while state is the unique social group which is legitimate to correct externalities and redistribute wealth regarding preferences of majority. Traditional economists are among those who warn that there may be a risk for freedom and free entrepreneurship (i.e. capitalism) if roles of main groups constituting economy are mixed. For the modern economic research associated to CSR term, we have seen that it assumes that role of the firm is to maximize shareholders' utility. Similarly to traditional economic research it does not propose the multidimensional purpose of firms studied in broad approaches associated to CSR term. In this profit-maximising framework, CSR is defined as beyond-legal-compliance behaviours in the social interest. This definition is not exempt of limits and it may be refined. Anyway, this counter intuitive behaviour may be justified regarding maximization of shareholders' utility if complex set of preferences are assumed. Finally under modern economic approach, CSR appears to be a strategic behaviour with possible important consequences on social welfare and political process. These considerations led to a typology of CSR distinguishing For Profit or Strategic CSR and Not For Profit CSR. Strategic CSR appears to be the most widely studied form of motivations triggering CSR while this typology remains ambiguous.

In a second section we have studied consequences of beyond-legal-compliance behaviours. For consequences of CSR on firms' financial performance, it appears that research on relationship between CSR and CFP started in the seventies in response to traditional economics criticisms toward CSR (i.e. misallocation criticism). It still remains an hot topic but the knowledge is now better organized than before. About contributions to the question, we have seen that the theoretical literature interested in linking CSR to CFP is basically literature on strategic CSR and financial literature based on risk-return paradigm. We have seen that it is possible to envisage an empirical neutral to positive relationships between CSR and CFP. There seems to be a virtuous circle, while financial performance being the starting condition. But due to complexity of the question there are methodological limits to previous empirical results that still need to be treated if possible. About the relationship between CSR and reduction of externalities, it appears that it is an open question that needs to be urgently treated to see what is the impact for society.

In a third section we have reviewed literature about SRI. Hence we have introduced a common typology of SRI distinguishing a positive and a negative SRI which are the two main type of SRI and are the elementary components of various other approaches. We have seen that SRI and CSR are closely related. Both consider the importance of the complex set of relationship between firms and society. We have seen that we may distinguish two types of extra-financial performance, one related to screenings and one related to social impact of SRI. We have noted that extra financial performance related to social impact is difficult to measure and it is uncertain. We have reviewed that there is not an unequivocal financial under-performance of SRI funds compared to conventional funds. On the one hand it is possible to obtain positive abnormal returns by investing in firms according to public information on CSR. The proposed explanation is the repricing of CSR information by the market. On the other hand it seems that under diversification induces a risk-return costs. The latter are in line with modern portfolio theory and the derivation of intrinsic utility hypothesis (i.e. some people are ready to pay for investing according to their belief).

From this literature review we have identified the following questions that need further research:

What is CSR? What is the relationship between the different approaches of CSR, if any?

- Is it possible to conciliate broad and economic approaches to role(s) of firm in society? The question is important to clarify why broad approach seems opposite to economic approach and to find a synthesis that could help to clarify research on the role(s) of firm in society. What is the contribution of Baron (2009) about this question?

- What is firms' motivation for beyond compliance behaviours in the social interest, is it altruism or profit maximization? The question is important for two reasons. First from a normative view point, following Friedman (1970) and Baron (2009), only beyond compliance behaviours in the social interest motivated by altruism are corporate social responsibility, other motivations just trigger normal business behaviours. Second from a positive view point, to know whether CSR is triggered by altruism or profit maximization is important to anticipate dynamics of such behaviour (Bénabou and Tirole 2010a), for instance its sustainability regarding strength of competition, or the level of involvement regarding level of incentives.

What are the impacts of involvement of firms in CSR?

- Whatever motivation is triggering beyond compliance behaviours, is it possible to validate a causal effect between prior CSR (generic economic definition) and CFP? The question is a largely studied one, but as actual results are somewhat controversial it is therefore still open.
- Is it possible to find a different relationship between prior CSR and CFP regarding motivations triggering CSR? The question is important to status if it pays or not, on the long run, to be morally motivated and socially responsible (as defined by Baron (2009)).
- Is there a relationship between CSR and reduction of externalities of activities of the firm? What is the net and social benefit-cost to CSR? The question is important to see whether CSR pays for society and therefore matching benefits to the potential risks of involving firms in society's affairs.
- Is it possible to find a different relationship between CSR reduction of externalities of activities of the firm regarding motivations triggering CSR? The question is important to see whether or not there is a difference be-

tween strategic and altruistic CSR regarding reduction of externalities.

What is the financial and extra-financial performance of SRI?

- What are the mechanisms driving the financial performance of SRI? Why the positive relationship between CSR and CFP does not translate to SRI funds? It seems that information and the way it is incorporated to market play a key role in this line of research.
- Is there an impact of SRI on society? Is SRI helps to modify firms' behaviour through cost of capital or shareholders activism? The question is important for investors that pursue extra-financial objectives and derive pure intrinsic utility from investing in SRI funds.

2.6 Appendixes

2.6.1 Appendix A: about the impossibility to reconcile broad and economic approach of CSR

If an objective of researchers in the field of CSR is to find a normative and positive synthesis of different approaches on relationships between corporations and society, is such a synthesis possible? Our explanation of multiplicity leads to the possibility that it may be not possible to gather the different approach in a global rational one. K. J. Arrow (1950) has developed a formal analysis of what seems to be a similar issue (i.e. how to aggregate individual preferences into a rational social preference). His conclusion is that the only possibility to obtain a rational synthesis of individual preferences is either by imposing one of the point of view to the whole community either by using an exogenous code such as religion, tradition, and ethics.

This criticism is also the strength of the field of research on CSR. Indeed from a positive view point the multiplicity of approach associated to CSR allows to fit different cases of initiative undertaken by corporations (Crane et al. 2008 Part II Chapter 3). And from a normative view point, the multiplicity of approach associated to CSR suggests an inter-disciplinary debate on the role(s) of corporations in society. This debate and absence of consensus may be an illustration of possibility theorem of K. J. Arrow (1950) making visible the different normative standards embedded in the different disciplines. Research on social choice and particularly escapes from possibility theorem could be therefore investigated in order to explain and maybe solve the debate on the role of corporations in society.

2.6.2 Appendix B: Friedman's critics of CSR

Friedman's approach of corporate social responsibility is presented in a famous article. This discussion published in the New-York times is a classic of literature on corporate social responsibility. In particular we focus on distinction between unprofitable and profitable beyond compliance behaviors in the social interest.

Friedman (1970) states that only costly and unprofitable beyond compliance behaviors in the social interest deserve to be named social responsible behaviors. For him corporate social responsibility is a manifestation of managerial agency issue, where managers take money to some stakeholders to give to others. Recent empirical work has been proposed to illustrate this idea (Cheng et al. 2013). In addition we understand that Friedman does not say that beyond compliance actions made in the social interest cannot lead to profit (i.e. strategic CSR studied by modern economic literature on CSR), but for him they are "hypocritical window-dressing" for profit maximization. This distinction is grounded on motivations at stake in accomplishing such behaviors and on economic theory. We understand that Friedman is against CSR since the only CSR he would envisage has to be unprofitable, which is contrary to the unique economic role of the firm in society.

Finally he proposed that profitable beyond compliance actions made in the social interest are dangerous for organization of a free society. It is so because, if we let manager take money to some stakeholders to give to other, the decision of who is taxed and who benefit should result from a democratic process. Friedman therefore argues that all economic decision would be taken through a political process and not a market process anymore, which is socialism. These two points resume Friedman's concerns about a "social responsibility of business".

2.6.3 Appendix C: Levitt's critics of CSR

Levitt (1958) proposes another point of view regarding a broad set of roles for firms in society and beyond-legal-compliance behaviors in the social interest.

Similarly to Friedman (1970) he argues for a clear and distinct functional way of organizing society, "The functions [i.e. roles] of the four main groups in our economy - government, business, labor, and agriculture - must be kept separate and separable". It is the best way to obtain the highest degree of welfare for all society. Otherwise the risk is to lose the pluralistic characteristic of society, which is a requirement for political democracy, personal freedom and capitalism, and to obtain a monolithic society. "The danger is that all these things [i.e. employee welfare programs, involvement in community, government, charitable ...] will turn the corporation into a twentieth-century equivalent of the medieval Church" empowered to rule a "broad spectrum of unrelated noneconomic subjects" through its narrow moneyminded ideas.

Finally he proposes two responsibilities for business, "to obey the elementary canons of everyday face-to-face civility and to seek material gain". And representative of its relatively fair development he concludes by remarking that "Few people will man the barricades against capitalism if it is a good provider, minds its own business, and supports government in the things which are properly government's" (i.e. general welfare issues).

2.6.4 Appendix D: refinements to the definition of CSR for modern economics

CSR is "the corporate social or environmental behavior that goes beyond the legal (regulatory) requirements of the relevant market(s) and/or economy(s)" (Hay et al. 2005, Kitzmueller and Shimshack 2012, see also Lyon and J. W. Maxwell 2008). A narrower definition is that CSR "is about sacrificing profits in the social interest" (Bénabou and Tirole 2010b, Baron 2009). In Hay et al. (2005) the two definitions are discussed. It appears that beyond-legal-compliance behaviors made in the social interest encompass profit-enhancing behaviors and profit-sacrificing behaviors. The first are therefore strategic and the second, according to Friedman, are the only behaviors that would deserve the name of social responsible behavior. In addition Hay et al. (2005) also discussed that profitability dimension has to be considered under the light of time effect.

Baron (2009) has recently introduced a model incorporating these different considerations. He defines CSP as being costly beyond compliance actions in the social interest whatever are the motivations triggering them. Motivations can be strategic or moral. It is a different definition than the one seen in general sub-section on CSR. Here CSP is "the private provision of public goods or the private redistribution of profits to social causes" Baron (2009). This definition may correspond to corporate social responsiveness as defined by Wood (2010). However the two can be matched. Indeed in economics, firms are assumed to comply with the law, and pro-social actions are assumed to benefit to society. In that case the definition from management science collapses to the one proposed by economics. Differentiating corporate responsiveness (pro-social actions) from corporate social performance (outcomes of pro-social actions) is unnecessary since the former is assumed to lead the latter. In economics corporate social performance of firms is the number of pro-social behaviors that are done.

Finally CSP results in benefits that can offset their costs, but subsequent profits are maximized only in the case where motivation is strategic. Similarly to Friedman, Baron (2009) proposes that only morally motivated CSP can be considered as CSR, others are normal business behaviors. But differently from Friedman he envisages that CSR can yield profits, even if morally motivated. In economics, the generic definition of CSR is generally used.

2.6.5 Appendix E: the paradox of ethics applied to economics

The trend of typology relying on profitability and motivations toward profit shows ambiguities and may not be adapted to classify types of beyond compliance behaviors.

First ambiguity lies in the use of impact on profit to infer motivations triggering CSR. Indeed according to Friedman there is a distinction between unprofitable and profitable CSR. Friedman thought that only unprofitable beyond compliance actions in the social interest deserved to be named social responsible behavior (Lyon and J. W. Maxwell 2008). It may be so because in a profit seeking framework with a theory of choice driven by simple set of preferences (i.e. no image or reputation concerns), only unprofitable actions seems to bear unambiguous altruistic motivations[17]. In that case the distinction between profitable and unprofitable CSR sounds relevant and may be used to infer motivation at the basis of studied typology.

But what happens when image or reputation concerns are introduced into utility functions describing agents' behavior (Bénabou and Tirole 2006, see

[17] There is a different interpretation to Friedman's distinction. It attributes to him a more simple thought than the one we propose. Among others Brito et al. (2005) and Beurden and Gassling (2008) propose that Friedman just considers true CSR as charity. It would explain why he proposes that the only true CSR is unprofitable.

also discussion in Kitzmueller and Shimshack 2012): Is profitable CSR really unambiguously self-interested? Is unprofitable CSR unambiguously altruistic?

Actually it is possible to imagine that true altruistic shareholders decide to do an unintended visible beyond compliance action in the social interest which finally creates a profit for the firm because consumers value such behavior (cf. Typology of CSR in Kitzmueller and Shimshack 2012, Baron 2001, Baron 2009). In addition it is possible to imagine that self-interested shareholders decide to do a strategic beyond compliance action in the social interest which does not match consumers' preferences leading to looses. In that case profitability of an action is not a sufficient indicator to infer motivations. Because when broader type of preferences are used, CSR leads to ambiguous consequences on profit whatever is the motivation triggering the action. Within this context we propose that to be unambiguously altruistic CSR should be costly and invisible, which is anonymous charity.

Second ambiguity lies in the proposed dichotomy between action done for profit and those done not for profit. Indeed according to Kitzmueller and Shimshack (2012) and Baron (2001) it is possible that not for profit CSR, altruistic included, may result in profit.

Hence is it still possible to have such not for profit CSR?

Actually it is possible to imagine profit motivated shareholders (Bénabou and Tirole 2006) ready to sacrifice some of their profit to obtain an altruistic reputation and finally making profit because such reputation is good for business (Baron 2009). Doing so they may appear intrinsically motivated but it is a very strategic behavior. Therefore it seems that because of the existence of complex preferences for explaining agents' behavior, the not for profit CSR type is hiding cases which are at least partially overlapping with strategic CSR. We presented what are those complex preferences in our sub-section on not for profit CSR.

Finally the two previous ambiguities are described as a paradox of ethics applied to economics by Brito et al. (2005) which is that moral motivations and economic motivations may result in same consequences. We note that Baron (2009) remark that this conclusion has not been empirically validated, and raise the possibility that citizens see the difference.

2.6.6 Appendix F: criticisms against research on the relationship between CSR and CFP

Beside the theoretical and empirical lines of research looking for a relationship between CSR and CFP, there is a literature criticizing the two.

For instance from the theoretical point of view, we point out McWilliams and D. Siegel (2001), Orlitzky, D. Siegel, et al. (2011) and Wood (2010). First authors advocate that CSR is not associated to higher rate of return. Indeed they explain that price premium is equal to the additional cost engaged to practice CSR. Second authors raise a theoretical concern about performance sustainability of strategic CSR. Indeed the latter is based on strategies leading to competitive advantages for the firm (called Resource-Based View framework in management science). But since a competitive advantage has to be unique, if every firms develop such strategies there is no more competitive advantages. Finally Orlitzky, D. Siegel, et al. (2011) remark that CSR "have been widely adopted by multinational and, increasingly small businesses as well", which feeds their concern. The last author criticizes the theoretical foundation of working on such a relationship. Indeed in its approach of CSR "a firm's FP is seen as one dimension of its overall social performance - not as a competing or contrasting type of performance, and so the hoary search for statistical links between CSR and FP is at best misguided and at worst disingenuous".

In addition it appears that we have similar type of criticism inside financial line of research on relationship between CSR and CFP. Briefly, Bénabou and

Tirole (2010b) and Guenster et al. (2011) (among other authors) are concerned about the sustainability of positive out performance of stocks of firms with strong CSR. Indeed in the case of a mispricing story, investors holding stocks of "responsible" firms should earn higher return during the price adjustment period then a lower return once the adjustment is finished. Another theoretical concern is about violation of diversification principle by reducing universe of investment. At best the SRI portfolio is as diversified as mainstream portfolio.

Finally, from the empirical point of view, the fuzzy situation of various empirical results has been described as a "data in search of theory" situation by Ullmann (1985). His main points, "(a) a lack in theory, (b) inappropriate definition of key terms, and (c) deficiencies in the empirical data bases currently available" are still, fully or partially, valid today. Similar contributions are cited in Beurden and Gassling (2008) (Davidson and Worrell 1990, and Ruf et al. 2001).

Chapter 3

Raising Companies' Profile with Corporate Social Performance:

Variations in Investor Recognition and Liquidity Linked to VIGEO CSP Rating Disclosures

3.1 Companies' profile and corporate social performance

Since the mid-1950s, increasing interest has been shown worldwide in environmental and social themes, with for example international climate conferences and debate on national and international regulations. The business world is no exception: the "social responsibilities of the businessman" have been debated since 1953 (Carroll 1999). A recent contribution by Baron (2009) defines corporate social performance (CSP) as the set of activities that extend beyond the requirements of the law or regulations and that involve the private provision of public goods or private redistribution[1]. For example, CSP implies improved employment conditions, environmental protection, investment in local communities, in short, any activities that contribute to sustainable development, as defined by Brundtland et al. (1987).

[1] Baron (2009) also distinguishes between CSP motivated by strategic motivations and that motivated by moral duty; the latter constitutes Corporate Social Responsibility (CSR). Note that there are varying opinions about pro-social behaviors characterized by a fuzzy theoretical framework that attempts to combine approaches from various fields including ethics, sociology and economics.

CSP is now a component of business activity, reported to investors along with other core operations (Dhaliwal et al. 2011) and evaluated by rating agencies such as Vigeo. During the 1970s, the concept of CSP, though not clearly defined, triggered a lively stream of empirical and theoretical studies investigating how it is linked to corporate financial performance (CFP). While empirical studies report neutral to weakly positive correlations between CSP and market or accounting-based CFP (Renneboog et al. 2008), formalized approaches that rely on individual preferences relegate any form of CSP to the status of a means rather than a cause of improvement in CFP. However this situation, sometimes referred to as "data in search of theory", is changing. Recent empirical contributions that test the CSP-CFP relationship (Dhaliwal et al. 2011, Ghoul et al. 2011), propose serial mechanisms to link firms' CSP with liquidity and investor recognition of their securities, and ultimately with their cost of equity capital (e.g. Merton 1987, Amihud and Mendelson 1989). Figure 3.1 illustrates these serial mechanisms.

Figure 3.1 – Serial mechanisms linking CSP to CFP

Here, we empirically investigate the first step of such serial mechanisms. CSP ratings could increase the liquidity of rated firms through an informational effect, because rating agencies bring additional information to the market (Cellier et al. 2011), as well as through a volume effect, triggered by variations in investor recognition. In addition, CSP ratings could increase investor recognition by reducing the costs of information and bringing rated firms to attention of previously unaware investors. We address three key research questions in this respect. First, is the liquidity of stocks of rated firms greater after the rating than before? Second, is investor recognition greater after the rating than before? Third, is the magnitude of these changes related to the level at which firms are rated?

Using a sample of 478 European listed firms, rated between 1999 and 2010, we find an average increase in liquidity and investor recognition associated with rating initiations. In addition, we find empirical evidence that supports a positive relationship between rating level and magnitude of variations in liquidity, and this appears to interact with firm size. We also find empirical evidence of a positive relationship between rating level and magnitude of variations in investor recognition for small capitalization firms, although this relationship appears to be negative for large capitalization firms. Overall, our empirical results are consistent with reduced asymmetry in the information component of liquidity, improved investor recognition for small and possibly neglected firms, and with the presence of preferences regarding level of CSP.

Our study thus contributes to the academic literature in several ways. First, while most prior research on the relationship between disclosures and liquidity focuses on financial disclosures and ratings (Odders-White and Ready 2006, Healy and Palepu 2001), our study is, to the best of our knowledge, the first investigation of variations in liquidity and investor recognition using a sample of CSP ratings. This is also the first time that the possible relationship between the magnitude of these variations and the level of CSP ratings has been investigated. Second, our study complements recent empirical analyses by Dhaliwal et al. (2011) and Ghoul et al. (2011). We explicitly analyze the empirical relationship among CSP rating, liquidity and investor recognition, which Ghoul et al. (2011) simply assume, and which Dhaliwal et al. (2011) test only partially in the different context of voluntary CSP disclosures. Further, we use a sample of European listed firms, in contrast with the previous samples of U.S. listed firms. Note that we rely on Vigeo CSP ratings, whereas they used annual data from KLD. Third, we extend existing empirical research

(Cellier et al. 2011) indicating that the Vigeo CSP rating brings information to the market.

Our results have important implications for practitioners. First, investment in corporate social responsibility (CSR) represents a potential alternative way to improve market quality for a firm's stock, as opposed to liquidity provider contracting or market listing transfer[2]. Because of their low profile, small firms would be the main beneficiaries. Second, when a company's board investigates CSR investment opportunities, it should consider that the cost of doing so may be partly offset by an increase in the firm's market value. Finally, from an asset manager's perspective, CSP disclosure becomes a factor that has an impact on portfolio performance through its effect on firm valuation. In both the latter two cases, the benefits come about as a result of liquidity enhancement and the subsequent decrease in the cost of capital.

The remainder of this article is organized as follows. In the next section, we briefly summarize the theoretical literature that explains why CSP may affect liquidity and size of investor base. We also review the empirical literature that uses these factors to test the relationship between CSP and CFP and formulate the hypotheses we propose to test. In Section 3, we introduce our data sources, variables and sample selection criteria, as well as presenting descriptive statistics on the sample. In the presentation of our empirical strategy and results, we analyze how they answer our three main research questions. The last section concludes.

[2]For example, on the NYSE Euronext stock exchange, stocks' liquidity can be improved by either market makers or liquidity providers, who compensate for the lack of demand from investors. Another way to increase a stock's market quality as well as raising a firm's profile is to move from one market listing to another. However, market listing transfer is costly for a firm, both in terms of fees and of compliance with regulation.

3.2 Theoretical background and testable hypothesis

We will address three key research questions on variations in liquidity and size of investor base. In this section we discuss the theoretical explanations for such variations and we state the hypotheses we intend to test.

Regarding liquidity, the theoretical literature reveals that the implicit and explicit costs of transacting drive the liquidity of a security (Amihud and Mendelson 2000, H. Stoll 2003). Thus, one way to measure the liquidity of a security is to consider its bid-ask spread. Why should the bid-ask spread of rated stocks be smaller after rating than before?

To answer this question, we are particularly interested in the uncertainty cost components of bid-ask spread (H. Stoll 2003): the inventory risk cost, the free trading option cost and the asymmetric information cost. In addition, considering the correlations among volume, uncertainty cost components and size of investor base (Amihud and Mendelson 1989), we are also interested in a volume factor.

Indeed, in this theoretical framework, we hypothesize that CSP ratings modify the liquidity of rated firms through an informational effect, because rating agencies bring new kinds of information to the market (Cellier et al. 2011), as well as through a volume effect triggered by variations in size of investor base and in investors' holdings (Figures 3.2 and 3.3 arrows (c) for volume effect). The informational and volume effects should affect the uncertainty cost components of spread by modifying uncertainty about stock prices of rated firms. As mentioned, an identical framework and assumptions were used by Ghoul et al. (2011) and Dhaliwal et al. (2011) in their respective papers on the relationship between corporate social performance and cost of capital. In addition, more (fewer) investors lead to higher (lower) transaction volume which reduces (increases) the inventory risk cost component[3] (H. Stoll 2000).

[3] We point out that volume has also a positive effect on liquidity by reducing the cost of order processing and by increasing competition between market operators.

Because CSP ratings seem to raise volume (Cellier et al. 2011), liquidity should therefore increase.

Moreover, we hypothesize that the informational effect can be separated into two components, one of which depends on the level of CSP ratings, where a low level of CSP decreases liquidity. Indeed, the rating level gives traders additional information about the specific risks of rated firms; low rated firms are considered riskier by investors (Waddock and Graves 1997, Hong and Kacperczyk 2009). Therefore, this difference in the level of uncertainty about stock prices of rated firms should show up in the size of uncertainty cost components of spreads (Figure 3.3 arrow (a) for risk effect). The second component is independent of rating level and should be added to the first component. Indeed, because the Vigeo ratings provide new information about the operational management of rated firms, whatever their ratings, the information asymmetry between insiders and common traders should be modified. This decrease in information asymmetry should also reduce the size of the asymmetric information cost component of spreads, liquidity should therefore increase (Figure 3.2 arrow (a) for asymmetry of information effect).

Finally, because small firms have a low profile, they bear larger transaction costs than large firms (Demsetz 1968). We hypothesize that the magnitude of variation should be greatest for small firms, and diminishing as the size of the rated firms increase.

The three following hypotheses summarize the above:

Hypothesis 1-1: The overall informational and volume effects of CSP ratings are to diminish the bid-ask spread.

Hypothesis 1-2: The previous effects of CSP ratings on the bid-ask spread diminish with increasing size of the rated firms.

Hypothesis 1-3: There is a positive relationship between level of CSP rating and magnitude of variation in the bid-ask spread.

We propose to measure investor recognition by the size of firms' investor base. Why should the investor base be larger after the rating than before?

In answer to this question, it is commonly known that investors invest only in a limited proportion of the overall security market. This behavior leads to segmented securities markets. Merton (1987) explains this situation by the incompleteness of information and by factors such as institutional restrictions. According to Merton (1987), incompleteness of information results from the costs of information, which accrue from the costs of producing, sending and receiving information. The first two types of costs are incurred by firms, but the third type is investors' responsibility. Thus, investors follow only a limited number of securities. Regarding institutional restrictions, Kadlec and Mcconnell (1994) illustrate the existence of prudent investing laws and traditions that rule out investment in particular firms. For example, socially responsible investment plans exclude investments in poor-CSP firms and thus cause market segmentation.

In this framework, we hypothesize that CSP ratings may modify the investor base through a recognition effect, because rating agencies provide investors with new information regarding CSP, and reduce the costs of gathering this information (Figure 3.2 arrow (b) for cost of information effect). Rating agencies probably enjoy economies of scale and have specific skills in terms of collecting and processing large quantities of extra-financial information about listed firms, providing investors with large sets of homogeneous information that is easier to collect and process. They may bring to light neglected firms that do not produce their own information about CSP. An identical framework and similar assumptions were proposed by Ghoul et al. (2011), and partially tested by Dhaliwal et al. (2011) in the context of voluntary disclosures.

In addition, we hypothesize that the magnitude and sign of recognition effect depend on the rating obtained (Figure 3.3 arrow (b) for institutional restriction effect) and on the visibility of firms before they get rated, and that the two factors interact. Indeed, assuming that large firms, in contrast to small firms, have a high profile, we hypothesize that for neglected good-CSP firms, CSP ratings increase the size of the investor base by sending a positive signal to unaware investors. In contrast, for small poor-CSP firms, CSP ratings decrease the size of the investor base by sending a negative signal to all investors. For large firms, because the firm is assumed to have a high profile, we hypothesize that CSP ratings have a negative or null effect on size of investor base. This may be because they decrease the base of investors who see high CSP as evidence of agency issues (Friedman 1970, Cheng et al. 2013), or, it may be due to the decreased size of the socially responsible investors. We finally assume that size is a good proxy for visibility.

The three following hypotheses summarise the above:

Hypothesis 2-1: CSP ratings have an impact on size of investor base.

Hypothesis 2-2: There is a positive relationship between level of CSP ratings and variation in size of investor base.

Hypothesis 2-3: The previous effect of level of CSP ratings interacts with the size of the rated firms.

Finally in Figures 3.2 and 3.3 arrows (d) stand for the liquidity premium effect (Amihud and Mendelson 1989), and arrows (e) stand for the risk sharing effect (Ghoul et al. 2011, Merton 1987).

Figure 3.2 – CSP rating, liquidity and investor recognition

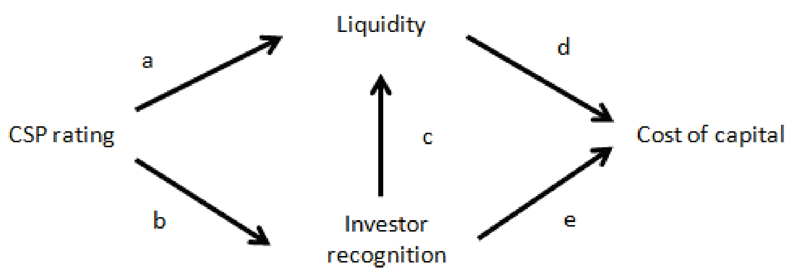
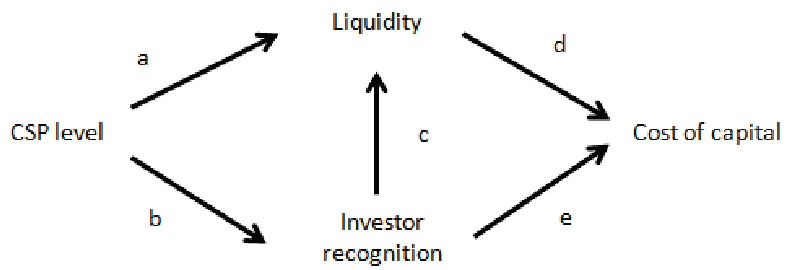


Figure 3.3 – CSP level, liquidity and investor recognition



3.3 Data sources, variables, and sample selection

This section describes our data sources, the sample selection criteria we adopt and the variables we use in our analysis.

3.3.1 Data sources

We build a database by merging data from three sources. The core consists of Vigeo's Environmental Social and Governance (ESG) ratings (see Appendix A). Because the effect of CSR ratings on liquidity and investor recognition may be sticky over time, we focus on initiations, that is on the first CSP ratings published by Vigeo. The CSP ratings evaluate the extent of a firm's involvement in the management of its relationships with society. Vigeo attempts to evaluate six domains: human resources (HR), customers and suppliers (CS), firm involvement in local community (CIN), corporate governance (CG), environment (ENV), and human rights (HRT). Adapted to specific sectors, Vigeo uses weighting to reflect the importance of each criterion for a given sector, estimating a relative rating for each industry, with firms classified as ++, +, =, - or - - in relation to the average absolute rating in the industry to which they belong. The idea is that ratings in a sector are normally distributed. Hence, categories are symmetrically distributed around the average rating. The ++ category comprises the top 5 % performers, the + category the following 25%

and the = category the 40% of the firms that are around the average.

In this paper we use both average absolute and average relative ratings. Relative ratings offer the advantage of controlling for industry effect, which is why we use average relative ratings in our descriptive statistics and univariate-bivariate analysis. This allows us to control for industry effect. Absolute ratings offer more precise information about CSP, but suffer from the industry effect, which is why average absolute ratings are used as an independent variable in our multivariate analysis. To calculate average relative ratings, the +, =, or - are first obtained, by averaging the different relative domain ratings. To do so we transform relative domain ratings (i.e. ++, +, =, - or - -) into integers from -2 to +2, by taking their averages rounded to the nearest integer and finally by transforming the resulting integer back into relative ratings ++, +, =, - or - -. Because the two extreme relative ratings are rare, we group ++ with + firms and - - with - firms in the analyses of interest.

We use the list of rated firms to retrieve financial market data from Reuters and shareholder information from the Thomson One Banker database. 135 firms out of the initial sample of rated firms appear to be missing.[4] Finally, we transform the financial information from foreign currencies to euros.

3.3.2 Variables and sample selection

To asses liquidity changes, we collect and calculate an average end-of-day relative bid-ask spread before and after the rating initiation. Drawing on the existing empirical literature, we control for the usual factors that explain the relative bid-ask spread changes (Demsetz 1968): the logarithm of average end-

[4] A specific trait of Reuters is that information is not kept if it pertains to unlisted or inactive firms. To verify why firms are missing, we cross-check our Reuters database with the Bureau Van Djik Mint database, which keeps information about firms over the last 10 years, whatever their status. We can thus explain 134 out of the 135 missing firms: 94 firms are no longer publicly quoted, 21 went inactive or dissolved and 19 have incomplete financial information. For these entries, we lack information for each date in one or more of the following categories: bids, asks, prices, or volumes. We therefore have a survivor bias in our studied sample.

Table 3.1 – Descriptive statistics for variables

Variables before/after rating	**Mean**	**Min.**	**Median**	**Max.**	**Std. Dev.**	**Description**
$1/\text{Price}_b$	0.131	0.001	0.071	1.154	0.163	Inverse of end-of-day price
$1/\text{Price}_a$	0.133	0.001	0.070	1.259	0.170	
$\Delta 1/\text{Price}$	0.001	-0.130	0.000	0.884	0.045	
$Ln(\text{Volume}_b)$	12.022	5.674	11.985	16.616	1.762	Logarithm of end-of-day volume
$Ln(\text{Volume}_a)$	11.984	5.075	12.021	16.635	1.766	
$\Delta Ln(\text{Volume})$	-0.038	-1.499	-0.051	1.439	0.397	
Spread_b (%)	0.454	0.007	0.342	5.629	0.477	End of day proportional spread
Spread_a (%)	0.447	0.063	0.326	6.411	0.466	
ΔSpread (%)	-0.007	-1.761	-0.006	0.879	0.187	
Spread_b (€)	0.125	0.003	0.047	5.008	0.317	End of day spread
Spread_a (€)	0.133	0.003	0.048	4.614	0.366	
ΔSpread (€)	0.007	-0.532	-0.001	2.404	0.136	
Investors_b	201.274	3.000	177.000	722.000	124.703	Number of identified shareholders
Investors_a	210.126	3.000	188.000	767.000	127.920	
ΔInvestors	8.851	-44.000	6.000	83.000	17.776	
σ_b	0.350	0.048	0.316	1.262	0.191	Annualized volatility
σ_a	0.328	0.031	0.271	1.455	0.215	
$\Delta\sigma$	-0.022	-0.647	-0.025	0.814	0.165	
$ln(\text{Market Cap.}_b)$	21.592	16.098	21.549	25.951	1.296	Logarithm of market capitalization
$ln(\text{Market Cap.}_a)$	21.607	16.034	21.572	25.878	1.293	
$\Delta ln(\text{Market Cap.})$	0.015	-1.217	0.010	2.671	0.182	
RH rating	36.448	0.000	39.000	84.000	17.125	Continuous CSP ratings
ENV rating	35.364	0.000	37.000	79.000	19.117	
CS rating	41.136	9.000	43.000	76.000	13.455	
CG rating	46.464	6.000	48.000	84.000	15.446	
CIN rating	39.856	0.000	41.000	95.000	17.563	
HRTS rating★	35.013	3.000	32.000	77.000	12.428	
Average rating	40.085	11.500	41.000	72.800	12.167	
ln(Average rating)	3.636	2.442	3.714	4.288	0.354	

Notes: Subscript a stands for after and subscript b stands for before. "Before" statistics describe distribution of variables' averages calculated on the 20 days before initiation. "After" statistics describe distribution of variables' averages calculated on the 20 days after initiation + initiation day. Δ statistics describe distribution of the differences between before and after averages.
★: Only 235 of the 478 firms of our sample received an independent HRT rating.

of-day volume[5], average inverse of end-of-day stock price[6], volatility of return[7] and logarithm of average end-of-day market capitalization. Our calculation methodology for liquidity is as follows (see also Figure 3.4): for each firm we take averages of the spread and the liquidity factors for the 20 trading days before rating initiation and for 4 non-overlapping windows of 5 trading days after initiation. The latter divides the 20 trading days after initiation into four equal time periods. Before including any end-of-day information in our average

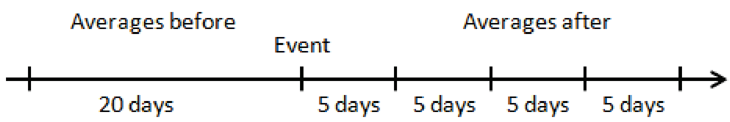
[5]These reported results feature the number of stocks exchanged on the market. We control for proxy impact and run analyses with the monetary volume, without observing significant changes in results.

[6]Price is mid-market price at the end of the day.

[7]These reported results feature volatility as the square root of empirical variance of daily returns. We control for proxy impact and run analyses with the High-Low estimator and the maximum likelihood estimator, without observing significant changes in results.

calculations, we confirm that the corresponding bid-ask spread is positive and below 40% of the stock price.

Figure 3.4 – Calculation methodology



To asses investor recognition changes, we collect quarterly measures of size of investor base, before and after rating initiation. Size of investor base is measured by the number of identified shareholders that own at least 0.01% of firms' shares. Finally, to asses the relationship between CSP ratings and variations in liquidity and investor recognition, we collect CSP ratings for different dimensions, and we calculate averages as above.

In the resulting sample, we check for missing data, outliers or reliability issues. To eliminate the problem of missing data, we collect only complete observations. For outliers, we verify the data pertaining to firms below the 1st and above the 99th percentile for each market variable. As a reliability check, we also confirm that the number of full trading days included in calculations is not less than 50% of the number of days declared. As a result, we discard 2 observed initiations because of data anomalies, and 1 other because of low reliability. We also discard 2 observations that were initiated in 1997, the first Vigeo production year. Our final sample of 478 firms represents about 58% of the initial Vigeo database and covers the years from 1999 to 2010.

Finally we check for any concurrent news releases that might have a positive of negative effect on variations in liquidity and in the investor base of the studied firms[8]. We find 88 such cases. We note that where there are concurrent news releases the firms involved are significantly larger. The results of our study are

[8]In the Factiva database, we check for stock splits, profit warnings, earnings announcements, mergers and acquisitions, dividends and business-related news such as major contract announcements.

robust to the exclusion of these 88 firms. We choose to report results on the entire sample to avoid the size bias created by their exclusion. Other results are presented in Appendix B.

3.3.3 Descriptive statistics

Statistics in Tables 3.1 and 3.2 are compiled by calculating, for each firm, averages of spreads for the 20 days before ratings and averages for the 20 days after ratings plus the rating initiation day and then taking the difference between the two.

We observe that average variations from before to after rating initiation are positive for absolute spreads and number of identified shareholders, and negative for proportional spreads. Medians are negative for relative and absolute spreads, and positive for number of identified shareholders. These preliminary observations indicate that the answer to our question about the increase in the investor base is affirmative. Statistics on the reduction of bid-ask spreads are slightly less conclusive.

The sample comprises 19 different nationalities: the United-States, Japan and 17 European countries. The three most frequently represented countries are the United Kingdom at 30.13%, France at 18.20% and Germany at 9.41%. The market capitalization frequency distribution is based on Euronext class A, B, C segmentation. Of the 478 firms we studied, 80.12% belong to the class A segment; that is, firms with market capitalization above 1 G€. The sample also represents various industries: 20.67% belong to financial services, 19.87% to industrials and 14.23% to consumer services. Finally, regarding the time-series frequency distribution of initiations, we find that initiation distribution is concentrated on three years, 1999, 2003, and 2009, representing 20.71%, 19.87%, and 11.72% of the sample, respectively. The average relative CSP rating frequency distribution is skewed below the sectors' average rating (i.e.

- class). Its overall median nonetheless belongs to the sectors' average rating (i.e. = class). A possible explanation for this negative skewness is the presence of high social performers that increase the average rating of their respective industry (see Appendix C).

Regarding the correlation between characteristics of firms and variables, we compile our statistics from values before rating initiation (see Appendix D), and observe several noteworthy relationships. First, consistent with conventional empirical results, we observe a negative correlation between market capitalization and proportional spread. We also observe a positive correlation of market capitalization with volume and size of investor base.

Table 3.2 – Characteristics of sample firms

Total number	**Market Cap.**		**Average Rating**		
	≥ 1G€	< 1G€	+	=	-
478	383	95	69	255	154

Notes: The market capitalization classification is based on the largest of the two averages of market capitalization estimated on the 20 days before and on the 21 days after initiation.

Second, we observe a positive correlation between rating and volume and between rating and size of investor base. This finding is consistent with the empirical results of Dhaliwal et al. (2011), who show that among firms that disclose, those with better CSP ratings tend to attract more dedicated institutional investors. This last observation does not, however answer our third question about a possible relationship among level of rating, liquidity and size of investor base. Indeed, we also observe a significant positive correlation between market capitalization and rating, which prompts us to control for firm size in our econometric models.

3.4 Empirical strategy and results

First, we examine variations in bid-ask spreads surrounding rating initiations, to examine the possible impact of rating initiation and relative rating level on the spreads of the firms in our sample. We use univariate-bivariate ordinary regressions and quantile regressions on the sample clustered by relative rating level and market capitalization. Then we perform a similar analysis for size of investor base and comment on theoretical factors explaining these variations. Second, we perform a multivariate ordinary and quantile regressions to explain variations in spreads and in size of investor base through different factors, including the CSP absolute rating.

3.4.1 Variation in bid-ask spreads surrounding rating initiations

To analyze variations in bid-ask spreads at rating initiation and during the 4 non-overlapping windows of 5 trading days after initiation, we regress variations in proportional spread on time interval dummies d_t for t equals 1 to 4, and cluster dummies C. The general model is as follows:

$$\Delta \mathrm{Spread}_{it} = \beta_0 + \beta_1 * \mathrm{d}_{i1} + \beta_2 * \mathrm{d}_{i2} + \beta_3 * \mathrm{d}_{i3} + \beta_4 * \mathrm{d}_{i4} + \sum_j \beta_j * \mathrm{C}_{ij} + \varepsilon_{it}$$

In line with Kadlec and Mcconnell (1994), to verify that changes in proportional spreads are not simply due to variations in stock price, we control with variations in absolute spreads. To do so, we run the same regression as previously, with variations in absolute spreads. To control for the impact of outliers, we run median regressions. Because of the impact of market capitalization on the spread, we firs add a dummy that indicates the market capitalization of the security (Table 3.3). To determine whether CSP relative ratings influence variation in spreads, we add dummies that indicate the relative rating level of rated firms (Table 3.4).

The results of ordinary regressions are mixed and distorted by outliers which are positive as median regressions suggest. Conditional on size of market capitalization (Table 3.3), on the initiation day, we observe positive variations in absolute and relative bid-ask spreads whatever the size of market capitalization. As we move on from the initiation day, while variations in proportional spreads turn negative, variations in absolute bid-ask spreads of large firms remain positive. For instance, at t=3 the average variation in absolute spread is 0.028-0.044+0.030=0.014 euros. This means that some prices are increasing. From an economic point of view, we observe similar results when we include dummies for relative rating (Table 3.4): on the initiation day, we observe positive variations in absolute and relative bid-ask spreads whatever the relative rating of firms. As we move on from the initiation day, while variations in proportional spreads turn negative, variations in absolute bid-ask spread remain positive for - and + firms. For instance, at t=3 the average variation in absolute spread for - firms is 0.066-0.043=0.023 euros, and for + firms 0.066-0.043-0.015=0.008 euros.

Table 3.3 – Average and median values of the variations in spreads surrounding rating initiation

$$\Delta \text{Spread}_{it} = \beta_0 + \beta_1 * \text{d}_{i1} + \beta_2 * \text{d}_{i2} + \beta_3 * \text{d}_{i3} + \beta_4 * \text{d}_{i4} + \beta_5 * \text{Large}_i + \varepsilon_{it}$$

We estimate the previous model using OLS and QR estimators. The Spread_{it} is reported in percentage. The variation of proportional spread is in points. The dummy Large_i indicates if firm i has a market capitalization above or equal to 1G€ throughout the 41 days of the analysis. The coefficient β_0 is the average or median of the variations in spreads at the end of the event day, for firms with a market capitalization below 1G€.

	Variation of Proportional Spread				Variation of Absolute Spread			
	Average variation		Median variation		Average variation		Median variation	
t=0	0.042		-0.051	***	0.028		-0.003	***
t=1	-0.067	***	0.010		-0.049	*	0.001	
t=2	-0.059	**	0.018		-0.042		0.002	*
t=3	-0.067	***	0.010		-0.044	*	0.000	
t=4	-0.063	**	0.014		-0.053	*	0.001	
Large	0.015		0.023	*	0.030	**	0.001	

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

The results of quantile regressions are robust to outlier effects, and they offer a clearer picture of what is going on. Thus, medians of variations in absolute and relative bid-ask spreads, from before to after the rating, are negative (Table 3.3). The largest variation emerges with data for small firms, collected at the end of the initiation day. Here, the median of variations in proportional spread of rated stocks is -0.051 points accounting for 14.91% of the median of the proportional spread before the rating. The median of variations in absolute spread is -0.003€, accounting for 6.38% of the median of the absolute spread before the rating.

Conditional on the level of relative CSP rating (Table 3.4), we obtain similar results. At the end of the initiation day, the median of variations in proportional spread of the + rated stocks is equal to -0.034 points, obtained by summing coefficients β_0 and β_6 for + class dummy[9]. It accounts for 9.94% of the median of proportional spread before the rating.

Table 3.4 – Average and median values of the variations in spreads surrounding rating initiation

$$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \text{d}_{i1} + \beta_2 * \text{d}_{i2} + \beta_3 * \text{d}_{i3} + \beta_4 * \text{d}_{i4} + \beta_5 * \text{Neutral}_{i5} + \beta_6 * \text{Good}_{i6} + \varepsilon_{it}$$

We estimate the previous model using OLS and QR estimators. The Spread_{it} is reported in percentage. The variation of proportional spread is in points. The dummy Neutral_i indicates that firm i has an average relative rating, and the dummy Good_i indicates that firm i has a good relative rating. The coefficient β_0 is the average or median of the variations in spreads at the end of the event day, for firms with poor relative ratings (i.e. - rated firms).

	Variation of Proportional Spread				Variation of Absolute Spread			
	Average variation		Median variation		Average variation		Median variation	
t=0	0.064	***	-0.018	*	0.066	*	-0.002	***
t=1	-0.067	***	0.008		-0.049	*	0.001	
t=2	-0.059	**	0.017		-0.042		0.002	**
t=3	-0.067	***	0.005		-0.043	*	0.001	
t=4	-0.063	**	0.012		-0.053	*	0.002	*
=	-0.011		-0.015	**	-0.021		-0.001	
+	-0.027		-0.016		-0.015		-0.001	

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

The median of variations in absolute spread is equal to -0.003€, obtained by summing coefficients β_0 and β_6 for + class dummy[10]. It accounts for 6.38% of the median of absolute spread before the rating. Finally, regarding the possible impact of the level of relative CSP rating, we observe that the magnitude of the decrease in the median of proportional spread increase with relative rating. A similar trend is observed for absolute spread, although it is too small[11] to be visible in Table 3.4 when switching from = to + rated firms.

[9] The sum is significantly different from zero, the p-value of the F-test is 0.03.
[10] The sum is significantly different from zero, the p-value of the F-test is less than 0.01.
[11] Small in absolute terms, but the decrease for + firms is 10% larger than the decrease for = firms.

These observations are consistent with the three hypotheses 1-1, 1-2 and 1-3: that ratings offer information to the market, reducing the information asymmetry, and that the size of the firm and the relative level of CSP have an important effect on the size and sign of the variations.

3.4.2 Variations in the investor base surrounding rating initiations

To verify the effect on investor recognition (Merton 1987) of the relative CSP ratings, we collect quarterly data on the number of shareholders of rated firms, before and after initiation, and we calculate variations. As in our previous analysis, we add dummies to indicate the size of market capitalization and the relative ratings. The general model is as follows:

$$\Delta \text{Investors}_i = \beta_0 + \sum_j \beta_j * \text{C}_{ij} + \varepsilon_i$$

Conditional on market capitalization we observe economically and statistically significant positive increases in investor base, concurrent with the rating initiations (Table 3.5). The median of variations in number of shareholders of large firms that are rated is equal to +9 and is obtained by summing coefficients β_0 and β_1 for size dummy. It accounts for 5.08% of the median of number of shareholders before the rating. Similar trends prevail in the small firms cluster.

Conditional on relative rating level (Table 3.5), we observe economically and statistically significant positive increases in investor base for +, =, and - rated firms. The median of variations in number of shareholders of + rated stocks is +6, obtained by summing coefficients β_0 and β_2 for + class dummy[12]. It accounts for 3.39% of the median of the number of shareholders before the rating. This is consistent with an effect of ratings on investors' awareness.

These observations are consistent with hypothesis 2-1, that ratings modify the size of the investor base.

[12] The sum is significantly different from zero, the p-value of the F-test is close to 0.00

Table 3.5 – Average and median values of variations in number of shareholders surrounding rating initiations

$$\Delta\text{Investors}_i = \beta_0 + \sum_j \beta_j * \text{C}_{ij} + \varepsilon_i$$

We estimate two versions of the previous model using OLS and QR estimators. In the first version the dummy indicates whether firm i is large, meaning it has a market capitalization above or equal to 1G€ throughout the 41 days of the analysis. In the second version the dummies indicate whether firm i has an average or a good relative rating.

	Variation of investor base								
	Average variation		Median variation			Average variation		Median variation	
Small	4.35	***	4.00	***	-	5.38	***	4.00	***
Large	5.71	***	5.00	***	=	5.27	***	5.00	***
					+	4.58	*	2.00	

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HC variances. LAD p-values are calculated with HC variances.

3.4.3 Multivariate regression analysis

The second part of our analysis, consists of a multivariate analysis of variations in proportional spreads and in size of investor base related to several different factors, including absolute CSP rating. We present models for variations in proportional spreads, followed by models for variations in investor base.

Effect of the level of rating on variations in bid-ask spreads

To analyze the relationships between variations in spread and both rating initiation and CSP rating level, we regress variations in bid-ask spreads on absolute CSP ratings, on variations in the usual determinants of spread and on variations in size of investor base. We control for a possible size effect using market capitalization. We perform two different types of ordinary least square (OLS) regressions on a panel sample: a pooled regression and a quasi-time-demeaned or random effects regression (RE)[13]. We also perform a quantile regression (QR) to control for outliers. Finally, to observe the impact of country, industry and year effect, we run four versions of the OLS and two versions of the QR regressions with or without country, industry and year controls. The general model is as follows:

[13] RE approach has been selected after having been tested against FE approach

Table 3.6 – Variation in bid-ask spread models

$$\Delta \text{Spread}_{it} = \beta_0 + \beta_1 * \Delta Ln(\text{Volume}_{it}) + \beta_2 * \Delta(1/\text{Price}_{it}) + \beta_3 * \Delta\sigma_{it} + \beta_4 * \Delta\text{Investors}_i + \beta_5 * \Delta Ln(\text{Market Capitalization}_{it}) + \beta_6 * Ln(\text{Rating}_i) + \beta_7 * Ln(\text{Market Capitalization}_{it}) + \sum_{t>1} \text{d}_{it} + \text{Controls}_i + \varepsilon_{it}$$

We estimate the previous model using OLS and QR estimators. To observe the impact of country, industry and year effect, we run four versions of OLS (OLS(I) to OLS(IV)) and two versions of QR (QR(I) and QR(II)) regressions with or without country, industry and year controls. In OLS(I) the constant is the average calculated on the whole sample. In QR(I), the constant is the median calculated on the whole sample. For other models, because of country, industry and/or year dummies, the constants are averages or medians calculated in respective reference group.

	OLS(I)	**OLS(II)**	**OLS(III)**	**OLS(IV)**	**OLS RE**	**QR(I)**	**QR(II)**
cst	-0.025	0.063	0.05	0.023	0.006	-0.086**	-0.196**
	0.882	0.731	0.790	0.911	0.978	0.047	0.023
ΔLn(V)	-0.03	-0.024	-0.022	-0.024	-0.023*	-0.029***	-0.029***
	0.290	0.363	0.401	0.282	0.090	0.000	0.000
$\Delta \frac{1}{\text{P}}$	0.430**	0.431**	0.438**	0.480**	0.611***	0.308***	0.313***
	0.042	0.046	0.041	0.038	0.002	0.000	0.000
$\Delta\sigma$	2.220***	2.185***	2.098***	2.076***	1.797***	1.360***	1.161***
	0.006	0.005	0.007	0.004	0.002	0.000	0.000
ΔI	-0.001	-0.001**	-0.001**	-0.001**	-0.001**	-0.001***	-0.001***
	0.236	0.014	0.026	0.016	0.033	0.000	0.000
ΔLn(MC)	0.037	0.013	0.01	0.014	0.017	-0.017	-0.017
	0.502	0.824	0.861	0.817	0.691	0.354	0.508
Ln(R)♦	-0.025	-0.045*	-0.048*	-0.045*	-0.043	-0.033***	-0.018*
	0.207	0.051	0.053	0.094	0.212	0.000	0.068
Ln(MC)	0.009	0.01	0.011	0.01	0.01	0.008***	0.009***
	0.293	0.229	0.227	0.236	0.169	0.000	0.004
[1.5] days	-0.077*	-0.080*	-0.081*	-0.079*	-0.068**	0.015	0.018
	0.071	0.067	0.062	0.063	0.041	0.496	0.434
]5.10] days	-0.071*	-0.074*	-0.074*	-0.073*	-0.061*	0.021	0.015
	0.094	0.091	0.087	0.088	0.063	0.344	0.528
]10.15] days	-0.078*	-0.081*	-0.082*	-0.080*	-0.069**	0.013	0.010
	0.067	0.063	0.059	0.059	0.038	0.571	0.654
]15.20] days	-0.077*	-0.079*	-0.080*	-0.078*	-0.067**	0.015	0.017
	0.080	0.077	0.072	0.074	0.043	0.508	0.469
Countries	No	No	No	Yes	Yes	No	Yes
Industries	No	No	Yes	Yes	Yes	No	Yes
Years	No	Yes	Yes	Yes	Yes	No	Yes
n	478	478	478	478	478	478	478
t	5	5	5	5	5	5	5
Adj. R^2	0.01	0.03	0.03	0.04	0.04		
Log Lik.	-710	-690	-680	-660	-660	89	120

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.
Haussman statistic test p-value = 0,14 H0: random effects are consistent.
♦: average of continuous ratings.

$$\Delta \text{Spread}_{it} = \beta_0 + \beta_1 * \Delta Ln(\text{Volume}_{it}) + \beta_2 * \Delta(1/\text{Price}_{it}) + \beta_3 * \Delta\sigma_{it} + \beta_4 * \Delta\text{Investors}_i + \beta_5 * \Delta Ln(\text{Market Capitalization}_{it}) + \beta_6 * Ln(\text{Rating}_i) + \beta_7 * Ln(\text{Market Capitalization}_{it}) + \sum_{t>1} \text{d}_{it} + \text{Controls}_i + \varepsilon_{it}$$

Where i belongs to $\{1, ..., 478\}$, t belongs to $\{1, ..., 5\}$ (i.e. from initiation to the fourth week after initiation), $\Delta \text{Spread}_{it}$ is the variation in proportional spread in percentage, $\Delta Ln(\text{Volume}_{it})$ is the variation in the logarithm of volume, $\Delta(1/\text{Price}_{it})$ is the variation in the inverse of price, $\Delta\sigma_{it}$ is the variation in the return volatility, $\Delta\text{Investors}_i$ is the variation in the size of the investor base, $\Delta Ln(\text{Market Capitalization}_{it})$ is the variation in the logarithm of market capitalization, $Ln(\text{Rating}_i)$ is the logarithm of continuous CSP ratings and $Ln(\text{Market Capitalization}_{it})$ is the logarithm of market capitalization of security i from before to after the rating initiation. Finally, d_t are time dummies and Controls_i are country, industry and year dummies.

According to our regressions listed in Table 3.6, the usual determinants all relate to variation in spreads with the expected sign. As the empirical literature indicates, proportional spread is positively related to inverse of price and volatility, and negatively related to volume. The relationship between proportional spread and market value can be either positive or negative depending on the context(Madhavan 2000, H. Stoll 2000). Variation in size of investor base relates negatively to variation in spread around the rating initiation. As Amihud and Mendelson (1989) suggest and Demsetz (1968) illustrates, more investors means less information asymmetry. These observations support the representativeness of our data.

Regarding the relationship between variations in spread and CSP ratings, models OLS(I) and QR(I) yield a negative intercept. When we plug average and median values[14] respectively in OLS(I) and QR(I) models, we obtain 0,069 and -0,037 points respectively. These account for 15.20% of the average and 10.82% of the median of proportional spread before the rating. These results are consistent with existence of outliers and with previous analyses. QR(I) result means that proportional spreads diminish on the day of rating. We note that the signs and statistical significance of coefficients of time dummies in models OLS(I) and QR(I) support a permanent diminution of proportional spreads. Consistent with the existence of outliers, intercept and time dum-

[14]We plug average and median values of variables that can not be equal to zero in our study: the logarithm of the continuous CSP ratings and of the logarithm of the market capitalization.

mies of quantile regression suggest an immediate diminution of proportional spreads. Intercepts of other models are variations in spread for the reference group defined by control dummies. In addition, we observe that market capitalization is positively related to variations in proportional spreads. The bigger the firm, the smaller the decrease in proportional spread. Again, despite this similar economic significance, only the quantile regression coefficients are statistically significant.

Regarding the relationship between variations in spread and level of CSP ratings, we find an economically and statistically rather significant negative relationship between the two, both for average and for median ratings. High-CSP-rated firms experience a greater decrease in spread than low-CSP-rated firms, holding all other variables fixed. Our regressions confirm our previous analyses and allow us to propose a measure of the effect. A one positive standard deviation change to the logarithm of the CSP rating is associated with a reduction in variation of spreads of 0.045*0.354=0.016 points. Holding other factors fixed, this represents a 3.52% decrease in average of spreads from before to after the rating initiation (using estimations of model OLS(IV)).

This set of observations is consistent with hypotheses 1-1, 1-2, and 1-3, confirming the proposed informational and volume effects of CSP ratings, which diminish the spread. To investigate the previous effects in detail, we run additional analyses (see Appendix E).

The first additional analysis controls for the effect of rating methodology. From 1999 to 2003, Vigeo used a different methodology, adopting the present methodology thereafter. Adding a dummy for the old methodology to the general model, we do not observe any significant effect of the methodology. However, while investigating this question using two sub-samples based on rating methodology, we note that the previous informational and volume effects of CSP ratings are economically and statistically significant only with the subsample for the new methodology, which is also the subsample of the

Table 3.7 – Effect of one positive SD change in rating on variations in proportional spread

We estimate the following model with different rescaled values of interaction variable. Hence we obtain estimations and p-values for partial effect of rating at particular values of market capitalization (i.e. the mean and values around the mean). We multiply the estimated partial effect by 0.354, which is the standard deviation of logarithm of average rating. We use the most recent rating methodology sample covering rating initiations from 2004 to 2010.

$$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \Delta Ln(\text{Volume}_{it}) + \beta_2 * \Delta(1/\text{Price}_{it}) + \beta_3 * \Delta\sigma_{it} + \beta_4 * \Delta\text{Investors}_i + \beta_5 * \Delta Ln(\text{Market Capitalization}_{it}) + \beta_6 * Ln(\text{Rating}_i) + \beta_7 * Ln(\text{Rating}_i) * Ln(\text{Market Capitalization}_{it}) + \beta_8 * Ln(\text{Market Capitalization}_{it}) + \sum_{t>1} \text{d}_{it} + \text{Controls}_i + \varepsilon_{it}$$

OLS(V)	**-3 s.d.**	**-2 s.d.**	**-1 s.d.**	$\overline{Ln(\mathbf{MC}_a)}$	**+1 s.d.**	**+2 s.d.**	**+3 s.d.**
$\delta\Delta$Spread	-0.06	-0.05	-0.03*	-0.02*	-0.01	0.01	0.02
p-value	0.21	0.16	0.08	0.07	0.70	0.85	0.68
QR(III)	**-3 s.d.**	**-2 s.d.**	**-1 s.d.**	$\overline{Ln(\mathbf{MC}_a)}$	**+1 s.d.**	**+2 s.d.**	**+3 s.d.**
$\delta\Delta$Spread	-0.04***	-0.03***	-0.02***	-0.01***	-0.002	0.01	0.02
p-value	0.03	0.02	0.00	0.00	0.80	0.49	0.31

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

most recent initiations. These two observations are consistent with a change in the way CSP information is integrated by the market.

The second additional analysis investigates the interaction between level of rating and size of the rated firm (i.e. model in Table 3.7). The expected interaction would be that the effect of the level of CSP ratings should diminish with the size of the rated firm. We observe interactions consistent with the model estimated on the most recent rating methodology sample. Although the two models show similar economic significance, the quantile regression yields more statistically significant interaction. In Table 3.7 we report the effect of one positive SD change of rating on the variations in proportional spread. We find a statistically significant economic decrease in spread for firms that are below average or average size.

These additional analyses are consistent with hypotheses 1-1, 1-2, and 1-3, confirming an interaction between the effect of CSP ratings and the size of rated firms. These additional analyses also support an increase in market interest in CSP information.

Effect of level of rating on variations in size of investor base

In the second set of regressions, we regress variation in size of investor base on average of continuous CSP ratings. We propose cross-sectional pooled OLS and quantile regressions in which we control for industry, year and country effects. Because of a possible size effect, we also control for interaction between rating and market. The general model is as follows:

$$\Delta\text{Investors}_i = \beta_0 + \beta_1 * \text{Rating}_i + \beta_2 * \text{Rating}_i * Ln(\text{Market Cap}_{ib}) + \beta_3 * Ln(\text{Volume}_{ib}) + \beta_4 * \text{Price}_{ib} + \beta_5 * \text{Investors}_{ib} + \beta_6 * \text{Spread}_{ib} + \beta_7 * Ln(\text{Market Cap}_{ib}) + \beta_8 * \sigma_{ib} + \text{Controls}_i + \varepsilon_i$$

Where $\Delta\text{Investors}_i$ is the variation in size of the investor base, and Market Cap_{ib} is the market capitalization of firm i before the rating. All the other factors are the usual variables estimated before rating initiation, and country, industry and year controls.

According to our regressions listed in Table 3.8, the relationship between variations in size of investor base and CSP ratings is positive. Indeed, when we plug the average and the median values of all variables respectively in the OLS(I) and QR(I) models, we obtain +47.64 and +14.82 investors respectively. Intercepts of other models are variations in spread for the reference group. Quantile regression and OLS regressions yield similar economic and statistical significance. The variation in the investor base is not subject to strong outliers.

In addition, the market capitalization and rating interaction coefficient is negative. Therefore, the partial effect of a positive variation in level of CSP is to increase variation in size of investor base for small capitalization. This effect decreases with increasing market capitalization. Using the model (IV) and QR(II) estimations, we calculated different values for variation in size of investor base, for a one positive standard deviation change in the rating, at different values of market capitalization, holding all other variables fixed (Table

Table 3.8 – Variation in the size of the investor base model

$\Delta \text{Investors}_i = \beta_0 + \beta_1 * \text{Rating}_i + \beta_2 * \text{Rating}_i * Ln(\text{Market Cap}_{ib}) + \beta_3 * Ln(\text{Volume}_{ib}) + \beta_4 * \text{Price}_{ib} + \beta_5 * \text{Investors}_{ib} + \beta_6 * \text{Spread}_{ib} + \beta_7 * Ln(\text{Market Cap}_{ib}) + \beta_8 * \sigma_{ib} + \text{Controls}_i + \varepsilon_i$ We estimate the

previous model using OLS and QR estimators. To observe the impact of country, industry and year effect, we run four versions of OLS (OLS(I) to OLS(IV)) and two versions of QR (QR(I) and QR(II)) regressions with or without country, industry and year controls. In OLS(I) the constant is the average calculated on the whole sample. In QR(I), the constant is the median calculated on the whole sample. For other models, because of country, industry and/or year dummies, the constants are averages or medians calculated in respective reference group.

	OLS(I)	**OLS(II)**	**OLS(III)**	**OLS(IV)**	**QR(I)**	**QR(II)**
const	-240**	-211**	-235***	-232***	-162***	-234***
	0.01	0.01	0.00	0.00	0.00	0.00
$R_t^{\star}$	3.80**	3.70**	3.94**	3.04*	2.50*	3.90**
	0.04	0.05	0.02	0.06	0.05	0.01
$R_t * Ln(MC_b)^{\star}$	-0.17*	-0.17**	-0.18**	-0.15*	-0.11*	-0.19**
	0.05	0.05	0.02	0.05	0.07	0.01
$Ln(V_b)$	1.10*	1.71***	2.08***	3.76***	0.85	2.70**
	0.08	0.00	0.00	0.00	0.32	0.02
P_b	-0.00	-0.01	-0.01	-0.00	-0.01	0.00
	0.66	0.17	0.27	0.95	0.79	0.96
I_b	-0.02	-0.00	-0.01	-0.03*	0.01	0.00
	0.15	0.84	0.66	0.06	0.52	0.71
S_b	-0.01	-1.54	-1.44	-3.45*	-0.88	-2.60
	0.96	0.42	0.48	0.08	0.68	0.22
$Ln(MC_b)$	11.00***	9.60**	10.51***	9.61***	7.10**	10.00***
	0.00	0.01	0.00	0.00	0.01	0.00
σ_b	121.70*	168.90**	109.40	45.25	21.35	57.08
	0.08	0.02	0.13	0.52	0.78	0.49
Countries	No	No	No	Yes	No	Yes
Industries	No	No	Yes	Yes	No	Yes
Years	No	Yes	Yes	Yes	No	Yes
n	478	478	478	478	478	478
Adj. R^2	0.08	0.2	0.21	0.28		
Log Lik.	-2030	-1990	-1981	-1952	-2020	-1938

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HC variances. LAD p-values are calculated with HC variances. ★: average of continuous rating

3.9).

The interaction linear effect is threefold, according to size of capitalization. For small capitalization, the positive effect is consistent with the previous descriptive results and the notion that small firms have a low profile. Investors become aware of small firms through CSP ratings, which send a positive signal to the market. For large capitalization firms, visible on the market and probably owned by a large variety of investors, we interpret the negative effect of the level of CSP as evidence that some investors consider CSP a negative signal and thus prefer to sell their shares. Finally, for medium capitalization, subject to varying visibility on the market, we interpret the mixed effect of

Table 3.9 – Effect of one positive SD change of rating on variations in the size of the investor base

We estimate the following model with different rescaled values of interaction variable. Hence we obtain estimations and p-values for partial effect of rating at particular values of market capitalization (i.e. the mean and values around the mean). We multiply the estimated partial effect by 12.167, which is the standard deviation of average rating.

$$\Delta\text{Investors}_i = \beta_0 + \beta_1 * \text{Rating}_i + \beta_2 * \text{Rating}_i * Ln(\text{Market Cap}_{ib}) + \beta_3 * Ln(\text{Volume}_{ib}) + \beta_4 * \text{Price}_{ib} + \beta_5 * \text{Investors}_{ib} + \beta_6 * \text{Spread}_{ib} + \beta_7 * Ln(\text{Market Cap}_{ib}) + \beta_8 * \sigma_{ib} + \text{Controls}_i + \varepsilon_i$$

OLS (IV)	**-3 s.d.**	**-2 s.d.**	**-1 s.d.**	$\overline{Ln(\mathbf{MC}_b)}$	**+1 s.d.**	**+2 s.d.**	**+3 s.d.**
$\delta\Delta$I	5.88*	3.60	1.32	-0.95	-3.23*	-5.50**	-7.78**
p-value	0.09	0.14	0.38	0.41	0.07	0.04	0.04
QR (II)	**-3 s.d.**	**-2 s.d.**	**-1 s.d.**	$\overline{Ln(\mathbf{MC}_b)}$	**+1 s.d.**	**+2 s.d.**	**+3 s.d.**
$\delta\Delta$I	7.08**	4.14*	1.20	-1.74*	-4.67***	-7.61***	-11.24***
p-value	0.03	0.06	0.33	0.06	0.01	0.01	0.01

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HC variances. LAD p-values are calculated with HC variances.

the rating level as a combination of the two previous effects.

This set of observations is consistent with hypotheses 2-1, 2-2, and 2-3, and supports the proposed recognition effect of CSP ratings and interaction with firm size. As in the previous sub-section, to investigate the previous effects in detail, we run an additional analysis to control for rating methodology (see Appendix E). As previously for spread, the main result is that the relationship between variations in number of shareholders and CSP ratings appears to be more economically and statistically significant with the most recent sub-sample.

This additional analysis suggests a modification of market behavior in response to CSP information.

3.5 Conclusion

This study examines the hypothesis that variations in liquidity and investor recognition are linked to the initiation of the Vigeo corporate social performance (CSP) rating. Specifically, we analyze variations in the bid-ask spreads and in the number of shareholders from before to after the ratings, to determine whether rating initiations are associated with a reduction in spreads and an increased number of shareholders. We also run regressions to model variations in spread and number of shareholders in relation to CSP rating level. We estimate our models from a sample of 478 firms listed on European stock markets that received ratings between 1999 and 2010.

According to univariate-bivariate models, the largest variations are obtained for small firms that are rated at the end of the initiation day. Here, when the firms of our sample are rated, the median of variations in proportional spread shows a 14.91% reduction in the median of proportional spread before the rating. The median of variations in absolute spread shows a 6.38% reduction in median of absolute spread before the rating. We also find that for + rated firms, the median of variations in number of shareholders shows a 3.39% increase in the median number of shareholders before the rating. These observations are consistent with hypotheses 1-1, 1-2, and 1-3, and with hypothesis 2-1 as stated in Section 2.

Our multivariate models both confirm the results of the univariate-bivariate models and yield additional results. Size and sign of time dummy coefficients support a permanent diminution of the proportional spread. In addition, one positive standard deviation change in the CSP average absolute rating is associated with a negative variation in spreads of 0.016 points, which represents a decrease of 3.52% in the average proportional spread before the rating. When size interaction is included, one positive standard deviation change in the CSP rating is associated with a decrease of 0.06 points in the average proportional spread for small capitalization, and an increase for large capitalization firms. However this interaction is not statistically significant. Regarding size of investor base, we find that one standard deviation change in the CSP rating is associated with an increase of 5.88 in the average number of shareholders for small capitalization, and a decrease of 7.78 in shareholders for large capitalization firms. Finally, additional analyses of a sub-sample based on the rating methodology (sub-sample of initiations before and after 2004) seem to indicate that the CSP ratings have only been reflected in the market since 2004. Overall, our multivariate analyses provide significant support for hypotheses 1-1, 1-2, and 1-3, and hypotheses 2-1, 2-2 and 2-3 (Section 2).

Finally, our results complement the related literature that uses mechanisms linking CSP to the cost of equity capital, offering empirical evidence in support of the liquidity channel and the investor base channel for small capitalization firms. For large capitalization firms, the impact on spread of rating initiations is not significantly positive, and the impact on size of investor base at initiation is significantly negative. Overall, our results are consistent with a diminution of the neglected firm effect caused by CSP rating initiations. The smaller the firm and the better the rating, the stronger this diminution. A valuable extension of this work would be to test for causality by including a control group.

3.6 Appendixes

3.6.1 Appendix A: dissemination of ratings from VIGEO

Vigeo is the historical French rating agency, before 2000 it was known as ARESE which has been the first to propose environmental, social and governance ratings in France. Since then, it has been used by the vast majority of French institutional investors and asset managers interested in socially responsible investment. According to Novethic, from 2008 to 2012 Vigeo the lowest penetration rate of Vigeo equals 44%. The penetration rate is defined as the percentage of asset managers that propose SRI funds and that use Vigeo as supplier.

Table 3.10 – Penetration rate of VIGEO in the market of ESG rating

Year		Penetration rate
2008	:	51,70%
2009	:	44%
2010	:	55,70%
2011	:	51,70%
2012	:	59,30%

3.6.2 Appendix B: robustness to concomitant events

We use Factiva to collect information releases from one day before to one day after rating initiations so as to control for event occurring at same time than rating initiations. Table 3.11 recalls results of the paper for the four models we want to compare.

We collect news releases related to following key words: "Profit" AND "Warning", "Merger", "Acquisition", "Earning" AND "Announcement", "Stock" AND "Split", "Dividend". We note that some news proposed by Factiva are irrelevant. To avoid inconsistent exclusions we decide to verify manually whether the news releases obtained are relevant for our purpose.

We identify 88 news releases occurring at the same time than a rating. We identify the corresponding firms with a dummy variable. We run our models on variations in liquidity with this additional variable so as to estimate the partial effect of concomitant news releases. We also run our models on two samples so as to estimate how a news release interacts with each variables of our models.

First observation, the firms that have a concomitant news release are significantly larger than firms without news release (Table 3.12).

When we use the simplest models of our paper, OLS I and QR I, we have following results (Table 3.13). If we let the intercept varies with presence of concomitant news release we do not see modification of our results. The dummy coefficient is negative but not statistically significant.

When we estimate these models on sub sample of firms without concomitant

Table 3.11 – Variation in bid-ask spreads models - original results

$$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \text{d}_{i1} + \beta_2 * \text{d}_{i2} + \beta_3 * \text{d}_{i3} + \beta_4 * \text{d}_{i4} + \beta_5 * \text{Large}_i + \varepsilon_{it}$$

Original results from Table 3.3.

	OLS I	OLS IV	QR I	QR II
cst	-0.025	0.023	-0.086**	-0.20**
	0.88	0.91	0.05	0.02
$\Delta Ln(\text{V})$	-0.03	-0.024	-0.029***	-0.029***
	0.29	0.28	0.00	0.00
$\Delta\frac{1}{\text{P}}$	0.43**	0.48**	0.31***	0.31***
	0.04	0.04	0.00	0.00
$Ln(\text{R})$	-0.025	-0.045*	-0.033***	-0.018*
	0.21	0.09	0.00	0.07
$Ln(\text{MC})$	0.0086	0.01	0.0080***	0.0094***
	0.29	0.24	0.00	0.00
$\Delta\sigma$	2.2**	2.1**	1.4***	1.2***
	0.01	0.00	0.00	0.00
ΔI	-0.0005	-0.0012**	-0.00052***	-0.00082***
	0.24	0.02	0.00	0.00
$\Delta Ln(\text{MC})$	0.037	0.014	-0.017	-0.017
	0.50	0.82	0.35	0.51
$[1-5]$ days	-0.077*	-0.079*	0.015	0.018
	0.07	0.06	0.50	0.43
$]5-10]$ days	-0.071*	-0.073*	0.021	0.015
	0.09	0.09	0.34	0.53
$]10-15]$ days	-0.078*	-0.080*	0.013	0.01
	0.07	0.06	0.57	0.65
$]15-20]$ days	-0.077*	-0.078*	0.015	0.017
	0.08	0.07	0.51	0.47
Countries	No	Yes	No	Yes
Industries	No	Yes	No	Yes
Year	No	Yes	No	Yes

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

Table 3.12 – Size bias in sample of firms with concomitant events

Mkt Cap €	Coef.	Sd	p-value
Info	4,40E+09	2,53	0,0115
Year	Yes		
Industry	Yes		

news release, we observe some differences (Table 3.13). First with OLS, we observe a more significant relation between rating and variation in proportional spread than with the entire sample: time dummies coefficients are a bit more negative, and coefficient between level of rating and variation in spread is significant and negative. Second with QR, intercept is not significant anymore but still negative and coefficient between level of rating and variation in spread is significant and negative.

Table 3.13 – Variation in bid-ask spreads models - different samples

$$\Delta\text{Spread}_{it} = \beta_0 + \beta_1 * \text{d}_{i1} + \beta_2 * \text{d}_{i2} + \beta_3 * \text{d}_{i3} + \beta_4 * \text{d}_{i4} + \beta_5 * \text{Large}_i + \varepsilon_{it}$$

We estimate the previous model on different samples: the "All" sample and the "without information" sample. The latter sample is the sample without concomitant news releases that could pollute our analysis.

	OLS I All	OLS I wo info	QR I All	QR I wo info	OLS IV All	OLS IV wo info	QR II All	QR II wo info
cst	-0.04	0.02	-0,09*	-0.05	0.00	0.15	-0,20**	-0,18*
	0.8	0.9	0.07	0.24	0.98	0.52	0.02	0.06
$\Delta Ln(\text{V})$	-0.03	-0.03	-0,03**	-0,03**	-0.02	-0.03	-0,03**	-0,03**
	0.3	0.3	0.00	0.00	0.3	0.32	0.00	0.00
$\Delta\frac{1}{\text{P}}$	0,43**	0,43**	0,32**	0,33**	0,48**	0,51**	0,31**	0,33**
	0.04	0.05	0.00	0.00	0.04	0.03	0.00	0.00
$\Delta\sigma$	2,23**	2,33**	1,35**	1,28**	2,08**	2,10**	1,24**	1,28**
	0.01	0.01	0.00	0.00	0.00	0.01	0.00	0.00
ΔI	0.00	0.00	-0,00**	-0,00**	-0,00**	0.00	-0,00**	-0,00**
	0.26	0.95	0.00	0.04	0.02	0.26	0.00	0.00
$\Delta Ln(\text{MC})$	0.04	0.04	-0.01	0.00	0.01	0.03	-0.02	-0.01
	0.49	0.52	0.57	0.99	0.81	0.7	0.44	0.63
$Ln(\text{R})$	-0.02	-0,04*	-0,03**	-0,04**	-0.04	-0,06*	-0,02*	-0,04**
	0.22	0.1	0.00	0.00	0.11	0.06	0.06	0.00
$Ln(\text{MC})$	0.01	0.01	0,01**	0,01**	0.01	0.01	0,01**	0,01**
	0.26	0.39	0.00	0.00	0.21	0.34	0.00	0.00
$[1-5]$ days	-0,08*	-0,08*	0.01	0.01	-0,08*	-0,09*	0.02	0.02
	0.07	0.08	0.51	0.72	0.06	0.06	0.45	0.47
$]5-10]$ days	-0,07*	-0,08*	0.02	0.01	-0,07*	-0,08*	0.02	0.01
	0.09	0.09	0.37	0.58	0.09	0.08	0.46	0.54
$]10-15]$ days	-0,08*	-0,08*	0.01	0.00	-0,08*	-0,09*	0.01	0.01
	0.07	0.08	0.66	0.94	0.06	0.07	0.65	0.75
$]15-20]$ days	-0,08*	-0,09*	0.01	0.00	-0,08*	-0,10**	0.02	0.01
	0.08	0.06	0.55	0.89	0.08	0.02	0.39	0.57
Dummy Info	-0.01		-0.01		-0.02		-0,01**	
	0.5		0.15		0.4		0.01	
R^2 adj.	0.01	0.01			0.04	0.04		

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

When we use completed models of our paper, OLS IV and QR II, we have following results (Table 3.13). If we let the intercept varies with presence of concomitant news release we do not see modification of our results. The dummy coefficient is negative but not statistically significant for OLS and significant for QR.

When we estimate these models on sub sample of firms without concomitant news release, we observe some differences (Table 3.13). First with OLS, we observe a more significant relation between rating and variation in proportional spread than with the entire sample: time dummies coefficients are a bit more negative, and coefficient between level of rating and variation in spread is significant and negative. Second with QR, intercept is still significant and negative. Coefficient between level of rating and variation in spread is significant and negative.

Our conclusion is that taking into account the occurrence of simultaneous news releases does not change the overall conclusion of our study. Modifications we observe are consistent with the bias of size we create in our sample when we discard firms with simultaneous news release. We recall that size of firm has an impact on its visibility and on its transaction costs.

3.6.3 Appendix C: descriptive statistics

Table 3.14 – descriptive statistics

	Distribution of market values and ratings by industries					
Industry	Firms (%)	$\geqslant$ 1G€	$<$ 1G€	+	=	-
Basic Materials	8.58	9.14	6.32	5.80	9.41	8.44
Consumer Goods	8.79	9.40	6.32	5.80	10.59	7.14
Consumers Services	14.23	15.67	8.42	8.70	18.04	10.39
Financials	20.71	21.15	18.95	28.99	18.04	21.43
Health Care	6.90	7.05	6.32	13.04	5.49	6.49
Industrials	19.87	17.49	29.47	20.29	17.25	24.03
Oil & Gas	5.02	4.70	6.32	2.90	4.71	6.49
Technology	7.74	6.27	13.68	5.80	9.02	6.49
Telecom	3.35	3.66	2.11	2.90	3.14	3.90
Utilities	4.81	5.48	2.11	5.80	4.31	5.19
Total number	478	383	95	69	255	154

	Distribution of market values and ratings by years					
Year	Firms (%)	$\geqslant$ 1G€	$<$ 1G€	+	=	-
1999	20.71	19.06	27.37	11.59	31.37	7.14
2000	6.28	5.48	9.47	11.59	7.06	2.60
2001	5.02	4.44	7.37	11.59	3.92	3.90
2002	2.30	1.83	4.21	1.45	3.14	1.30
2003	19.87	21.41	13.68	27.54	23.14	11.04
2004	2.51	1.83	5.26	1.45	3.14	1.95
2005	6.07	6.79	3.16	5.80	4.71	8.44
2006	4.81	4.96	4.21	1.45	4.31	7.14
2007	6.90	8.09	2.11	2.90	4.31	12.99
2008	7.53	8.09	5.26	10.14	3.14	13.64
2009	11.72	10.70	15.79	10.14	8.63	17.53
2010	6.28	7.31	2.11	4.35	3.14	12.34
Total number	478	383	95	69	255	154

	Distribution of market values and ratings by countries					
Country	Firms (%)	$\geqslant$ 1G€	$<$ 1G€	+	=	-
Austria	0.84	1,04				2,60
Belgium	3.35	3.13	4.21		3.92	3.90
Denmark	3.56	3.13	5.26	1.45	2.35	6.49
Finland	2.93	2.61	4.21	7.25	2.35	1.95
France	18.20	15.14	30.53	17.39	23.92	9.09
Germany	9.41	10.70	4.21	8.70	12.16	5.19
Greece	1.26	1.31	1.05	2.90	0.39	1.95
Ireland	1.46	1.57	1.05		1.57	1.95
Italy	2.30	2.87			1.96	3.90
Japan	0.21	0.26		1.45		
Luxembourg	0.21		1.05	1.45		
Norway	2.30	2.35	2.11	2.90	2.35	1.95
Portugal	1.26	0.78	3.16		1.57	1.30
Spain	6.49	6.27	7.37	2.90	4.71	11.04
Sweden	5.44	6.01	3.16	4.35	4.31	7.79
Switzerland	6.90	7.31	5.26	4.35	5.10	11.04
The Netherlands	3.35	3.39	3.16	1.45	3.92	3.25
United Kingdom	30.13	31.85	23.16	42.03	29.02	26.62
United States of America	0.42	0.26	1.05	1.45	0.39	
Total number	478	383	95	69	255	154

3.6.4 Appendix D: matrix of correlations

Table 3.15 – Table of correlations

A RH rating	B ENV rating	C CS rating	D CG rating	E CIN rating	F HRTS rating	G Average rating	H ln(Average rating)	I ln(Market Cap.$_b$)	J Spread$_b$ (%)	K Spread$_b$ (€)	L σ_b	M Ln(Volume$_b$)	N 1/ Price$_b$	O Inves- tors$_b$	P Institu- tionals$_b$	
1,00	0,76	0,67	0,14	0,58	0,66	0,84	0,85	0,12	0,20	0,05	-0,07	0,08	0,07	0,09	0,10	A
	1,00	0,66	0,22	0,57	0,56	0,84	0,87	0,18	0,17	0,03	-0,02	0,19	-0,02	0,24	0,24	B
		1,00	0,17	0,54	0,58	0,77	0,79	0,11	0,15	0,05	0,04	0,09	0,07	0,13	0,14	C
			1,00	0,25	0,23	0,44	0,45	0,12	-0,03	-0,14	0,16	0,39	-0,17	0,40	0,36	D
				1,00	0,47	0,78	0,78	0,15	0,05	-0,02	0,04	0,17	-0,05	0,22	0,23	E
					1,00	0,74	0,76	0,16	0,08	-0,02	-0,06	0,14	0,13	0,13	0,15	F
						1,00	0,98	0,16	0,15	0,01	0,03	0,22	-0,01	0,25	0,25	G
							1,00	0,19	0,15	-0,01	0,03	0,24	-0,02	0,28	0,28	H
								1,00	-0,27	0,01	0,02	0,37	-0,19	0,57	0,60	I
									1,00	0,38	0,11	-0,25	0,16	-0,21	-0,20	J
										1,00	0,01	-0,44	-0,12	-0,18	-0,16	K
											1,00	0,27	0,02	0,19	0,19	L
												1,00	0,03	0,71	0,69	M
													1,00	-0,24	-0,21	N
														1,00	0,99	O
															1,00	P

Subscript b stands for before. "Before" statistics describe distribution of variables' averages calculated on the 20 days before initiation.

3.6.5 Appendix E: robustness to type of rating

In Table 3.16 we investigate how the effect of rating on spread interacts with the size of the firm. We present estimations of models OLS(IV) and QR(II) on sub-samples conditional on rating methodology.

Sub-sample A is for classic rating methodology, used from 1999 to 2003, and sub-sample B is for Equitics methodology used from 2004 to now. We also propose three new models, OLS(VI), QR(III) and QR(IV). QR(III) is a model with and interaction factor. The others are similar to OLS(IV) and QR(II) with an additional dummy indicating if the rating methodology is classic. We find that for a given variations in CSP rating, large firms would enjoy a smaller variation in spreads than small firms (Table 3.16, model QR(III) and Table 3.7). In addition the relation between variations in spread and the CSP ratings appears to be statistically significant only for the more recent initiations.

Table 3.16 – Variation in bid-ask spreads models - different samples

We estimate various models of variations of relative spread on different samples: the A sample, the B sample and the A+B sample. Sub-sample A is for classic rating methodology, used from 1999 to 2003, and sub-sample B is for Equitics methodology used from 2004 to now.

	OLS(IV) **A**	**OLS(IV)** **B**	**OLS(VI)** **A+B**	**QR(II)** **A**	**QR(II)** **B**	**QR(III)** **B**	**QR(IV)** **A+B**
const	0.059	-0.39	-0.021	-0.065	-0.24***	1.5	-0.27**
	0.86	0.27	0.92	0.73	0.00	0.16	0.02
$\Delta Ln(\text{V})$	-0.01	-0.03	-0.02	-0.029**	-0.018***	-0.021***	-0.028***
	0.66	0.15	0.27	0.02	0.00	0.00	0.00
$\Delta \frac{1}{\text{P}}$	3.00***	0.55	0.48**	1.90***	-0.09	-0.04	0.30***
	0.00	0.15	0.04	0.00	0.64	0.86	0.00
$Ln(\text{R})$	-0.00	-0.061*	-0.049*	-0.02	-0.030***	-0.51*	-0.021**
	0.96	0.06	0.09	0.58	0.00	0.08	0.03
$Ln(\text{MC})$	0.00	0.033*	0.01	0.00	0.015***	-0.06	0.001**
	0.75	0.07	0.24	0.13	0.00	0.19	0.00
$\Delta\sigma$	1.20	2.10***	2.10***	1.30**	0.98***	1.20***	1.20***
	0.37	0.00	0.00	0.01	0.00	0.00	0.00
ΔI	-0.002**	-0.00	-0.001***	-0.002***	0.00	0.00	-0.001***
	0.03	0.35	0.02	0.00	0.54	0.63	0.00
$\Delta Ln(\text{MC})$	-0.02	0.13	0.01	-0.01	-0.094***	-0.07	-0.03
	0.66	0.54	0.82	0.92	0.00	0.20	0.30
[1,5] days	-0.11	-0.03	-0.079*	-0.02	0.037**	0.030*	0.02
	0.17	0.43	0.06	0.65	0.02	0.08	0.42
]5,10] days	-0.01	-0.04	-0.073*	-0.02	0.044**	0.042**	0.01
	0.22	0.43	0.09	0.63	0.01	0.02	0.50
]10,15] days	-0.11	-0.04	-0.080*	-0.04	0.040**	0.034**	0.01
	0.18	0.41	0.06	0.39	0.01	0.05	0.61
]15,20] days	-0.01	-0.04	-0.079*	-0.01	0.040**	0.034*	0.02
	0.23	0.38	0.07	0.86	0.02	0.05	0.39
Classic			0.06				0.10
			0.60				0.26
$Ln(\text{R})$						0.022*	
$*Ln(\text{MC})$						0.10	
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes
n	254	224	478	254	224	224	478
t	5	5	5	5	5	5	5
Adj. R^2	0,06	0,05	0,04				
Log Lik.	-550	77	-660	-220	510	510	130

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HAC variances. LAD p-values are calculated with HC variances.

In Table 3.17 we also analyse the relation between variations in number of shareholders and CSP ratings on sub-samples conditional on rating methodology. We present estimations of models OLS(IV) and QR(II) on sub-samples conditional on rating methodology. As previously introduced Sub-sample A is for classic rating methodology, and sub-sample B is for Equitics methodology.

Table 3.17 – Variation in the size of the investor base models - different samples

We estimate various models of variations of investor base on different samples: the A sample, the B sample and the A+B sample. Sub-sample A is for classic rating methodology, used from 1999 to 2003, and sub-sample B is for Equitics methodology used from 2004 to now.

	OLS(IV) **A**	**OLS(IV)** **B**	**OLS(V)** **A+B**	**QR(II)** **A**	**QR(II)** **B**	**QR(III)** **A+B**
R_t	-0.06	3.40	2.90	-0.17	2.7	3.90**
	0.98	0.32	0.13	0.94	0.36	0.01
$R_t * Ln(MC_b)$	-0.00	-0.16	-0.14	0.011	-0.13	-0.18**
	1.00	0.32	0.12	0.92	0.32	0.01
$Ln(V_b)$	5.10**	2.40	3.70**	5.10**	0.16	2.70**
	0.00	0.11	0.00	0.00	0.94	0.01
P_b	0.04	-0.00	-0.00	0.067*	-0.00	0.00
	0.45	0.75	0.94	0.09	0.99	0.98
I_b	-0.03	-0.059**	-0.03	-0.01	-0.02	0.00
	0.15	0.04	0.11	0.52	0.30	0.87
S_b	-3.00	-0.55	-3.4	1.80	1.70	-3.00
	0.66	0.87	0.14	0.72	0.49	0.23
$Ln(MC_b)$	1.80	14.00**	9.20**	0.39	10.00*	10.00**
	0.78	0.01	0.02	0.94	0.07	0.00
σ_b	199.40	-45.91	54.33	130.60	-38.41	49.98
	0.21	0.66	0.49	0.38	0.56	0.53
Classic			-15.00**			-17.00
			0.02			0.12
Controls	Yes	Yes	Yes	Yes	Yes	Yes
n	254	224	478	254	224	478
Adj. R^2	0.32	0.25	0.28			
Log Lik.	-1013	-906	-1950	-1004	-896.2	-1935

Notes: *** p-value < 0.01 ** p-value < 0.05 * p-value < 0.10
OLS p-values are calculated with HC variances. LAD p-values are calculated with HC variances.

We also propose two new models, OLS(V) and QR(III). They are similar to OLS(IV) and QR(II) with an additional dummy classic rating methodology. The relation appears to be more statistically significant with the more recent initiations. It is similar to previous observations (Table 3.17).

Chapter 4

Socially Responsible Investment Performance:

Is It Improved by Risk Based Allocation?

4.1 Socially responsible investment and risk-based strategies

With the increasing public awareness of the concept of sustainable development (Brundtland et al. 1987), a kind of investment generally called socially responsible investment (SRI) is experiencing rapid growth in its assets under management. SRI incorporates non-financial criteria into the construction of financial portfolios. These criteria include respecting simple subjective rules (e.g. no investment in issuers involved in gambling or tobacco activities), or being involved in Corporate Social Responsibility (CSR)[1] to obtain a minimum level of extra-financial performance (e.g. investment in issuers that have low carbon emissions or low rates of fatalities compared to industry competitors). Level of involvement in CSR, and when possible extra-financial performance[2], are evaluated by extra-financial ratings agencies such as VIGEO.

[1] CSR is a set of costly, beyond-legal-compliance behaviors by firms in the public interest.
[2] The quantity of positive or negative externalities created by firm's activities.

Investors adopt SRI for two main reasons. First, assuming that social performance ratings and indicators are reliable, SRI allows the pro-social investor to invest only in the financial assets of issuers involved in CSR. Second, it is now accepted that involvement in CSR can lead to superior economic performance (Flammer 2013), through different mechanisms. For instance, it has been shown that issuers with a high degree of involvement in CSR (henceforth - high CSR firms) enjoy a lower ex ante cost of capital[3] (Ghoul et al. 2011, Dhaliwal et al. 2011). The mechanisms proposed as driving this empirical observation are specific risks, asymmetry of information and market segmentation (Merton 1987, Amihud and Mendelson 1986). Moreover, economic mechanisms stamped as strategic CSR have been theoretically and empirically studied (see review of Kitzmueller and Shimshack 2012), it appears that they have positive impacts on financial performance. Thus, by incorporating extra-financial criteria into portfolio construction so as to capture these characteristics, SRI should yield higher risk-adjusted returns in the long-run.

However, empirical results show mixed performances for SRI indices and SRI funds (Capelle-Blancard and Monjon 2011, Renneboog et al. 2008, Schroder 2007). This empirical observation is puzzling, for two opposite reasons. First, for supporters it is natural to think that economic outperformance is correlated to market outperformance. Hence they expect SRI financial vehicles to outperform common financial vehicles. This aspect of the puzzle however has two explanations. On the first place, markets are efficient (Fama 1970) and quickly incorporate all new value-relevant information into pricing. For instance, as Flammer (2013) showed, the economic outperformance observed over a two-year period after a CSR treatment is accompanied by a positive cumulative abnormal return on the three days following the CSR treatment. Consequently, as it is not possible to systematically capture this repricing,

[3]Lower ex ante cost of capital is empirically associated with long term growth rate, see discussion of literature in Dhaliwal et al. (2011). Ex ante cost of capital of a stock is the actualisation rate such that present value of forecasted cash flows is equal to price of the stock.

returns obtained from holding stocks of high CSR firms are merely equivalent to the corresponding level of systematic risk. And if high CSR firms are perceived as less risky (Ghoul et al. 2011, Barnett and Salomon 2006), expected returns are lower. Secondly, extra-financial screening goes against the capital asset pricing model (CAPM) and the diversification principle. It goes against the CAPM because SRI takes account of specific risks of firms, and it goes against the diversification principle because extra-financial screening results in a filtered universe of investment that is a subset of the available universe. Consequently, efficient SRI mean-variance frontiers at best are identical to the total universe mean-variance frontier; otherwise, efficient frontiers are sub-optimal. In that case, corresponding market-capitalization weighted (CW) portfolios (i.e. the tangent portfolio in the CAPM framework) built on subsets of the investible universe are dominated. This is empirically illustrated by the case of funds with subjective exclusion that under-perform other SRI and unscreened funds (Capelle-Blancard and Monjon 2011, Renneboog et al. 2008).

The second aspect of the puzzle is that despite the above arguments against outperformance of SRI, it has to be admitted that most SRI funds and indexes perform in line with their unscreened counterparts, and that simple extra-financial screening can lead to outperformance (Renneboog et al. 2008). There are two explanations here too. First, markets are not perfectly efficient: some firms suffer from a neglected effect (Merton 1987), showing inefficiencies in their pricing when value-relevant information is released. Other inefficiencies may arise from the fact that some information is not considered value-relevant by the market at the time of release and is incorporated later via a learning effect (Huppé 2011, Bebchuk et al. 2010, Derwall et al. 2005). In these two cases, socially responsible investors can use their extra-financial analyzing skills to systematically identify inefficiencies and generate outperformance. A last case that still involves market inefficiency, is when investors can also engage in shareholder activism and modify the extra-financial behavior of the firms they control so as to improve their market value (Gollier and Pouget 2012). Second, the CW allocation strategy is not mean-variance efficient in practice, and suffers from lack of diversification and from biases such as momentum or growth bias. Therefore, despite theoretical sub-optimality, a CW allocation strategy applied on a subset of the investible universe may in practice be as efficient as the CW allocation strategy applied on the entire universe.

In the light of these remarks, because CW allocation suffers from weak diversification and favors large firms that are not neglected, we hypothesize that the CW allocation strategy is not the most efficient allocation strategy to build socially responsible portfolios, and that it is not the best allocation to capture any outperformance that may be generated by extra-financial analysis. Consequently, the fact that most SRI indices are weighted by capitalization and that most SRI funds are benchmarked against CW indices raises the following research question: is it possible that the CW allocation drawbacks (i.e. weak diversification and bias) neutralize the positive effect of selecting only high CSR firms? A positive answer would suggest that assets managers of SRI funds should be encouraged to depart further from the CAPM framework.

The inefficiency of CW allocation is an issue that has recently been tackled by promoters of risk-based allocation strategies. Also known as smart beta strategies, they define the weights of assets in portfolios as functions of the individual and common asset risk. The popularity of risk-based strategies is commonly justified by their good record of out-performing the CW allocation strategy. This outperformance is explained by the fact that they improve risk diversification compared to the CW allocation strategy. Note that critics claim the outperformance of risk-based is mainly, if not totally, driven by exposure to common risk factors (Carvalho et al. 2012). Recently, Le Sourd (2012) ran back-tests using the Maximum Sharpe Ratio (MSR) risk-based allocation strategy. She ran a performance analysis of this allocation strategy and compared it with the performance of the common Eurozone socially responsible (SR) indexes. From January 2008 to December 2011 the MSR allocation out-performed the other indexes based on the CW or fundamental weighting approaches. In a companion paper (see Chapter 5), we empirically investigate differences in the characteristics of risk-based portfolios using a universe of stocks of high CSR firms. We confirm that risk-based strategies improve diversification compared to the CW allocation, and we find that the high CSR universe reduces the diversification effect of risk-based allocations.

In this article we examine more specifically how risk-based allocations impact the absolute, relative and risk-adjusted performances of SRI portfolios. Our aim is to test whether risk-based allocations are more efficient and are better at capturing extra-financial outperformance than the CW allocation. To do so, we analyze the returns of various portfolios based on four risk-based allocation strategies: the Equally Weighted (EW), the Maximum Diversification (MD), which is equivalent to the modified Maximum Sharpe Ratio (MSR) portfolio, the Minimum Variance (MV) and the Equal Risk Contribution (ERC). We apply these strategies to the EuroStoxx universe of stocks and subsets of this universe conditional on social performance estimated by VIGEO[4]. Then we use the three-factor model (Fama and French 1992) and two multi-factor models to investigate the exposure of portfolios to different common risk factors, as well as the risk-adjusted performance generated. Finally we run robustness checks for cost of rebalancing and risk models.

Our analyses reveal that the answer to that earlier research question (on whether CW drawbacks might neutralize the positive CSR effect) depends on which performance is selected. If we look at relative performance against a CW benchmark, the answer tends to be positive. Indeed we find that the size bias created by extra-financial filtering is amplified by CW allocation and penalizes the latter. In that case risk-based strategies happen to be interesting

[4]The EuroStoxx is a subset of the EuroStoxx 600 that contains a variable number of stocks, roughly 300, traded in Eurozone countries.

alternatives. However if we decompose risk-adjusted performance, the answer tends to be negative, mainly because of the cost imposed by SRI universe constraint. We find that the CW and the ERC allocations have the largest premium for high level of CSR and therefore demonstrate the best ability to capture CSR outperformance. Finally, though we stress the usual limitations of back-testing, our analyses show that risk-based strategies can return good results from the perspective of investors interested in SRI strategies and benchmarked against CW indices.

The remainder of our article is organized as follows. In the next section we present the four risk-based strategies examined. In Section 2 we present the data and the methodology for our back-tests and in Section 3 we analyze portfolio performance. In Section 4 we review the robustness of our results regarding risk models. The last section concludes.

4.2 Risk-based strategies: expected exposure to risk factors

According to Demey et al. (2010) there are four usual types of risk-based strategies yielding four types of risk-based portfolios. In this section we review these four strategies and we recall their exposure to risk factors predicted by theory (Carvalho et al. 2012, Clarke et al. 2013, Scherer 2011).

The first type is the EW portfolio. The EW portfolio simply depends on the number n of components and its weights w_i are given by:

$$\forall i, w_i = \frac{1}{n} \tag{4.1}$$

This portfolio is perfectly diversified in weights by construction. When compared to the CW portfolio, the EW overweights small capitalization stocks and underweights large capitalization stocks.

The second type is the MV portfolio. The vector of weights w of the MV portfolio, with the variance-covariance matrix Σ, is given by the following optimization program:

$$
\begin{aligned}
& w = \arg\min(w'\Sigma w) \\
& \text{s.t. } \sum_{i}^{n} w_i = 1 \\
& \forall i, 0 \leq w_i \leq 1
\end{aligned}
\tag{4.2}
$$

The unconstrained version of this portfolio, assuming the returns follow a one-factor model, is exposed to low-beta and low-residual volatility stocks (Clarke et al. 2006, Scherer 2011).

The third type is the MD (Choueifaty and Coignard 2008) or modified MSR (Martellini 2008). To obtain the vector of weights w of this portfolio, Choueifaty and Coignard (2008) introduce a diversification measure that is maximized:

$$
\begin{aligned}
& w = \arg\max\left(\frac{w'\sigma}{\sqrt{w'\Sigma w}}\right) \\
& \text{s.t. } \sum_{i}^{n} w_i = 1 \\
& \forall i, 0 \leq w_i \leq 1
\end{aligned}
\tag{4.3}
$$

The unconstrained version of this portfolio, again assuming returns follow a one-factor model, is exposed to low-beta and high-residual volatility stocks (Carvalho et al. 2012, Clarke et al. 2013).

The last type of portfolio is the ERC portfolio (Maillard et al. 2010) where the risk contribution (RC) of each asset of the portfolio is the same.

$$
\forall i, j, \left(w_i \frac{\delta\sigma(w)}{\delta w_i} = w_j \frac{\delta\sigma(w)}{\delta w_j}\right) \tag{4.4}
$$

The composition of this portfolio is given by the following program:

$$\begin{aligned} & w = \arg\min(\sum_{i=1}^{n}\sum_{j=1}^{n}(w_i(\Sigma w)_i - w_j(\Sigma w)_j)^2) \\ & \text{s.t. } \sum_{i}^{n} w_i = 1 \\ & \forall i, 0 \leq w_i \leq 1 \end{aligned} \tag{4.5}$$

The ERC portfolio is exposed to low-beta, low-residual volatility and, because it invests in the entire universe, to small capitalization stocks.

In Table 4.1, based on the literature, we summarize the exposure of the different risk-based strategies to usual factors. All except the EW portfolio rely on estimations of the matrix of variances and covariances Σ. In the next section we present the different risk models we use to estimate our four portfolios.

Table 4.1 – Risk-based exposure to risk factors

In this table we list the exposure of each strategy (lines) to different factors (columns). These results are based on formal analysis of solutions of the different optimization programs, assuming that returns are generated by a one-factor model.

	Exposition toward factors			
Strategy	**Small capitalization**	**Low beta**	**Low residual volatility**	**High residual volatility**
EW	X			
MV		X	X	
MD		X		X
ERC	X	X	X	

4.3 Data and methodology

We run our back-tests using daily-adjusted prices for three different universes of stocks, the EuroStoxx, the Advanced Sustainability Performance Index (ASPI)[5] and the complement of the ASPI in the EuroStoxx universe. We use four risk-based allocation strategies, the EW, the ERC, the MV and the

[5]The ASPI is a best in class index provided by VIGEO until beginning of 2013. It selects the 120 best rated firms in the EuroStoxx, according to VIGEO extra-financial performance rating.

MD, and the CW allocation strategy. We use data from March 15, 2002 to May 1, 2012. This period of time is rather short but has the advantage of covering very different economic contexts.

Our data sources are Datastream for prices and composition of the EuroStoxx and IEM[6] for composition of the ASPI index. We verify that our in-house-built universes are reliable by estimating tracking error volatility of index replication. Because the ASPI is a best-in-class index, we expect its sector composition to be similar to that of the EuroStoxx. We verify that they are similar; however, for most of the ten sectors we statistically reject equality of weights (Table 4.2). This suggests we should control for sector exposure in our analysis of outperformance. We use arithmetic returns and calculate all returns in Euro[7]; when necessary we take the 3-months German interest rate as risk-free rate and, using index calculation methodology, we rebalance the portfolios at closing on third Friday of March, June, September and December. The weights of portfolios are allowed to drift between rebalancing dates.

For the EuroStoxx and the complement universes of stocks, the weights of the CW portfolios are calculated using free-float market capitalization based on Datastream information. The EW portfolio weights are given by the number of components in the EuroStoxx and in the complement of the ASPI in the EuroStoxx universe[8]. For the MV, the MD and the ERC portfolios, we estimate weights by optimizing their respective objective functions introduced in the previous section. For the three optimization programs, constraints are no short-sells and no cash holdings. For the ASPI universe of stocks, we follow the same methodology.

Note that solutions to the MV, the MD and the ERC optimization programs

[6]IEM is the firm in charge of the calculation methodology of the ASPI. VIGEO is a provider of social performance ratings and sponsor of the ASPI.

[7]By construction EuroStoxx is a Euro Zone universe.

[8]The EuroStoxx has a variable number of components; its average is 300. The complement of the ASPI has 180 components; this number is variable. The ASPI universe has 120 components, it is a fixed number.

depend on the matrix of variances and covariances (the VCV matrix) of stock returns. Estimation of the VCV matrix is challenging and different estimators are proposed in the literature. To control for possible impact of the VCV matrices, we use four of them: the empirical, the constant correlation and the shrinkage estimator with two shrinkage targets, the constant correlation VCV matrix and the one-factor model VCV matrix (Ledoit and Wolf 2004). In our analyses we point out that our default case is the empirical VCV matrix. We discuss the impact of changing the risk model in section 6. Regarding calculation, at initiation and at each rebalancing, we update the VCV matrix from a 260-day rolling window of the most recent historical data[9]. Because the MV and the MD optimizations can be highly concentrated, we run the MV and the MD optimization programs with upper-bound constraints (5% or 10%) for weights, as analyzed and proposed by Maillard et al. (2010).

We first analyze absolute and relative performance of our different portfolios. We focus on the performance of portfolios built on the ASPI universe, comparing it with that of other portfolios. To verify the robustness of our results, we investigate how and when the performances are generated, and we investigate how the cost of rebalancing impacts level of performance (Anderson et al. 2012). We present the latter procedure in Appendix A. The purpose of these analyses is to investigate the potential efficiency gains offered by a risk-based allocation strategy as compared to a value-weighted allocation strategy, as well as to investigate whether risk-based strategy can capture potential outperformance related to extra-financial selection.

Second, we estimate the risk-adjusted performance of portfolios with factor models. Then we run regressions to analyze the correlation of estimated alphas of portfolios with the strategies and universes used. The regressions allow us to obtain the economic and statistical significance of the relations of interest.

[9] We point out that for some stocks historical series are shorter than the VCV estimation window. For the ASPI universe, this holds for two stocks out of 238, the smallest window is 100 days. For the EuroStoxx and complement of ASPI universes, it holds for 53 stocks out of 536, the smallest window is 12 days.

Table 4.2 – Industrial composition of universes

In this table we report the average historical number , the percentage of firms and the ratio of percentage of firms in each industry. We use the GICS classification. For average number and percentage we report the standard deviation of respective statistics. The ratio is the percentage of firms in each industry for ASPI or ASPI divided by the same percentage for EuroStoxx. The P-values correspond to the Student's t-test for the following H0 hypothesis: the average of distributions of ratios is equal to one. Column A is Consumer Discretionary, B is Consumer Staples, C is Energy, D is Financials, E is Health Care, F is Industrials, G is Information Technology, H is Materials, I is Telecommunication Services, J is Utilities.

	A	B	C	D	E	F	G	H	I	J	NA	TOTAL
	Number of firms in each industry											
EuroStoxx	41.4	23.2	12.0	66.6	14.2	48.8	15.3	26.1	12.5	18.4	34.2	312.7
s.d.	3.3	2.0	3.1	5.4	1.7	10.8	2.4	4.5	1.0	2.7	27.1	5.5
A$\bar{S}$PI	22.9	12.2	7.5	42.9	10.5	30.7	6.0	16.6	7.2	12.5	22.8	191.9
s.d.	2.9	2.4	3.1	5.1	2.1	6.7	3.0	4.2	1.1	1.7	18.0	5.1
ASPI	18.5	11.0	4.4	23.4	3.6	18.0	9.2	9.5	5.3	5.9	11.0	119.9
s.d.	2.3	0.8	2.4	2.3	0.7	5.0	1.5	1.3	0.7	2.5	10.3	0.3
	Percentage of firms in each industry											
EuroStoxx	13.2%	7.4%	3.8%	21.3%	4.6%	15.6%	4.9%	8.4%	4.0%	5.9%	10.9%	100.0%
s.d.	1.1%	0.7%	1.0%	1.7%	0.5%	3.4%	0.8%	1.4%	0.3%	0.9%	8.7%	0.0%
A$\bar{S}$PI	12.0%	6.4%	3.9%	22.3%	5.5%	16.0%	3.2%	8.7%	3.8%	6.5%	11.9%	100.0%
s.d.	1.5%	1.2%	1.6%	2.6%	1.1%	3.5%	1.6%	2.2%	0.5%	0.9%	9.4%	0.0%
ASPI	15.4%	9.2%	3.7%	19.5%	3.0%	15.0%	7.7%	7.9%	4.4%	4.9%	9.2%	100.0%
s.d.	1.9%	0.7%	2.0%	2.0%	0.6%	4.2%	1.3%	1.1%	0.6%	2.1%	8.6%	0.0%
	Ratio of percentage of firms in each industry (Subset/EuroStoxx)											
A$\bar{S}$PI	**0.90**	**0.85**	1.00	**1.05**	**1.19**	**1.03**	**0.62**	1.02	**0.94**	**1.12**		
p-val	*0.00*	*0.00*	*0.92*	*0.00*	*0.00*	*0.01*	*0.00*	*0.25*	*0.00*	*0.00*		
ASPI	**1.17**	**1.24**	0.98	**0.92**	**0.67**	**0.95**	**1.62**	0.97	**1.11**	**0.82**		
p-val	*0.00*	*0.00*	*0.83*	*0.00*	*0.00*	*0.01*	*0.00*	*0.32*	*0.00*	*0.00*		

It can be interpreted as a decomposition of alphas into sources of alpha. As previously, we investigate how the cost of rebalancing impacts our results. The purpose of these analyses is to derive conclusions that account for potential differences in risk exposure. For both types of analyses we complement the parametric inference with a non-parametric bootstrap inference. We present the procedure in Appendix B.

To build the different factors, we follow the usual approach using stocks from the EuroStoxx universe. In Tables 4.3 and 4.4 we report statistics for the different factors we estimate[10]. The first two factors are value and size. For the High-Minus-Low (HML) factor or value factor, we classify stocks from

[10] As Scherer (2011), we report a slight positive correlation of LBMHB with SMB. This trend is rather puzzling for us because by construction large firms have beta close to one, and small firms have beta that can diverge largely above and below one (see Chapter 5, see also Table 2 - Panel B in Heston et al. (1999)). A possible explanation could be that we used value-weighted portfolios for factors construction, but Scherer (2011) used equal-weighted portfolios to build its LBMHB factor.

Table 4.3 – Statistics on absolute performance for the five factors

In this table we report different statistics on performance of the five risk factors. Sharpe ratios are calculated against a zero risk-free rate. Annualized realized performance is discrete annual rate equivalent to total performance. For statistics of distribution we estimate the four first shape parameters of distributions of arithmetic daily returns. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

	HML	**LBMHB**	**LRVMHRV**	**SMB**	**Mkt-Rf**
			Realized performance		
Total realized perf. (%)	127.19	53.20	-52.67	30.74	-42.53
Annualized perf. (%)	8.41	4.29	-7.10	2.67	-5.30
Sharpe ratio (realized)	0.23	1.23	2.23	3.23	4.23
Max. Drawdown (%)	-46.84	-30.78	-77.66	-38.53	-64.56
			Tracking performance		
Daily TE (pts)	0.0391	0.0198	-0.0196	0.0157	-0.0093
Std dev. daily TE (pts)	1.3530	1.4279	1.9421	1.8847	0.0048
Information ratio	0.0289	0.0139	-0.0101	0.0083	-1.9359
Correlation	0.4712	0.2486	-0.0803	-0.2614	1.0000
			Distribution of arithmetic returns		
Annual expected return (%)	9.81	4.80	-5.46	3.70	-2.77
Volatility (%)	18.63	11.05	19.34	14.57	23.14
Sharpe ratio (expected)	0.53	0.43	-0.28	0.25	-0.12
Average daily return (%)	0.0377	0.0184	-0.0210	0.0142	-0.0107
Std dev. daily return (%)	1.1554	0.6855	1.1992	0.9037	1.4351
Skewness daily return	-0.06	4.80	-1.18	-0.93	0.11
Kurtosis daily return	13.81	157.76	76.76	18.84	8.37

the Eurostoxx universe into market capitalization deciles, then into book-to-market value deciles. We build equally weighted portfolios with the 10 value-weighted portfolios of highest book-to-market value, and the 10 value-weighted portfolios of lowest book-to-market value. For the Small-Minus-Big (SMB) factor or size factor, we classify stocks from the Eurostoxx universe into book-to-market value deciles, then into market capitalization deciles. We keep the 10 portfolios of highest market capitalization and the 10 portfolios of lowest market capitalization.

Table 4.4 – Correlation of the five factors

	HML	**LBMHB**	**SMB**	**LRVMHRV**
LBMHB	0.05			
SMB	-0.13	-0.20		
LRVMHRV	-0.15	-0.18	-0.46	
Mkt-Rf	0.47	-0.26	0.24	-0.07

The two other factors are the Low-Beta-Minus-High-Beta (LBMHB) and the Low-Residual-Volatility-Minus-High-Residual-Volatility (LRVMHRV) (Scherer

2011). The reason why we add two risk-based factors to the first factor model is to account for additional market anomalies documented in the literature and to cover the particular exposure to SMB, LBMHB and LRVMHRV theoretically implied by risk-based strategies (see Carvalho et al. 2012). For the LBMHB factor, we classify stocks of the Eurostoxx universe into residual volatility deciles, then into beta deciles. We build equally weighted portfolios with the 10 value-weighted portfolios with the highest betas, and the 10 value-weighted portfolios with the lowest betas. For the LRVMHRV factor, we classify stocks of the Eurostoxx universe into beta deciles, then into residual volatility deciles. We keep the 10 portfolios with the highest residual volatility and the 10 portfolios with the lowest residual volatility. As Carvalho et al. (2012) and Scherer (2011), we neutralize beta in the calculation of returns for the two factors.

Finally, as introduced previously, we include industry factors to control for differences in sector exposure. We follow the methodology used in Derwall et al. (2005) to derive industry factors that are orthogonal to the four previously introduced risk factors, we build 10 value-weighted sector portfolios corresponding to the 10 top industries of the Global Industry Classification Standard. Then we explain the returns obtained with 10 5-factor models (i.e. Mkt-Rf, HML, SMB, LBMHB and LRVMRHRV). We collect the 10 time series of the sum of the estimated constant terms and residuals. Finally, we run a principal component analysis on the VCV matrix of these 10 time series. The three industry factors' weights are proportional to the three eigenvectors with the three largest eigenvalues.

4.4 Analysis of absolute, relative and risk-adjusted performance of portfolios

Characteristics of portfolios and absolute performance

In a companion paper we analyze the portfolio characteristics of risk-based strategies built on the ASPI (see Chapter 5). Using the same data and methodology for portfolio calculation, we confirmed that there is a price to pay for using the ASPI universe in terms of ex-ante optimality of solutions given by risk-based optimization programs. But we also found that using the ASPI universe protects risk-based portfolios from extreme negative risks, and perhaps from parameter estimation risks.

Table 4.5 – Statistics of absolute performance for portfolios on the three universes

In this table we report statistics on performance of all risk-based and CW strategies that are simulated on the respective universes from March 15, 2002 to May 1, 2012. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

		1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
EuroStoxx	Annualized perf. (%)	0.46	1.52	-3.43	4.51	**4.73**	0.97	3.75	2.72	-2.99
	p-val. bootstrap	*0.47*	*0.39*	*0.75*	*0.12*	*0.10*	*0.42*	*0.21*	*0.26*	*0.66*
	Sharpe ratio (realized)	0.02	0.09	-0.22	0.37	0.41	0.06	0.25	0.20	-0.13
	Max. Drawdown (%)	-63.93	-61.28	-72.97	-46.84	-43.38	-60.68	-48.52	-49.58	-61.79
	Annual expected return(%)	2.72	2.98	-2.18	5.14	5.29	2.20	4.81	3.56	-0.36
	Volatility (%)	21.24	17.19	15.73	12.18	11.59	15.77	15.13	13.29	23.14
	Skewness daily return	-0.06	-0.15	-7.50	3.14	1.53	1.41	4.08	0.87	0.12
	Kurtosis daily return	8.11	9.34	154.87	78.65	39.73	101.95	120.21	26.55	8.37
AS̄PI	PA	1.27	1.91	-4.30	3.28	3.53	0.22	2.68	1.90	-1.97
	p-val. bootstrap	*0.43*	*0.36*	*0.80*	*0.19*	*0.17*	*0.47*	*0.26*	*0.33*	*0.62*
	Sharpe ratio (realized)	0.06	0.12	-0.27	0.29	0.31	0.02	0.21	0.14	-0.09
	Max. Drawdown (%)	-63.65	-61.84	-74.29	-50.63	-46.99	-61.16	-48.75	-50.57	-65.69
	Annual expected return(%)	3.32	3.24	-3.05	3.87	4.13	1.15	3.46	2.75	0.31
	Volatility (%)	20.30	16.39	15.93	11.26	11.43	13.57	12.79	13.13	21.44
	Skewness daily return	-0.12	-0.22	-7.43	0.03	-0.32	-2.68	-0.28	-0.36	-0.04
	Kurtosis daily return	8.36	9.62	149.35	11.11	10.92	41.38	10.80	11.06	8.38
ASPI	PA	-0.89	0.77	**7.42**	**6.15**	3.86	4.79	4.62	3.95	-3.41
	p-val. bootstrap	*0.55*	*0.45*	*0.06*	*0.10*	*0.20*	*0.22*	*0.20*	*0.22*	*0.68*
	Sharpe ratio (realized)	-0.04	0.04	0.50	0.41	0.27	0.24	0.27	0.25	-0.14
	Max. Drawdown (%)	-64.63	-59.82	-42.44	-44.49	-49.79	-50.41	-53.35	-52.76	-60.30
	Annual expected return(%)	1.79	2.75	8.24	7.08	4.83	6.64	5.96	5.12	-0.55
	Volatility (%)	23.19	19.91	14.85	15.11	14.45	20.29	17.13	15.84	24.20
	Skewness daily return	0.04	0.05	3.56	3.63	0.72	7.11	2.76	0.36	0.18
	Kurtosis daily return	7.81	8.94	93.99	94.34	22.19	235.63	74.50	16.60	8.23

Particularly important was the finding that risk-based strategies built on the entire EuroStoxx universe concentrate their solution on the complement of the ASPI in the EuroStoxx. A proposition of explanation is that extra-financial screening introduces a size bias, and that theoretical exposure of risk-based strategies toward LBMHB factor favors small stocks by construction (see Chapter 5). We observed that on average, the market values of firms in the ASPI are 3.74 greater than the market values of firms in the complement of the ASPI in the EuroStoxx. Jussa et al. (2013) made the same observation on the MSCI Environmental, Social and Governance data. This has several additional consequences: for instance, grouping high CSR stocks together increases diversification of portfolios, but at same time it decreases the positive effect of risk-based strategies on diversification. We also note that risk-based strategies built on the ASPI tend to have higher turnover, everything else being equal, and that distribution of returns of portfolios built on the ASPI universe have positive skewness, while the opposite is true for portfolios built on the two other universes. We also found differences in the tracking error volatility of portfolios. Most importantly for the purposes of this paper, we found that all the risk-based portfolios outperform the CW portfolio. Exhibit 4.5 reports the absolute performance of the different allocation strategies on the three universes of stocks.

Analysis of relative performance

The purpose of these analyses is to investigate the potential advantages of risk-based asset allocation strategies for socially responsible investment in comparison to the CW allocation. We are interested in two advantages compared to a value weighted benchmark: efficiency gains and a greater ability to capture potential outperformance related to extra-financial selection.

Table 4.6 reports excess returns of the different risk-based portfolios built on the ASPI compared to the EuroStoxx CW. This analysis simulates the behavior of an investor who decides to go for risk-based allocations and who is

Table 4.6 – ASPI portfolios against EuroStoxx CW

In this table we report statistics on the long-short portfolios of the different risk-based portfolios built on the ASPI minus the EuroStoxx CW. They are estimated from March 15, 2002 to May 1, 2012. Annualized realized performance is discrete annual rate equivalent to total performance. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

	1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
Annualized perf. (%)	**2.09**	**2.97**	**7.31**	6.24	4.39	5.11	5.19	4.79	-0.21
p-val. bootstrap	*0.06*	*0.06*	*0.10*	*0.13*	*0.15*	*0.22*	*0.15*	*0.12*	*0.62*
Sharpe ratio (realized)	0.49	0.49	0.42	0.37	0.33	0.25	0.33	0.38	-0.09
Max. Drawdown (%)	-10.38	-8.00	-32.96	-33.15	-24.19	-38.64	-25.96	-16.72	-7.66
Annual expected return(%)	2.16	3.11	8.61	7.45	5.20	7.01	6.33	5.49	-0.18
Volatility (%)	4.22	6.02	17.59	16.73	13.41	20.28	15.92	12.71	2.26
Skewness daily return	0.02	-0.66	0.13	0.47	-0.38	3.90	0.68	-0.58	0.65
Kurtosis daily return	7.14	19.66	42.85	54.51	14.33	219.96	87.00	19.50	13.84

benchmarked against traditional CW indexes. We note that the EW, the ERC and the MV allocation strategies significantly outperform the CW portfolio built on the EuroStoxx universe. All the MD and the constrained MV portfolios fail to outperform significantly. This analysis and that in our companion paper reveal the potential advantage of risk-based allocations for socially responsible investors who seek relative outperformance against a value-weighted benchmark. Both are in line with the literature on risk-based allocations, but neither can tell us whether any outperformance related to extra-financial selection is better captured or not. To find this out, we run a second set of comparisons.

Table 4.7 compares excess returns of the different risk-based portfolios built on the ASPI to the same risk-based portfolios built on the two other universes. This comparison enables us to identify which allocation has the highest premium for high level of CSR[11]. This proves to be the unbounded MV allocation strategy, which significantly outperforms its counterparts built on the two other universes and does better than the CW allocation. Note that this result is not robust to the inclusion of maximum weight constraints. The

[11] We compare performance of portfolios built according to the same allocation strategies. Differences in performance can be attributed to the only remaining difference: the level of social performance of universes.

Table 4.7 – ASPI portfolios against EuroStoxx and $A\bar{S}PI$ portfolios

In this table we report statistics on the long-short portfolios of the different risk-based portfolios built on the ASPI minus the same risk-based portfolios built on EuroStoxx and $A\bar{S}PI$. They are estimated from March 15, 2002 to May 1, 2012. Annualized realized performance is discrete annual rate equivalent to total performance. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

	1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
				ASPI against EuroStoxx					
Annualized perf. (%)	-0.99	-0.36	**9.63**	1.60	-0.71	3.79	0.80	1.26	-0.21
p-val. bootstrap	*0.80*	*0.59*	*0.02*	*0.27*	*0.63*	*0.16*	*0.38*	*0.30*	*0.61*
Sharpe ratio (realized)	-0.26	-0.07	0.60	0.19	-0.10	0.31	0.10	0.16	-0.09
Max. Drawdown (%)	-17.83	-14.97	-22.25	-18.93	-21.32	-20.62	-18.25	-14.25	-7.66
Annual expected return(%)	-0.92	-0.24	10.42	1.94	-0.46	4.44	1.16	1.56	-0.18
Volatility (%)	3.87	4.97	15.99	8.38	7.17	12.17	8.42	7.86	2.26
Skewness daily return	0.52	0.96	7.25	-0.07	0.05	5.22	0.12	0.16	0.65
Kurtosis daily return	6.72	12.51	135.51	15.05	8.30	92.55	5.75	5.06	13.84
				ASPI against $A\bar{S}PI$					
Annualized perf. (%)	-1.71	-0.75	**10.32**	2.55	0.32	3.87	1.66	1.91	-1.12
p-val. bootstrap	*0.81*	*0.63*	*0.03*	*0.25*	*0.45*	*0.26*	*0.34*	*0.27*	*0.69*
Sharpe ratio (realized)	-0.27	-0.10	0.59	0.21	0.04	0.21	0.13	0.19	-0.15
Max. Drawdown (%)	-27.74	-21.38	-21.69	-23.97	-18.29	-41.71	-31.37	-19.11	-25.39
Annual expected return(%)	-1.53	-0.49	11.30	3.22	0.70	5.49	2.50	2.38	-0.86
Volatility (%)	6.27	7.18	17.54	11.95	8.78	18.84	13.19	9.85	7.37
Skewness daily return	0.51	1.24	6.55	3.51	1.37	7.92	3.53	0.92	0.78
Kurtosis daily return	6.72	23.26	123.43	178.94	48.20	323.06	201.72	52.03	11.76

various MD allocation strategies outperform their counterparts built on the two other universes and do better than the CW allocation. The EW and the ERC allocation strategies tend to under-perform their respective counterpart and do worst than the CW allocation. However we note that none of them significantly under-performs, and we note that the relative under-performance is close to that obtained with the CW allocation.

Figure 4.1 – Ratios of values of ASPI portfolios to values of EuroStoxx CW

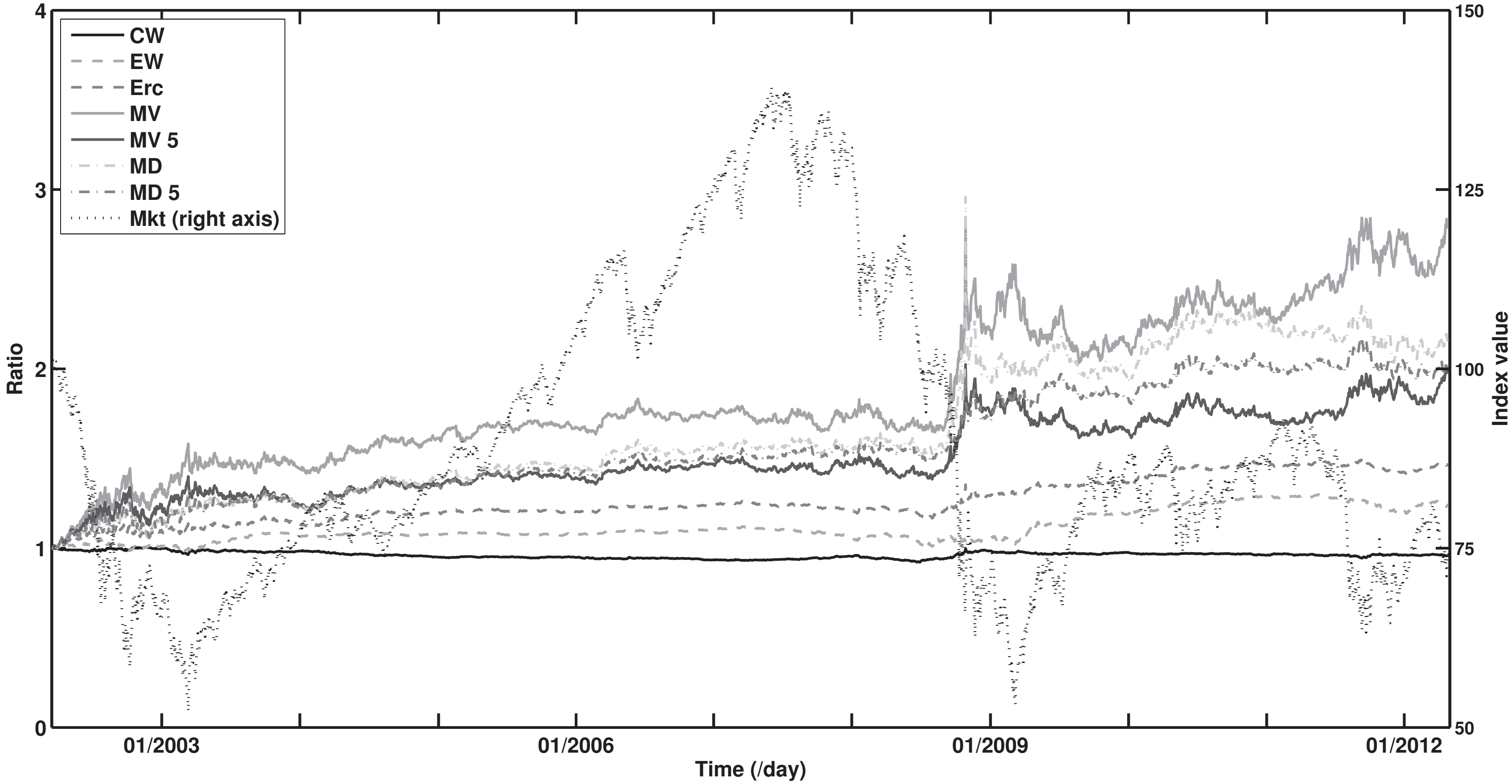


Figure 4.2 – Ratios of values of ASPI portfolios to values of same A$\bar{S}$PI portfolios

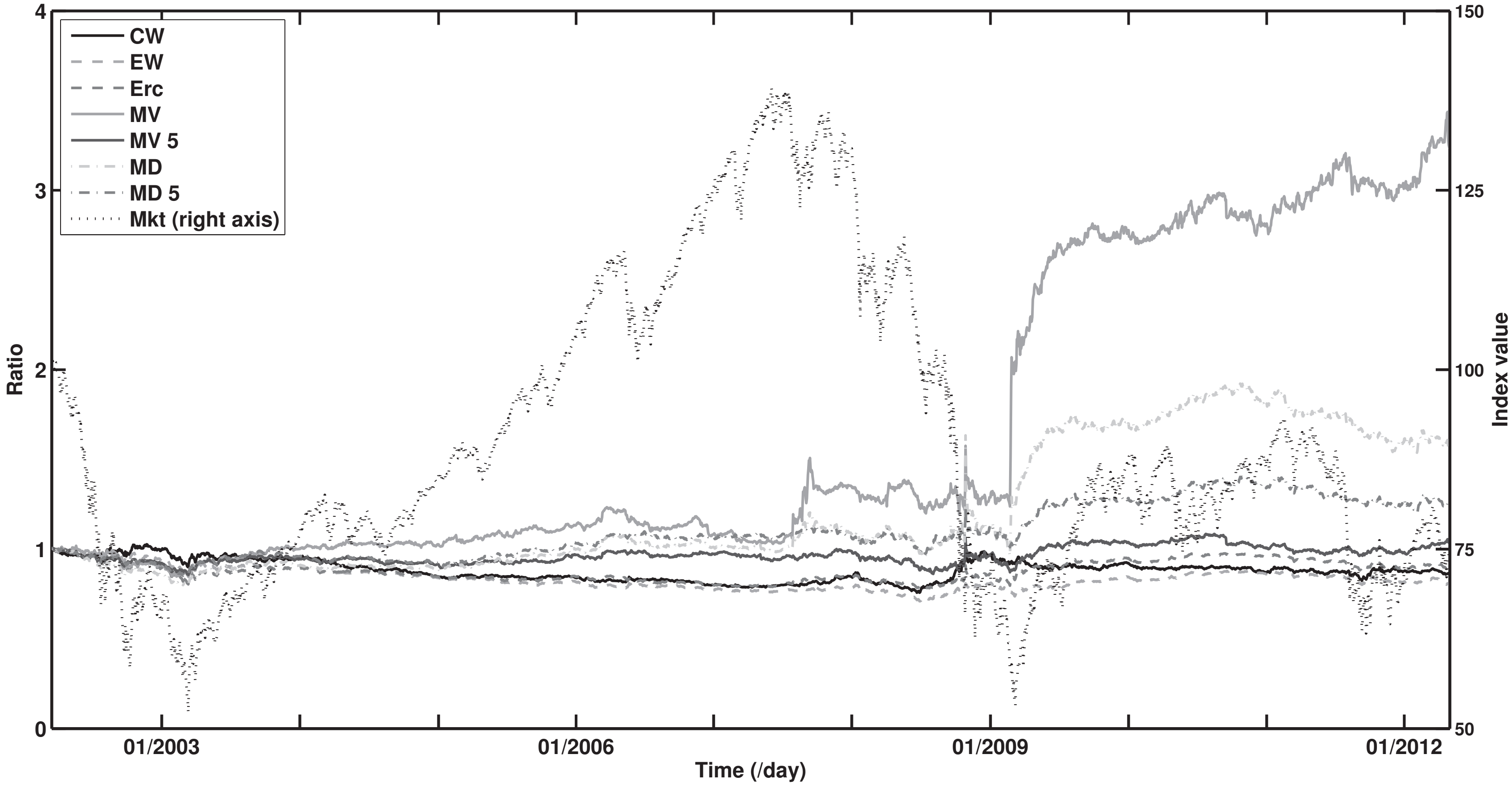
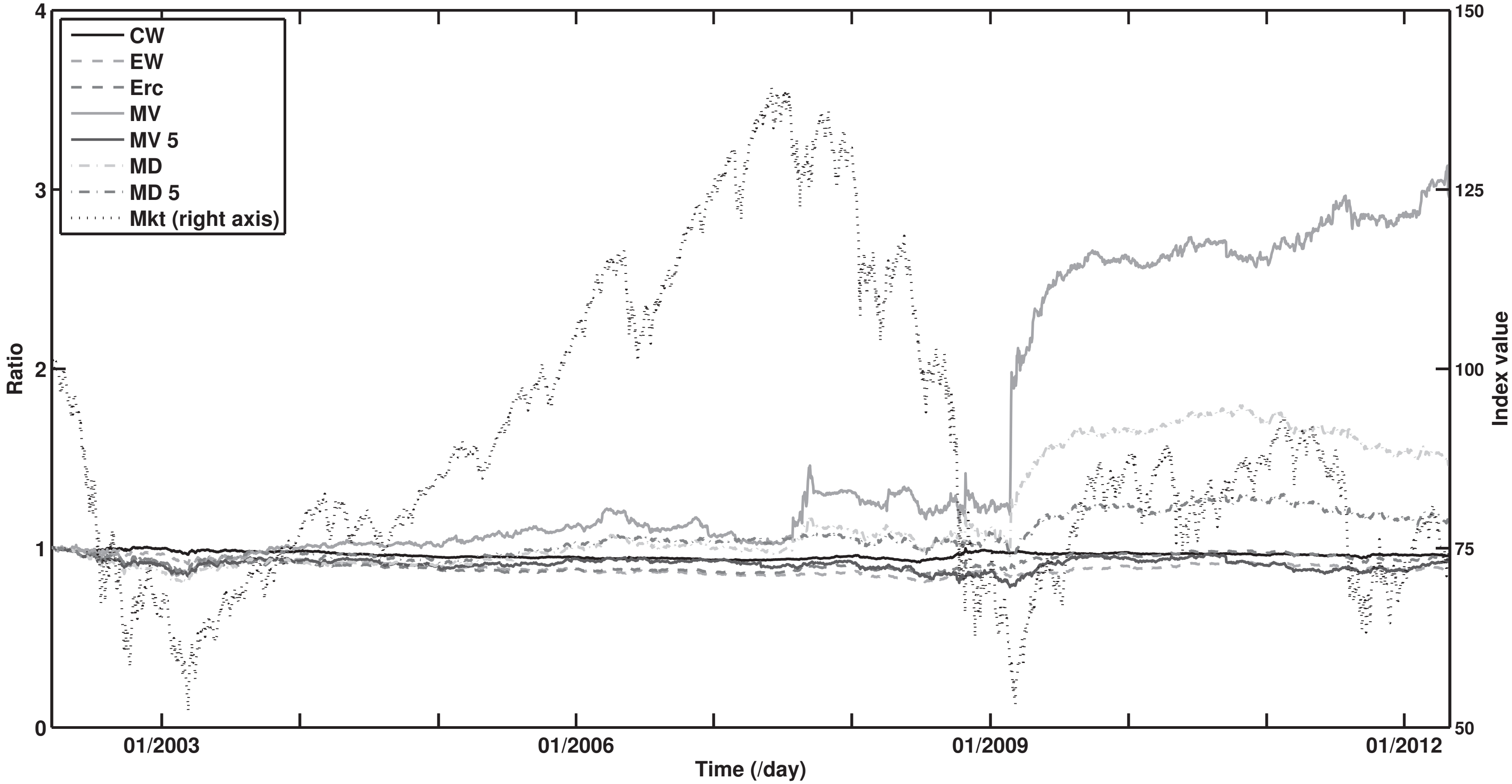


Figure 4.3 – Ratios of values of ASPI portfolios to values of same EuroStoxx portfolios



The main conclusion of Table 4.7 is that best allocations turn out to be the unbounded MV and the unbounded MD build on the ASPI universe. Recall that, contrary to the EW and the ERC, the MV and the MD only invest in a subset of the investible universe and usually end up with highly concentrated distributions of weights. Interestingly, this analysis reveals that only the two latter allocations demonstrate good relative performance. The latter observation triggers the following question: are the MV and the MD allocation really better able to capture the extra-financial outperformance, or is their performance related to their concentration of weights? To investigate further, we analyze when and how relative outperformance is generated. To do so we plot the ratios of values of portfolios previously introduced. This analysis enables us to investigate the robustness of outperformance against different start and end dates. In Figure 4.1 we compare the different risk-based portfolios built on the ASPI against the EuroStoxx CW. In Figure 4.2 and 4.3 we compare the different risk-based portfolios built on the ASPI against the same portfolios built on the EuroStoxx and the complement of ASPI in the EuroStoxx.

Our first observation is that relative outperformance is not uniform and is concentrated during crisis periods. Our second observation is that jumps in relative performance of the MV and the MD allocations occur, and that these jumps correspond to large decreases in the share prices of certain firms with a low level of involvement in CSR (henceforth - low CSR firms) caused by rare negative events. Hence, in August and September 2007, Atrium European Real Estate lost 57% of its value. VIGEO initiated coverage of Atrium European Real Estate in 2009. At that time the firm was below the industry average. At the end of February 2009, the CEPSA share price decreased by 57% in three days as Santander, its second-largest shareholder, discussed the sale of its stake. CEPSA was not a best-in-class firm because Corporate Governance was one of the points rated below peer group average by VIGEO. These observations are consistent with the idea that low CSR firms bear extreme negative risks, and it reveals that the relative outperformance of the MV and the MD allocations is mainly driven by the failures of a few low CSR firms.

It is not that the MV or the MD allocation have allocated wealth to the right firms in the ASPI universe, but rather that extra-financial filtering prevents them from allocating wealth to the wrong firms. In addition, it is because these jumps are rare events that the MV and the MD allocations built on the ASPI fail to significantly outperform their counterparts built on the two other universes. And it is because these rare events are diversified away by the EW, the ERC and the bounded MV and MD that the latter allocations built on the ASPI do not benefit from extra-financial filtering. Overall, this additional set of analyses, combined with the relative performances of other risk-based allocations, do not support the notion of a particular ability of risk-based allocations to better capture extra-financial outperformance. However they illustrate the respective advantages of extra-financial filtering and naive diversification of components.

Because allocation strategies under investigation have very different turnovers, we investigate how costs of rebalancing impact the previous results. These adjusted analyses show that the previous observations hold when costs of rebalancing are included. Detailed results are presented in Appendix A.

The conclusion we draw from our analyses is that risk-based allocation strategies have advantages for socially responsible investors who are benchmarked against CW indexes, and that risk-based allocation strategies do not appear to be systematically more efficient in capturing extra-financial outperformance. However, note that turning the problem the other way round, extra-financial filtering could be said to have advantages for investors who use concentrated risk-based allocations[12]. We now verify that our conclusions hold true with

[12] Extra-financial filtering protects risk-based portfolios from extreme negative events related to extra-financial matters as discussed in Chapter 5.

risk-adjusted performance when we control for differences in exposure to systematic risk factors.

Factor models: analysis of risk-adjusted performance

The general purpose of the following analyses is to derive conclusions on outperformance that take into account for potential differences in portfolio risk exposure. Hence, for all strategies on the three universes, we explain portfolio performance with factor models. In Table 4.8 we present results from regression of daily excess returns of different strategies against the EuroStoxx market excess returns and various factors introduced in Fama and French (1992), Fama and French (2004), Scherer (2011) and Derwall et al. (2005). We use the three-month German treasury bill rate to calculate excess returns. Table 4.9 reports bootstrap P-values for significance of alphas from previous factor models. Table 4.10 compares results of regressions of excess returns of risk-based portfolios built on the ASPI against the same risk-based portfolios built on the two other universes, and against the CW allocation built on the EuroStoxx. In addition to the estimation of factor models we include a regression of estimated alphas against different group dummies and size of portfolios (Table 4.11). As previously stated, this can be interpreted as a decomposition of the alpha.

When using the three-factor model, we first note that the different exposure to small-caps are in line with the theory (cf. Table 4.1) and consistent with the positive correlation between firms' size and high level of CSR. The size bias introduced by extra-financials explains the differences in absolute performance of the CW, the EW and the ERC allocations on the ASPI and A$\bar{\text{S}}$PI universes. We also note the economic and statistical significance of alphas for the EW and bounded MV allocation strategies built on the Eurostoxx. In addition we note the economic and statistical significance of the MV allocation strategies built on the ASPI universe, and that only the EW allocation strategy generates an average abnormal return for the A$\bar{\text{S}}$PI. The alpha goes up to 9% per year

Table 4.8 – Fama French models for the three universes from March 15, 2002 to May 1, 2012

Standard errors and P-values are the Newey and West (1987) HAC estimators. In bold coefficients are significant at 10%-level at least. The risk-free rate is the 3-month German interest rate. First part of the Table reports estimations for the three-factor model. Second part of the Table reports estimations for the eight-factor model. Alphas are annualized.

EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.24*	**0.01**	*0.07*	0.02	*0.25*	-0.03	*0.52*	**0.05**	*0.09*	**0.05**	*0.05*	0.01	*0.74*	0.04	*0.22*	0.03	*0.32*
Mkt-Rf	**1.00**	*0.00*	**0.92**	*0.00*	**0.74**	*0.00*	**0.30**	*0.00*	**0.35**	*0.00*	**0.40**	*0.00*	**0.38**	*0.00*	**0.41**	*0.00*	**0.47**	*0.00*
HML	0.00	*0.00*	**0.04**	*0.00*	0.01	*0.21*	**-0.06**	*0.01*	**-0.09**	*0.00*	**-0.09**	*0.00*	-0.05	*0.13*	-0.04	*0.15*	**-0.05**	*0.03*
SMB	0.00	*0.00*	**0.29**	*0.00*	**0.23**	*0.00*	0.07	*0.29*	-0.02	*0.88*	0.04	*0.71*	-0.02	*0.91*	-0.02	*0.91*	0.10	*0.38*
R^2 adj.	1.00		0.98		0.93		0.16		0.39		0.55		0.29		0.38		0.58	
AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.86*	0.02	*0.10*	0.02	*0.32*	-0.04	*0.39*	0.03	*0.23*	0.03	*0.14*	0.00	*0.91*	0.02	*0.39*	0.01	*0.57*
Mkt-Rf	**0.94**	*0.00*	**0.89**	*0.00*	**0.70**	*0.00*	**0.32**	*0.00*	**0.40**	*0.00*	**0.45**	*0.00*	**0.43**	*0.00*	**0.48**	*0.00*	**0.51**	*0.00*
HML	0.00	*0.99*	**0.02**	*0.00*	0.01	*0.43*	**-0.06**	*0.02*	**-0.07**	*0.00*	**-0.07**	*0.00*	**-0.04**	*0.02*	**-0.04**	*0.01*	**-0.04**	*0.00*
SMB	**0.19**	*0.00*	**0.36**	*0.00*	**0.31**	*0.00*	**0.13**	*0.00*	**0.15**	*0.00*	**0.18**	*0.00*	**0.21**	*0.00*	**0.23**	*0.00*	**0.25**	*0.00*
R^2 adj.	0.97		0.97		0.91		0.17		0.55		0.67		0.47		0.65		0.71	
ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.69*	0.01	*0.40*	0.02	*0.11*	**0.09**	*0.01*	**0.08**	*0.02*	**0.05**	*0.04*	0.07	*0.17*	0.05	*0.11*	**0.04**	*0.08*
Mkt-Rf	**1.03**	*0.00*	**0.99**	*0.00*	**0.84**	*0.00*	**0.46**	*0.00*	**0.48**	*0.00*	**0.56**	*0.00*	**0.48**	*0.00*	**0.53**	*0.00*	**0.60**	*0.00*
HML	0.00	*0.75*	**0.07**	*0.00*	**0.03**	*0.01*	**-0.14**	*0.00*	**-0.12**	*0.00*	**-0.09**	*0.00*	-0.02	*0.67*	-0.01	*0.80*	-0.01	*0.56*
SMB	**-0.08**	*0.00*	**0.17**	*0.00*	**0.11**	*0.07*	-0.08	*0.60*	-0.08	*0.62*	0.01	*0.89*	-0.19	*0.52*	-0.04	*0.82*	0.08	*0.42*
R^2 adj.	1.00		0.98		0.95		0.46		0.51		0.72		0.34		0.53		0.73	
EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.36*	0.01	*0.12*	0.00	*0.91*	-0.07	*0.20*	0.01	*0.68*	0.01	*0.46*	-0.04	*0.25*	-0.01	*0.60*	-0.02	*0.38*
Mkt-Rf	**1.00**	*0.00*	**0.92**	*0.00*	**0.70**	*0.00*	**0.23**	*0.00*	**0.30**	*0.00*	**0.35**	*0.00*	**0.30**	*0.00*	**0.33**	*0.00*	**0.39**	*0.00*
HML	**0.00**	*0.00*	**0.04**	*0.00*	**0.05**	*0.00*	**0.05**	*0.01*	0.01	*0.68*	0.01	*0.60*	**0.06**	*0.00*	**0.05**	*0.00*	**0.04**	*0.00*
SMB	**0.00**	*0.00*	**0.28**	*0.00*	**0.26**	*0.00*	**0.16**	*0.00*	**0.06**	*0.07*	**0.11**	*0.00*	0.04	*0.36*	0.02	*0.56*	**0.14**	*0.00*
LBMHB	**0.00**	*0.01*	**0.04**	*0.00*	**0.23**	*0.00*	**0.59**	*0.00*	**0.62**	*0.00*	**0.57**	*0.00*	**0.72**	*0.00*	**0.70**	*0.00*	**0.57**	*0.00*
LRVMHRV	0.00	*0.79*	**-0.03**	*0.00*	**0.03**	*0.01*	**0.16**	*0.00*	**0.07**	*0.02*	**0.07**	*0.00*	-0.04	*0.25*	**-0.09**	*0.01*	**-0.04**	*0.02*
R^2 adj.	1.00		0.99		0.95		0.28		0.71		0.80		0.67		0.80		0.83	
AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	-0.01	*0.62*	0.01	*0.24*	0.00	*0.94*	-0.07	*0.16*	0.00	*0.95*	0.00	*0.84*	-0.04	*0.28*	-0.01	*0.54*	-0.02	*0.34*
Mkt-Rf	**0.91**	*0.00*	**0.87**	*0.00*	**0.66**	*0.00*	**0.24**	*0.00*	**0.33**	*0.00*	**0.38**	*0.00*	**0.34**	*0.00*	**0.38**	*0.00*	**0.42**	*0.00*
HML	0.01	*0.29*	**0.03**	*0.00*	**0.05**	*0.00*	**0.06**	*0.01*	**0.03**	*0.03*	**0.02**	*0.04*	**0.06**	*0.00*	**0.05**	*0.00*	**0.05**	*0.00*
SMB	**0.18**	*0.00*	**0.35**	*0.00*	**0.33**	*0.00*	**0.22**	*0.00*	**0.21**	*0.00*	**0.23**	*0.00*	**0.25**	*0.00*	**0.25**	*0.00*	**0.27**	*0.00*
LBMHB	0.02	*0.39*	**0.07**	*0.00*	**0.22**	*0.00*	**0.53**	*0.00*	**0.47**	*0.00*	**0.45**	*0.00*	**0.48**	*0.00*	**0.44**	*0.00*	**0.42**	*0.00*
LRVMHRV	-0.01	*0.29*	**-0.04**	*0.00*	**0.05**	*0.00*	**0.19**	*0.00*	**0.13**	*0.00*	**0.12**	*0.00*	**0.07**	*0.02*	**0.04**	*0.07*	0.02	*0.28*
R^2 adj.	0.97		0.97		0.93		0.25		0.67		0.78		0.56		0.74		0.79	
ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.40*	0.01	*0.31*	0.01	*0.30*	**0.05**	*0.03*	**0.04**	*0.08*	0.02	*0.30*	0.01	*0.81*	0.01	*0.70*	0.01	*0.50*
Mkt-Rf	**1.05**	*0.00*	**1.01**	*0.00*	**0.84**	*0.00*	**0.41**	*0.00*	**0.44**	*0.00*	**0.51**	*0.00*	**0.41**	*0.00*	**0.47**	*0.00*	**0.56**	*0.00*
HML	**-0.01**	*0.01*	**0.06**	*0.00*	**0.05**	*0.00*	**-0.05**	*0.00*	**-0.04**	*0.02*	-0.01	*0.56*	**0.06**	*0.01*	**0.07**	*0.00*	**0.05**	*0.00*
SMB	**-0.08**	*0.00*	**0.17**	*0.00*	**0.13**	*0.00*	-0.01	*0.80*	-0.02	*0.75*	**0.06**	*0.01*	**-0.14**	*0.09*	0.00	*0.95*	**0.12**	*0.00*
LBMHB	**-0.01**	*0.09*	**-0.02**	*0.09*	**0.17**	*0.00*	**0.62**	*0.00*	**0.61**	*0.00*	**0.48**	*0.00*	**0.79**	*0.00*	**0.62**	*0.00*	**0.44**	*0.00*
LRVMHRV	0.00	*0.75*	**-0.02**	*0.00*	0.00	*0.92*	0.01	*0.73*	0.00	*0.95*	**0.03**	*0.04*	**-0.17**	*0.01*	**-0.10**	*0.00*	**-0.03**	*0.03*
R^2 adj.	1.00		0.98		0.97		0.73		0.78		0.84		0.80		0.82		0.85	

for the unconstrained MV portfolio built on the ASPI.

When using the eight-factor model[13], we first point out that the different exposure to the different factors are in line with theory[14] (cf. Table 4.1). We also note that the alphas are not significant any longer, though we observe that alphas tend to be larger for portfolios built on the ASPI. The additional factors capture previous unexplained outperformance for all but the unbounded MV allocation built on the ASPI universe, which is still significant. Finally, we estimate bootstrap P-values which confirm standard inference for all but the EW portfolio on the EuroStoxx. The latter analysis also indicates that some alphas estimated on EuroStoxx and $\overline{\text{ASPI}}$ are significantly negative (Tables 4.9 and 4.10).

Regressions of alphas against group dummies and size of portfolios confirm that using of the ASPI universe leads to portfolios with significantly higher alphas (i.e. a premium for high level of CSR). Using the $\overline{\text{ASPI}}$ does not significantly raise the level of alphas. The first observation is consistent with a premium for high level of CSR. The second observation is consistent either with a premium for low level of CSR, or with imperfect selection of high CSR firms. Regressions also show that using the EW, the MV and the MD allocation strategies raises the level of alphas compared to the CW allocation (Table 4.11). The two latter strategies have proved the most efficient in the market conditions prevailing over the last ten last years.

The second observation is consistent either with a premium for low level of CSR, or with imperfect selection of high CSR firms. Regressions also show that using the EW, the MV and the MD allocation strategies raises the level of alphas compared to the CW allocation (Table 4.11). The two latter strategies

[13] Results from the five-factor model are close to those from the eight-factor model and are reported in Appendix C.

[14] Only the exposure to LRVMHRV factor of MD portfolios built on the complement of ASPI is rather unexpected. This discrepancy can be explained by the fact that theoretical exposure to LRVMHRV factor is second order (Carvalho et al. 2012), and by the size bias toward small firms that have higher residual volatility.

Table 4.9 – Statistical significance of alphas 1/2

In this table we report annualized alphas (%) from the eight-factor models, and we test for statistical significance with a bootstrap P-value for H0: alpha ≤ 0. Significant statistics at the confidence level of 10% and below are in bold.

	CW	1/n	ERC	MV	MV 10%	MV 5%	MD	MD 10%	MD 5%
				EuroStoxx					
alpha	0.00	**1.07**	0.14	-6.74	0.81	1.18	-3.71	-1.04	-1.53
P-value bootstrap	*0.39*	*0.07*	*0.46*	*0.96*	*0.35*	*0.24*	*0.92*	*0.70*	*0.82*
				A$\bar{S}$PI					
alpha	-0.60	1.17	0.11	-7.43	-0.11	0.33	-3.62	-1.20	-1.77
P-value bootstrap	*0.70*	*0.13*	*0.48*	*0.97*	*0.53*	*0.42*	*0.91*	*0.72*	*0.82*
				ASPI					
alpha	0.44	0.95	0.98	**4.96**	**3.60**	1.77	0.59	0.79	1.20
P-value bootstrap	*0.20*	*0.15*	*0.18*	*0.02*	*0.06*	*0.17*	*0.42*	*0.37*	*0.27*

have proved the most efficient in the market conditions prevailing over the last ten last years.

In addition, model OLS II indicates that the premium for high level of CSR interacts negatively and significantly with the EW, the MV and the MD allocation strategies. It is consistent with optimality costs generated by universe constraints on the MV and the MD risk-based allocations (see Chapter 5). Note that, consistent with results from factor models, in only one case is this negative interaction not compensated by the positive effect of extra-financial selection and risk-based allocations: the unbounded MD allocation (i.e. here, the alpha is negative). Finally, the extra-financial selection premium does not interact significantly with the ERC allocation. Here, the premium for high level of CSR is similar to that obtained with the CW allocation, and is the largest.

As for the previous analyses, because the allocation strategies under investigation have very different turnovers, we investigate how the cost of rebalancing impacts previous results. These adjusted analyses show that the previous conclusions are slightly modified when costs of trading are included. In particular, some statistical significances are modified. We report detailed results in Appendix A.

Table 4.10 – Statistical significance of alphas 2/2

In this table we compare annualized alphas (%) from the regression of excess returns of risk-based portfolios built on the ASPI against same risk-based portfolios built on the two other universes and against the CW allocation built on the EuroStoxx. We use the eight factors model. We test for statistical significance with a bootstrap P-value for H0: alpha ≤ 0. Significant statistics at the confidence level of 10% and below are in bold.

	CW	1/n	ERC	MV	MV 10%	MV 5%	MD	MD 10%	MD 5%
ASPI vs CW Euro									
alpha	0.44	0.95	0.98	**4.96**	**3.60**	1.77	0.59	0.79	1.20
P-value bootstrap	*0.19*	*0.16*	*0.18*	*0.02*	*0.06*	*0.17*	*0.42*	*0.36*	*0.27*
ASPI vs Euro.									
alpha	0.44	-0.12	0.84	**12.54**	2.77	0.57	**4.47**	1.85	**2.77**
P-value bootstrap	*0.19*	*0.56*	*0.21*	*0.00*	*0.13*	*0.38*	*0.10*	*0.23*	*0.10*
ASPI vs A$\bar{S}$PI									
alpha	1.05	-0.22	0.87	**13.39**	3.72	1.43	4.37	2.01	3.02
P-value bootstrap	*0.27*	*0.56*	*0.28*	*0.00*	*0.10*	*0.26*	*0.15*	*0.26*	*0.12*

To summarize, the risk-adjusted analyses confirm our previous conclusions (i.e. analysis of absolute and relative performances). First, they confirm that the EW, the MV and the MD offer advantages for socially responsible investors who are benchmarked against CW indexes. Second, regarding the ability to better capture potential outperformance related to extra-financial selection, these analyses confirm that there is a performance cost when using the EW, the MV and the MD strategies with a constrained universe, although this cost can be offset by risk-based allocations and high level of CSR premiums[15]. They also show that there is a premium for high level of CSR: the CW and the ERC allocations have the largest one, closely followed by the EW. Finally, these analyses show that portfolios built on the ASPI universe have a size bias toward large capitalization firms. This bias fully explains the absolute and relative under-performance of the CW and the ERC allocations (i.e. negative excess returns, Table 4.7, correspond to positive alphas, Table 4.10).

[15] The latter remark is conditional to our dataset.

Table 4.11 – Analysis of Alphas

$$\text{Alpha}_i = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{A\bar{S}PI} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{A\bar{S}PI} * \text{D}_i^{Strategies} + \beta_9 * \text{Size}_i + \varepsilon_i$$

These regressions are estimated with an OLS estimator. We report H. White (1980) HC standard errors, HC and usual P-values. Significant coefficients at the robust confidence level of 10% and below are in bold. The sample is a cross-section of 108 observations that groups alphas of portfolios obtained with the four VCV matrices. We use the eight factors model. Portfolio size is average size divided by 100.

	OLS I				**OLS II**			
	coef.	**s.d.**	**HC p-val**	**p-val**	**coef.**	**s.d.**	**HC p-val**	**p-val**
Cst	**-0,05**	**0,01**	*0,00*	*0,00*	**-0,43**	**0,18**	*0,02*	*0,05*
ASPI	**0,04**	**0,01**	*0,00*	*0,00*	**0,27**	**0,11**	*0,01*	*0,05*
AS̄PI	0,00	0,01	*0,53*	*0,45*	**0,16**	**0,07**	*0,02*	*0,07*
EW	**0,01**	**0,00**	*0,00*	*0,26*	**0,01**	**0,00**	*0,00*	*0,51*
ERC	**0,01**	**0,00**	*0,02*	*0,49*	0,00	0,00	*0,01*	*0,77*
MV	**0,03**	**0,01**	*0,00*	*0,03*	**0,35**	**0,15**	*0,02*	*0,07*
MDP	**0,03**	**0,01**	*0,00*	*0,05*	**0,37**	**0,15**	*0,02*	*0,06*
ASPI * EW	-	-	-	-	**-0,01**	**0,00**	*0,00*	*0,81*
ASPI * ERC	-	-	-	-	0,00	0,00	*0,42*	*0,95*
ASPI * MV	-	-	-	-	**-0,19**	**0,10**	*0,06*	*0,13*
ASPI * MDP	-	-	-	-	**-0,23**	**0,10**	*0,03*	*0,08*
AS̄PI * EW	-	-	-	-	**0,01**	**0,00**	*0,00*	*0,77*
AS̄PI * ERC	-	-	-	-	0,00	0,00	*0,08*	*0,84*
AS̄PI * MV	-	-	-	-	**-0,16**	**0,07**	*0,02*	*0,06*
AS̄PI * MDP	-	-	-	-	**-0,15**	**0,07**	*0,02*	*0,07*
Size	**0,02**	**0,00**	*0,00*	*0,01*	**0,14**	**0,06**	*0,02*	*0,05*
R^2 adj.		0,27				0,35		

4.5 Robustness to choice of risk model

We used three different estimations of the VCV matrix: the empirical, the constant correlation and the shrinkage estimator[16] (Ledoit and Wolf 2004). The different analyses reported in this paper were performed on the empirical VCV matrix sample and on the sample that pools the four different VCV matrices. We investigate how the risk model impacts our results.

We find modifications in the relation between using of risk-based strategies and the performance of SRI portfolios. Using the Sharpe ratio, we observe in Table 4.12 that the constant VCV matrix yields portfolios with significantly lower performance. This can be explained by lower returns and higher variance of returns than portfolios built with other VCV matrices.

[16]Shrinkage targets are the constant correlation and the one-factor market model VCV matrices.

Table 4.12 – Impact of VCV matrix on performance statistics

$$\text{Stat}_i = \beta_0+\beta_1*D_i^{ASPI}+\beta_2*D_i^{A\bar{S}PI}+\beta_3*D_i^{ERC}+\beta_4*D_i^{EW}+\beta_5*D_i^{MD}+\beta_6*D_i^{MV}+\beta_7*D_i^{ASPI}*D_i^{Strategies}+\beta_8*D_i^{A\bar{S}PI}*D_i^{Strategies}+\beta_9*\text{Size}_{it}+\sum_j \beta_j*\text{VCV}_{ij}+\varepsilon_i$$

These regressions are estimated with an OLS estimator. We report H. White (1980) HC standard errors, HC and usual P-values. Significant coefficients at the robust confidence level of 10% and below are in bold. The sample is a cross-section of 108 observations that groups alphas of portfolios obtained with the four VCV matrices. We use the alpha from the eight-factor model. Portfolio size is average size divided by 100. Shrinkage 1 is shrinkage toward one-factor model, Shrinkage 2 is shrinkage toward constant.

	Sharpe Ration				**Annual Alpha**				**IR vs CW EuroStoxx**			
	coef.	**s.d.**	**HC p-val.**	**p-val.**	**coef.**	**s.d.**	**HC p-val.**	**p-val.**	**coef.**	**s.d.**	**HC p-val.**	**p-val.**
Cst	**-2,65**	**0,94**	*0,01*	*0,08*	**-0,43**	**0,16**	*0,01*	*0,05*	**-0,18**	**0,06**	*0,00*	*0,02*
ASPI	**1,62**	**0,58**	*0,01*	*0,08*	0,27	0,10	*0,01*	*0,05*	0,11	0,04	*0,01*	*0,02*
AS̄PI	**1,05**	**0,36**	*0,00*	*0,08*	**0,16**	**0,06**	*0,01*	*0,07*	**0,08**	**0,02**	*0,00*	*0,01*
EW	**0,14**	**0,02**	*0,00*	*0,20*	**0,01**	**0,00**	*0,00*	*0,51*	**0,03**	**0,00**	*0,00*	*0,00*
ERC	**0,18**	**0,02**	*0,00*	*0,10*	**0,00**	**0,00**	*0,01*	*0,77*	**0,03**	**0,00**	*0,00*	*0,00*
MV	**2,53**	**0,81**	*0,00*	*0,05*	**0,35**	**0,14**	*0,01*	*0,07*	**0,17**	**0,05**	*0,00*	*0,01*
MD	**2,59**	**0,84**	*0,00*	*0,05*	**0,37**	**0,14**	*0,01*	*0,06*	**0,18**	**0,06**	*0,00*	*0,01*
ASPI * EW	-0,04	0,03	*0,21*	*0,78*	**-0,01**	**0,00**	*0,07*	*0,81*	0,00	0,00	*0,29*	*0,76*
ASPI * ERC	-0,04	0,03	*0,23*	*0,82*	0,00	0,00	*0,53*	*0,95*	**0,01**	**0,00**	*0,00*	*0,11*
ASPI * GMV	**-1,28**	**0,54**	*0,02*	*0,14*	**-0,19**	**0,09**	*0,04*	*0,13*	**-0,08**	0,04	*0,03*	*0,06*
ASPI * MDP	**-1,46**	**0,54**	*0,01*	*0,10*	**-0,23**	**0,09**	*0,01*	*0,08*	**-0,09**	**0,04**	*0,01*	*0,04*
AS̄PI * EW	0,00	0,03	*0,89*	*0,98*	**0,01**	**0,00**	*0,03*	*0,77*	**-0,01**	**0,00**	*0,00*	*0,14*
AS̄PI * ERC	-0,01	0,03	*0,83*	*0,97*	**0,00**	**0,00**	*0,06*	*0,84*	**-0,01**	**0,00**	*0,00*	*0,16*
AS̄PI * GMV	**-1,08**	**0,37**	*0,00*	*0,06*	**-0,16**	**0,06**	*0,01*	*0,06*	**-0,08**	**0,02**	*0,00*	*0,01*
AS̄PI * MDP	**-1,04**	**0,36**	*0,00*	*0,07*	**-0,15**	**0,06**	*0,01*	*0,07*	**-0,08**	**0,02**	*0,00*	*0,01*
Size	**0,85**	**0,30**	*0,01*	*0,08*	**0,14**	**0,05**	*0,01*	*0,06*	**0,00**	**0,00**	*0,00*	*0,02*
Constant	**-0,07**	**0,04**	*0,06*	*0,09*	0,01	0,01	*0,19*	*0,20*	**0,01**	**0,00**	*0,01*	*0,01*
Shrinkage 1	0,01	0,04	*0,76*	*0,79*	0,00	0,00	*0,78*	*0,82*	0,00	0,00	*0,86*	*0,89*
Shrinkage 2	0,00	0,04	*0,90*	*0,91*	0,00	0,01	*0,70*	*0,74*	0,00	0,00	*0,66*	*0,72*
R^2 adj.		0,32				0,34				0,65		

Shrinkage estimators of the VCV matrix yield higher performance portfolios than those built with an empirical estimator of the VCV matrix, but the difference is not statistically significant. Using alphas and information ratios, we find that the constant VCV yields significantly higher performance portfolios. These observations can be explained by lower TEV and significantly different exposure to risk factors. Detailed statistics on absolute performances of portfolios are reported in Appendix D.

Finally the constant VCV is the matrix which most significantly modifies exposure to the different factors. This is consistent with the modifications in performance we previously pointed out. This VCV matrix yields higher exposure to market, SMB and LRVMHRV factors, and it yields lower exposure to HML and LBMHB factors. The latter are the two factors most responsible for performance (cf. Table 4.3). Detailed statistics on absolute performance of portfolios are reported in Appendix E.

4.6 Conclusion

Because CW allocation suffers from weak diversification and favors large firms that are not neglected, we hypothesized that the CW allocation strategy is not the most efficient allocation strategy to build socially responsible portfolios and to capture any outperformance that may be generated by extra-financial analysis. The inefficiency of CW allocation is an issue that has recently been tackled by promoters of risk-based allocation strategies. Here we investigated the value added by these risk-based asset allocations to the performance of socially responsible portfolios. From March 15, 2002 to May 1, 2012 we monitored four risk-based strategies, the EW, the MD, the MV and the ERC, using three universes of stocks, the EuroStoxx, the ASPI and the complement of ASPI universe. We then ran robustness checks for costs of rebalancing and risk models.

The results of our investigations on how risk-based strategies impact the performance of SRI portfolios are twofold. First, in line with the literature and our hypothesis, risk-based strategies significantly improve the relative performance of the SRI portfolios and have advantages for investors benchmarked against CW indexes. We note that the unbounded MV and MD portfolios built on the ASPI yield the highest returns of all our strategies and universes. Second, we observe that the ASPI universe and the EW, the MV and the MD allocations are linked to higher alphas. However this premium for high level of CSR interacts negatively with the risk-based premiums, which is consistent with the universe constraint imposed on the MV and the MD allocations. Overall, this does not support our hypothesis that risk-based allocations are better able to capture outperformance related to extra-financial selection. It is the CW and the ERC allocations that yield the largest premium for high level of CSR, closely followed by the EW allocation.

Other results from our different analyses are worth noting. First, contrary to risk-based portfolios, the CW portfolio built on the ASPI universe has an exposure to large capitalization stocks, and is therefore exposed to the related return anomaly. This can be a serious handicap for SRI funds that are benchmark against CW allocation built on the full universe of investment. Second, the relative outperformance of the MV and the MD allocations applied on the ASPI universe appears to be mainly driven by the extreme negative events that plague firms in the $\bar{\text{ASPI}}$ universe. Exclusion of these extreme negative events is the most significant value added by extra-financial filtering to performance.

Can CW allocation drawbacks (i.e. weak diversification and bias) therefore be said to neutralize the positive effect of selecting only high CSP firms? The answer depends on which performance is selected. If we look at relative performance, the answer tends to be positive. We find that the size bias created by extra-financial filtering is amplified by CW allocation and penalizes the latter. However, if we decompose risk-adjusted performance the answer tends to be negative. We find that the CW and the ERC allocations have the highest premium for high level of CSR. Ultimately, while we stress the usual limits of back-testing, our analyses show that risk-based strategies can return good results from the perspective of investors interested in SRI strategies and benchmarked against CW indices. A valuable extension of this study would be to use a different universe of issuers with high CSR. Moreover, while we based our work on VIGEO ratings, a different data provider could be used.

4.7 Appendixes

4.7.1 Appendix A: robustness to inclusion of cost of rebalancing

In this annex we report analyses of absolute, relative and risk-adjusted performance, including trading costs. We report the empirical VCV case. With trading costs included the cost of rebalancing is no longer zero. Recall that our allocations are rebalanced every quarter. To calculate cost of rebalancing we first calculate weight turnovers:

$$T(t) = \sum_i^n |w_i(t) - w_i(t-1)|$$

We use the same level of trading costs $z = 1$bps as in Anderson et al. (2012). Cost of rebalancing is:

$$C(t) = T(t) * z$$

Finally the return adjusted for cost of rebalancing is:

$$r'(t) = r(t) - T(t) * z$$

Table 4.13 reports the statistics on performance adjusted for cost of rebalancing of the different allocations applied on the three universes. Table 4.14 reports the statistics on excess returns adjusted for cost of rebalancing of the different allocations applied on the ASPI universe against the CW built on the EuroStoxx universe. Table 4.15 reports the statistics on excess returns adjusted for cost of rebalancing of the different allocations applied on the ASPI universe against their respective counterparts built on the EuroStoxx universe and $\bar{\text{ASPI}}$ universe.

As expected, absolute and risk-adjusted performance are reduced. Interestingly, relative performance is improved. Despite the fact that, everything else being equal, the ASPI universe is correlated to larger turnover, the raw turnovers observed on the ASPI universe are below those observed on the EuroStoxx and $\bar{\text{ASPI}}$ universes.

Tables 4.16, 4.17 and 4.18 report the statistics from analysis of risk-adjusted performance adjusted for cost of rebalancing. We note some modifications of statistical significance and we note reductions on risk-adjusted performance.

In Tables 4.13, 4.14 and 4.15 annualized realized performance is discrete annual rate equivalent to total performance. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return times 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

In Table 4.16 standard errors and P-values are Newey and West (1987) HAC. The risk-free rate is the 3-month German interest rate. In Table 4.17 we test for statistical significance with a bootstrap P-value for H0: alpha ≤ 0. In Table 4.18 we report H. White (1980) HC standard errors, HC and usual P-values. The sample is a cross-section of 108 observations that groups alphas obtained with the four VCV matrices. Portfolio size is average size divided by 100. In the three Tables significant coefficients at the robust confidence level of 10% and below are in bold.

Table 4.13 – Statistics on absolute performance for portfolios on the three universes

In this table we report statistics on performance of all risk-based and CW strategies that are simulated on the respective universes from March 15, 2002 to May 1, 2012. Costs of rebalancing are included.

		1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
EuroStoxx	Annualized perf.	0.44	1.43	-3.72	4.23	4.48	0.65	3.44	2.43	-3.04
	p-val. bootstrap	*0.48*	*0.40*	*0.77*	*0.14*	*0.12*	*0.45*	*0.23*	*0.28*	*0.67*
	Sharpe ratio (realized)	0.02	0.08	-0.24	0.35	0.39	0.04	0.23	0.18	-0.13
	Max. Drawdown (%)	-63.95	-61.34	-73.19	-47.20	-43.66	-60.92	-48.85	-49.88	-61.83
	Annual expected return(%)	2.70	2.90	-2.48	4.87	5.05	1.88	4.50	3.28	-0.41
	Volatility (%)	21.24	17.19	15.72	12.18	11.58	15.77	15.12	13.28	23.14
	Skewness daily return	-0.06	-0.15	-7.52	3.15	1.53	1.41	4.09	0.87	0.12
	Kurtosis daily return	8.11	9.33	155.20	78.76	39.77	102.09	120.35	26.59	8.37
A$\bar{\text{S}}$PI	Annualized perf.	1.23	1.80	-4.58	3.01	3.30	-0.09	2.37	1.63	-2.05
	p-val. bootstrap	*0.43*	*0.36*	*0.81*	*0.20*	*0.18*	*0.50*	*0.29*	*0.35*	*0.62*
	Sharpe ratio (realized)	0.06	0.11	-0.29	0.27	0.29	-0.01	0.19	0.12	-0.10
	Max. drawdown (%)	-63.68	-61.90	-74.68	-50.94	-47.24	-61.38	-49.05	-50.84	-65.75
	Annual expected return(%)	3.28	3.13	-3.35	3.60	3.90	0.84	3.16	2.48	0.23
	Volatility (%)	20.30	16.39	15.92	11.26	11.43	13.56	12.78	13.12	21.44
	Skewness daily return	-0.12	-0.22	-7.45	0.03	-0.32	-2.69	-0.28	-0.36	-0.04
	Kurtosis daily return	8.36	9.62	149.70	11.09	10.90	41.45	10.80	11.06	8.38
ASPI	Annualized perf.	-0.92	0.70	**7.15**	5.92	3.68	4.51	4.36	3.74	-3.46
	p-val. bootstrap	*0.54*	*0.45*	*0.06*	*0.11*	*0.21*	*0.24*	*0.20*	*0.23*	*0.68*
	Sharpe ratio (realized)	-0.04	0.04	0.48	0.39	0.25	0.22	0.25	0.24	-0.14
	Max. drawdown (%)	-64.64	-59.87	-42.71	-44.76	-49.98	-50.67	-53.55	-52.92	-60.33
	Annual expected return(%)	1.77	2.68	7.99	6.87	4.65	6.37	5.71	4.92	-0.59
	Volatility (%)	23.19	19.90	14.85	15.11	14.45	20.29	17.13	15.84	24.20
	Skewness daily return	0.04	0.05	3.56	3.64	0.72	7.11	2.76	0.36	0.17
	Kurtosis daily return	7.81	8.94	93.99	94.35	22.20	235.67	74.53	16.61	8.23

Table 4.14 – ASPI portfolios against EuroStoxx CW: absolute performance

In this table we report statistics on the long-short portfolios of the different risk-based portfolios built on the ASPI minus the EuroStoxx CW. They are estimated from March 15, 2002 to May 1, 2012. Costs of rebalancing are included.

	1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
Annualized perf.	**2.11**	**2.95**	7.09	6.06	4.25	4.88	4.98	4.63	-0.21
p-val. bootstrap	*0.05*	*0.06*	*0.11*	*0.13*	*0.16*	*0.23*	*0.16*	*0.13*	*0.62*
Sharpe ratio (realized)	0.50	0.49	0.40	0.36	0.32	0.24	0.31	0.36	-0.09
Max. drawdown (%)	-10.36	-8.02	-33.01	-33.21	-24.30	-38.80	-26.01	-16.72	-7.64
Annual expected return(%)	2.18	3.09	8.41	7.28	5.06	6.79	6.13	5.34	-0.18
Volatility (%)	4.22	6.02	17.60	16.74	13.41	20.28	15.92	12.71	2.26
Skewness daily return	0.02	-0.66	0.13	0.46	-0.38	3.89	0.68	-0.59	0.65
Kurtosis daily return	7.14	19.67	42.86	54.49	14.35	219.81	86.95	19.51	13.84

Table 4.15 – ASPI portfolios against EuroStoxx and AS̄PI portfolios: absolute performance

In this table we report statistics on the long-short portfolios of the different risk-based portfolios built on the ASPI minus the same risk-based portfolios built on EuroStoxx and AS̄PI. They are estimated from March 15, 2002 to May 1, 2012. Costs of rebalancing are included.

	1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
ASPI against EuroStoxx									
Annualized perf.	-1.00	-0.34	**9.69**	1.66	-0.65	3.84	0.86	1.34	-0.21
p-val. bootstrap	*0.80*	*0.59*	*0.02*	*0.27*	*0.61*	*0.16*	*0.38*	*0.30*	*0.62*
Sharpe ratio (realized)	-0.26	-0.07	0.61	0.20	-0.09	0.32	0.10	0.17	-0.09
Max. drawdown (%)	-17.87	-14.94	-22.16	-18.83	-21.10	-20.62	-18.24	-14.20	-7.64
Annual expected return(%)	-0.93	-0.22	10.47	2.00	-0.40	4.49	1.21	1.64	-0.18
Volatility (%)	3.87	4.97	15.98	8.38	7.17	12.17	8.42	7.86	2.26
Skewness daily return	0.52	0.96	7.26	-0.08	0.05	5.22	0.12	0.16	0.65
Kurtosis daily return	6.72	12.51	135.63	15.06	8.29	92.54	5.75	5.06	13.84
ASPI against AS̄PI									
Annualized perf.	-1.70	-0.71	**10.37**	2.60	0.37	3.91	1.71	1.98	-1.09
p-val. bootstrap	*0.81*	*0.63*	*0.03*	*0.24*	*0.44*	*0.25*	*0.33*	*0.26*	*0.68*
Sharpe ratio (realized)	-0.27	-0.10	0.59	0.22	0.04	0.21	0.13	0.20	-0.15
Max. drawdown (%)	-27.67	-21.17	-21.72	-23.98	-18.29	-41.72	-31.37	-19.09	-25.21
Annual expected return(%)	-1.52	-0.45	11.34	3.27	0.75	5.53	2.55	2.44	-0.82
Volatility (%)	6.27	7.18	17.54	11.95	8.77	18.84	13.19	9.85	7.37
Skewness daily return	0.51	1.24	6.56	3.51	1.37	7.92	3.53	0.92	0.78
Kurtosis daily return	6.72	23.26	123.53	178.99	48.22	323.04	201.73	52.04	11.76

Table 4.16 – Fama French models for the three universe from March 15, 2002 to May 1, 2012

Standard errors and P-values are the Newey and West (1987) HAC estimators. In bold coefficients are significant at 10%-level at least. The risk-free rate is the 3-month German interest rate. First part of the Table reports estimations for the three-factor model. Second part of the Table reports estimations for the eight-factor model. Alphas are annualized. Costs of rebalancing are included.

EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.76*	**0.01**	*0.06*	0.02	*0.26*	-0.04	*0.48*	**0.05**	*0.10*	**0.05**	*0.06*	0.01	*0.79*	0.04	*0.25*	0.02	*0.37*
Mkt-Rf	**1.00**	*0.00*	**0.92**	*0.00*	**0.74**	*0.00*	**0.30**	*0.00*	**0.35**	*0.00*	**0.40**	*0.00*	**0.38**	*0.00*	**0.41**	*0.00*	**0.47**	*0.00*
HML	0.00	*0.25*	**0.04**	*0.00*	0.01	*0.21*	**-0.07**	*0.01*	**-0.09**	*0.00*	**-0.09**	*0.00*	-0.05	*0.13*	-0.04	*0.15*	**-0.05**	*0.03*
SMB	0.00	*1.00*	**0.29**	*0.00*	**0.23**	*0.00*	0.07	*0.30*	-0.02	*0.88*	0.04	*0.71*	-0.02	*0.91*	-0.02	*0.91*	0.10	*0.38*
R^2 adj.	1.00		0.98		0.93		0.16		0.39		0.55		0.29		0.38		0.58	

AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.84*	**0.02**	*0.10*	0.02	*0.35*	-0.05	*0.36*	0.03	*0.27*	0.03	*0.17*	-0.01	*0.84*	0.02	*0.46*	0.01	*0.65*
Mkt-Rf	**0.94**	*0.00*	**0.89**	*0.00*	**0.70**	*0.00*	**0.32**	*0.00*	**0.40**	*0.00*	**0.45**	*0.00*	**0.43**	*0.00*	**0.48**	*0.00*	**0.51**	*0.00*
HML	0.00	*0.99*	**0.02**	*0.00*	0.01	*0.43*	**-0.06**	*0.02*	**-0.07**	*0.00*	**-0.07**	*0.00*	**-0.04**	*0.02*	**-0.04**	*0.01*	**-0.04**	*0.00*
SMB	**0.19**	*0.00*	**0.36**	*0.00*	**0.30**	*0.00*	**0.13**	*0.00*	**0.15**	*0.00*	**0.18**	*0.00*	**0.21**	*0.00*	**0.23**	*0.00*	**0.25**	*0.00*
R^2 adj.	0.97		0.97		0.91		0.17		0.55		0.67		0.47		0.65		0.71	

ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.68*	0.01	*0.39*	0.02	*0.11*	**0.09**	*0.01*	**0.08**	*0.02*	**0.05**	*0.05*	0.06	*0.18*	0.05	*0.13*	**0.04**	*0.10*
Mkt-Rf	**1.03**	*0.00*	**0.99**	*0.00*	**0.84**	*0.00*	**0.46**	*0.00*	**0.48**	*0.00*	**0.56**	*0.00*	**0.48**	*0.00*	**0.53**	*0.00*	**0.60**	*0.00*
HML	0.00	*0.76*	**0.07**	*0.00*	**0.03**	*0.01*	**-0.14**	*0.00*	**-0.12**	*0.00*	**-0.09**	*0.00*	-0.02	*0.67*	-0.01	*0.80*	-0.01	*0.56*
SMB	**-0.08**	*0.00*	**0.17**	*0.00*	**0.11**	*0.07*	-0.08	*0.60*	-0.08	*0.62*	0.01	*0.89*	-0.19	*0.52*	-0.04	*0.82*	0.08	*0.42*
R^2 adj.	1.00		0.98		0.95		0.46		0.51		0.72		0.34		0.53		0.73	

EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.66*	0.01	*0.11*	0.00	*0.95*	-0.07	*0.18*	0.01	*0.78*	0.01	*0.55*	-0.04	*0.22*	-0.01	*0.50*	-0.02	*0.30*
Mkt-Rf	**1.00**	*0.00*	**0.92**	*0.00*	**0.70**	*0.00*	**0.23**	*0.00*	**0.30**	*0.00*	**0.35**	*0.00*	**0.30**	*0.00*	**0.33**	*0.00*	**0.39**	*0.00*
HML	**0.00**	*0.33*	**0.04**	*0.00*	**0.05**	*0.00*	**0.05**	*0.01*	0.01	*0.67*	0.01	*0.59*	**0.06**	*0.00*	**0.05**	*0.00*	**0.04**	*0.00*
SMB	**0.00**	*0.71*	**0.28**	*0.00*	**0.26**	*0.00*	**0.16**	*0.00*	**0.06**	*0.07*	**0.11**	*0.00*	0.04	*0.37*	0.02	*0.56*	**0.14**	*0.00*
LBMHB	0.00	*0.78*	**0.04**	*0.00*	**0.23**	*0.00*	**0.59**	*0.00*	**0.62**	*0.00*	**0.57**	*0.00*	**0.72**	*0.00*	**0.70**	*0.00*	**0.57**	*0.00*
LRVMHRV	**0.00**	*0.47*	**-0.03**	*0.00*	**0.03**	*0.01*	**0.16**	*0.00*	**0.07**	*0.02*	**0.07**	*0.00*	-0.04	*0.24*	**-0.09**	*0.01*	**-0.04**	*0.02*
R^2 adj.	1.00		0.99		0.95		0.28		0.71		0.80		0.67		0.80		0.83	

AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	-0.01	*0.59*	0.01	*0.24*	0.00	*0.99*	-0.08	*0.15*	0.00	*0.85*	0.00	*0.94*	-0.04	*0.24*	-0.01	*0.45*	-0.02	*0.27*
Mkt-Rf	**0.90**	*0.00*	**0.87**	*0.00*	**0.66**	*0.00*	**0.24**	*0.00*	**0.33**	*0.00*	**0.38**	*0.00*	**0.34**	*0.00*	**0.38**	*0.00*	**0.42**	*0.00*
HML	0.01	*0.28*	**0.03**	*0.00*	**0.05**	*0.00*	**0.06**	*0.01*	**0.03**	*0.03*	**0.02**	*0.04*	**0.06**	*0.00*	**0.05**	*0.00*	**0.05**	*0.00*
SMB	**0.18**	*0.00*	**0.35**	*0.00*	**0.33**	*0.00*	**0.21**	*0.00*	**0.21**	*0.00*	**0.23**	*0.00*	**0.25**	*0.00*	**0.25**	*0.00*	**0.27**	*0.00*
LBMHB	0.02	*0.38*	**0.07**	*0.00*	**0.22**	*0.00*	**0.53**	*0.00*	**0.47**	*0.00*	**0.45**	*0.00*	**0.48**	*0.00*	**0.44**	*0.00*	**0.42**	*0.00*
LRVMHRV	-0.01	*0.29*	**-0.04**	*0.00*	**0.05**	*0.00*	**0.19**	*0.00*	**0.13**	*0.00*	**0.12**	*0.00*	**0.07**	*0.02*	**0.04**	*0.07*	0.02	*0.28*
R^2 adj.	0.97		0.97		0.93		0.25		0.67		0.78		0.56		0.74		0.79	

ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0.00	*0.39*	0.01	*0.29*	0.01	*0.32*	**0.05**	*0.04*	**0.03**	*0.10*	0.02	*0.35*	0.00	*0.89*	0.01	*0.78*	0.01	*0.57*
Mkt-Rf	**1.05**	*0.00*	**1.01**	*0.00*	**0.84**	*0.00*	**0.41**	*0.00*	**0.44**	*0.00*	**0.51**	*0.00*	**0.41**	*0.00*	**0.47**	*0.00*	**0.56**	*0.00*
HML	**-0.01**	*0.01*	**0.06**	*0.00*	**0.05**	*0.00*	**-0.05**	*0.00*	**-0.04**	*0.02*	-0.01	*0.57*	**0.06**	*0.01*	**0.07**	*0.00*	**0.05**	*0.00*
SMB	**-0.08**	*0.00*	**0.17**	*0.00*	**0.13**	*0.00*	-0.01	*0.79*	-0.02	*0.75*	**0.06**	*0.01*	**-0.14**	*0.09*	0.00	*0.95*	**0.12**	*0.00*
LBMHB	**-0.01**	*0.09*	**-0.02**	*0.09*	**0.17**	*0.00*	**0.62**	*0.00*	**0.61**	*0.00*	**0.48**	*0.00*	**0.79**	*0.00*	**0.62**	*0.00*	**0.44**	*0.00*
LRVMHRV	0.00	*0.74*	**-0.02**	*0.00*	0.00	*0.92*	0.01	*0.73*	0.00	*0.95*	**0.03**	*0.04*	**-0.17**	*0.01*	**-0.10**	*0.00*	**-0.03**	*0.03*
R^2 adj.	1.00		0.98		0.97		0.73		0.78		0.84		0.80		0.82		0.85	

Table 4.17 – Statistical significance of alphas

In this table we report annualized alphas (%) from the eight-factor models, and we test for statistical significance with a bootstrap P-value for H0: alpha ≤ 0. Significant statistics at the confidence level of 10% and below are in bold. Costs of rebalancing are included.

	CW	1/n	ERC	MV	MV 10%	MV 5%	MD	MD 10%	MD 5%
					EuroStoxx				
alpha	0,00	**1,10**	0,08	-7,01	0,54	0,95	-4,01	-1,34	-1,80
P-value bootstrap	*0,39*	*0,07*	*0,46*	*0,96*	*0,35*	*0,24*	*0,92*	*0,70*	*0,82*
					AS̄PI				
alpha	-0,65	1,16	0,03	-7,70	-0,36	0,11	-3,91	-1,48	-2,02
P-value bootstrap	*0,70*	*0,13*	*0,48*	*0,97*	*0,53*	*0,42*	*0,91*	*0,72*	*0,82*
					ASPI				
alpha	0,45	0,98	0,95	**4,72**	**3,40**	1,60	0,34	0,56	1,02
P-value bootstrap	*0,20*	*0,15*	*0,18*	*0,02*	*0,06*	*0,17*	*0,42*	*0,37*	*0,27*

Table 4.18 – Analysis of Alphas

These regressions are estimated with an OLS estimator. We report H. White (1980) HC standard errors, HC and usual P-values. Significant coefficients at the robust confidence level of 10% and below are in bold. The sample is a cross-section of 108 observations that groups alphas of portfolios obtained with the four VCV matrices. We use the eight factors model. Portfolio size is average size divided by 100. Costs of rebalancing are included.

	OLS I				**OLS II**			
	coef.	**s.d.**	**HC p-val**	**p-val**	**coef.**	**s.d.**	**HC p-val**	**p-val**
Cst	**-0,05**	**0,01**	*0,00*	*0,00*	**-0,44**	**0,18**	*0,02*	*0,05*
ASPI	**0,04**	**0,01**	*0,00*	*0,00*	**0,27**	**0,11**	*0,02*	*0,05*
AS̄PI	0,00	0,01	*0,53*	*0,45*	**0,16**	**0,07**	*0,02*	*0,06*
EW	**0,01**	**0,00**	*0,00*	*0,25*	**0,01**	**0,00**	*0,00*	*0,50*
ERC	**0,01**	**0,00**	*0,02*	*0,51*	0,00	0,00	*0,03*	*0,79*
MV	**0,03**	**0,01**	*0,00*	*0,04*	**0,36**	**0,16**	*0,02*	*0,06*
MDP	**0,03**	**0,01**	*0,00*	*0,06*	**0,38**	**0,16**	*0,02*	*0,06*
ASPI * EW	-	-	-	-	**-0,01**	**0,00**	*0,00*	*0,81*
ASPI * ERC	-	-	-	-	0,00	0,00	*0,41*	*0,94*
ASPI * MV	-	-	-	-	**-0,20**	**0,10**	*0,06*	*0,12*
ASPI * MDP	-	-	-	-	**-0,23**	**0,10**	*0,03*	*0,07*
AS̄PI * EW	-	-	-	-	**0,01**	**0,00**	*0,00*	*0,76*
AS̄PI * ERC	-	-	-	-	0,00	0,00	*0,09*	*0,83*
AS̄PI * MV	-	-	-	-	**-0,16**	**0,07**	*0,02*	*0,06*
AS̄PI * MDP	-	-	-	-	**-0,16**	**0,07**	*0,02*	*0,07*
Size	**0,02**	**0,00**	*0,00*	*0,01*	**0,14**	**0,06**	*0,02*	*0,05*
R^2 adj.		0,28				0,35		

4.7.2 Appendix B: bootstrap P-values

We run non-parametric bootstrap inference as an alternative and to control parametric inference for two reasons. First, parametric inference requires either normality of residuals or large samples. Second, because asset return volatilities are larger than expected, return parametric inference can be unsuitable for comparing financial series (Anderson et al. 2012). We estimate two types of bootstrap P-values. The first P-value corresponds to the test for statistical significance of the annualized realized performance. The tested hypothesis is H0: annualized realized performance ≤ 0. To calculate this P-value we apply a case resampling scheme. We draw (with replacement) 9999 bootstrap samples of 2643 observations (i.e. the number of days financial markets are open from March 15, 2002 to May 1, 2012) from the empirical distribution of returns. We calculate the total arithmetic realized performance P for each bootstrap sample. The P-value is given by:

$$\text{P-value} = \frac{\text{card}(P \leqslant 0) + 1}{10000}$$

The second P-value corresponds to the test for statistical significance of alphas estimated with the eight-factor model. The tested hypothesis is H0: alpha ≤ 0. To calculate this P-value we apply a residual resampling scheme. We estimate the following factor model:

$$\begin{gathered}\mathrm{R}_t = \alpha + \beta_1 * \text{Mkt-Rf}_t + \beta_2 * \mathrm{HML}_t + \beta_3 * \mathrm{SMB}_t + \beta_4 * \mathrm{LBMHB}_t + \beta_5 * \\ \mathrm{LRVMHRV}_t + \beta_6 * \mathrm{IND1}_t + \beta_7 * \mathrm{IND2}_t + \beta_8 * \mathrm{IND3}_t + u_t\end{gathered}$$

We obtain estimates for coefficients and residuals:

$$\begin{gathered}\mathrm{R}_t - \hat{\alpha} - \hat{\beta}_1 * \text{Mkt-Rf}_t - \hat{\beta}_2 * \mathrm{HML}_t - \hat{\beta}_3 * \mathrm{SMB}_t \hat{\beta}_4 * \mathrm{LBMHB}_t - \hat{\beta}_5 * \\ \mathrm{LRVMHRV}_t - \hat{\beta}_6 * \mathrm{IND1}_t - \hat{\beta}_7 * \mathrm{IND2}_t - \hat{\beta}_8 * \mathrm{IND3}_t = \varepsilon_t\end{gathered}$$

We draw (with replacement) 9999 bootstrap samples of 2643 observations from the empirical distribution of residuals ε. For each bootstrap sample ε^* we generate synthetic response variable R^*:

$$R_t^* = \hat{\alpha} + \hat{\beta}_1 * \text{Mkt-Rf}_t + \hat{\beta}_2 * \text{HML}_t + \hat{\beta}_3 * \text{SMB}_t + \hat{\beta}_4 * \text{LBMHB}_t + \hat{\beta}_5 * \text{LRVMHRV}_t + \hat{\beta}_6 * \text{IND1}_t + \hat{\beta}_7 * \text{IND2}_t + \hat{\beta}_8 * \text{IND3}_t + \varepsilon_t^*$$

Finally, for each bootstrap sample R^* we estimate the factor model to obtain new estimates of $\hat{\alpha}^*$ and other coefficients. The P-value of interest is given by:

$$\text{P-value} = \frac{\text{card}(\hat{\alpha}^* \leqslant 0) + 1}{10000}$$

4.7.3 Appendix C: five-factor models

Tables 4.19 and 4.20 report the results of estimations from factor models with five factors. Results are close to that obtained with the model that controls for industry effect. The main differences are lower level of alphas and weaker statistical significance. When cost of rebalancing is included, level of alphas and statistical significance are decreased further. The MV allocations suffer the greatest modifications.

Table 4.19 – Five-factor model for the three universes from March 15, 2002 to May 1, 2012

Standard errors and P-values are the Newey and West (1987) HAC estimators. In bold coefficients are significant at 10%-level at least. The risk-free rate is the 3-month German interest rate. This Table reports estimations for the five-factor model with empirical VCV.

EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,39*	0,01	*0,17*	0,00	*0,89*	-0,07	*0,17*	0,00	*0,96*	0,01	*0,74*	-0,05	*0,15*	-0,02	*0,35*	-0,02	*0,27*
MLt-Rf	**1,00**	*0,00*	**0,91**	*0,00*	**0,69**	*0,00*	**0,21**	*0,00*	**0,24**	*0,00*	**0,30**	*0,00*	**0,23**	*0,00*	**0,27**	*0,00*	**0,36**	*0,00*
HML	**0,00**	*0,00*	**0,04**	*0,00*	**0,06**	*0,00*	**0,06**	*0,00*	**0,03**	*0,04*	**0,02**	*0,05*	**0,08**	*0,00*	**0,08**	*0,00*	**0,05**	*0,00*
SMB	**0,00**	*0,00*	**0,28**	*0,00*	**0,25**	*0,00*	**0,14**	*0,00*	0,03	*0,52*	**0,09**	*0,01*	0,00	*1,00*	-0,01	*0,82*	**0,12**	*0,00*
LBMHB	**0,00**	*0,03*	0,05	*0,00*	**0,25**	*0,00*	**0,61**	*0,00*	**0,67**	*0,00*	**0,60**	*0,00*	**0,79**	*0,00*	**0,76**	*0,00*	**0,59**	*0,00*
LRVMHRV	0,00	*0,54*	-0,04	*0,00*	0,01	*0,30*	**0,14**	*0,00*	0,02	*0,54*	**0,05**	*0,06*	-0,11	*0,03*	-0,15	*0,00*	**-0,05**	*0,00*
R^2 adj.	1,00		0,99		0,95		0,27		0,69		0,79		0,65		0,78		0,83	
AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,80*	0,01	*0,26*	0,00	*0,96*	-0,07	*0,16*	0,00	*0,98*	0,00	*0,78*	-0,03	*0,32*	-0,01	*0,72*	-0,01	*0,50*
MLt-Rf	**0,93**	*0,00*	**0,87**	*0,00*	**0,66**	*0,00*	**0,24**	*0,00*	**0,33**	*0,00*	**0,38**	*0,00*	**0,36**	*0,00*	**0,41**	*0,00*	**0,45**	*0,00*
HML	0,00	*0,95*	**0,03**	*0,00*	**0,05**	*0,00*	**0,06**	*0,00*	**0,02**	*0,07*	**0,02**	*0,09*	**0,05**	*0,00*	**0,04**	*0,01*	**0,03**	*0,01*
SMB	**0,19**	*0,00*	**0,35**	*0,00*	**0,33**	*0,00*	**0,22**	*0,00*	**0,22**	*0,00*	**0,24**	*0,00*	**0,27**	*0,00*	**0,28**	*0,00*	**0,29**	*0,00*
LBMHB	0,01	*0,77*	**0,07**	*0,00*	**0,23**	*0,00*	**0,53**	*0,00*	**0,45**	*0,00*	**0,43**	*0,00*	**0,46**	*0,00*	**0,41**	*0,00*	**0,38**	*0,00*
LRVMHRV	-0,01	*0,33*	-0,05	*0,00*	**0,04**	*0,00*	**0,19**	*0,00*	**0,16**	*0,00*	**0,15**	*0,00*	**0,10**	*0,00*	**0,08**	*0,01*	**0,06**	*0,03*
R^2 adj.	0,97		0,97		0,93		0,25		0,67		0,77		0,55		0,73		0,78	
ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,66*	0,01	*0,48*	0,00	*0,67*	**0,04**	*0,10*	0,02	*0,24*	0,01	*0,47*	-0,01	*0,66*	0,00	*0,89*	0,01	*0,75*
MLt-Rf	**1,03**	*0,00*	**0,98**	*0,00*	**0,81**	*0,00*	**0,33**	*0,00*	**0,36**	*0,00*	**0,48**	*0,00*	**0,30**	*0,00*	**0,40**	*0,00*	**0,52**	*0,00*
HML	0,00	*0,51*	**0,07**	*0,00*	**0,06**	*0,00*	-0,02	*0,19*	-0,01	*0,66*	0,01	*0,66*	**0,11**	*0,00*	**0,10**	*0,00*	**0,07**	*0,00*
SMB	**-0,08**	*0,00*	**0,16**	*0,00*	**0,11**	*0,00*	-0,05	*0,42*	-0,05	*0,41*	**0,05**	*0,09*	**-0,21**	*0,06*	-0,04	*0,48*	**0,10**	*0,00*
LBMHB	0,00	*0,62*	0,00	*0,76*	**0,20**	*0,00*	**0,69**	*0,00*	**0,68**	*0,00*	**0,50**	*0,00*	**0,91**	*0,00*	**0,69**	*0,00*	**0,47**	*0,00*
LRVMHRV	0,00	*0,65*	**-0,04**	*0,00*	**-0,03**	*0,10*	-0,04	*0,46*	-0,05	*0,30*	0,02	*0,26*	**-0,28**	*0,00*	**-0,16**	*0,00*	**-0,05**	*0,01*
R^2 adj.	1,00		0,98		0,97		0,71		0,75		0,84		0,75		0,81		0,85	

Table 4.20 – Five-factor model for the three universes from March 15, 2002 to May 1, 2012

Standard errors and P-values are the Newey and West (1987) HAC estimators. In bold coefficients are significant at 10%-level at least. The risk-free rate is the 3-month German interest rate. This Table reports estimations for the five-factor model with empirical VCV. Costs of rebalancing are included.

EuroStoxx	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,71*	0,01	*0,16*	0,00	*0,86*	-0,07	*0,16*	0,00	*0,85*	0,00	*0,85*	-0,05	*0,13*	-0,02	*0,28*	-0,02	*0,21*
MLt-Rf	**1,00**	*0,00*	**0,91**	*0,00*	**0,69**	*0,00*	**0,21**	*0,00*	**0,24**	*0,00*	**0,30**	*0,00*	**0,23**	*0,00*	**0,27**	*0,00*	**0,36**	*0,00*
HML	0,00	*0,27*	**0,04**	*0,00*	**0,06**	*0,00*	**0,06**	*0,00*	**0,03**	*0,04*	**0,02**	*0,05*	**0,08**	*0,00*	**0,08**	*0,00*	**0,05**	*0,00*
SMB	0,00	*0,87*	0,28	*0,00*	**0,25**	*0,00*	**0,14**	*0,00*	0,03	*0,52*	**0,09**	*0,01*	0,00	*1,00*	-0,01	*0,82*	**0,12**	*0,00*
LBMHB	0,00	*0,84*	**0,05**	*0,00*	**0,25**	*0,00*	**0,61**	*0,00*	**0,67**	*0,00*	**0,60**	*0,00*	**0,79**	*0,00*	**0,76**	*0,00*	**0,59**	*0,00*
LRVMHRV	0,00	*0,42*	**-0,04**	*0,00*	0,01	*0,30*	**0,14**	*0,00*	0,02	*0,54*	**0,05**	*0,06*	**-0,11**	*0,03*	**-0,15**	*0,00*	**-0,05**	*0,00*
R^2 adj.	1,00		0,99		0,95		0,27		0,69		0,79		0,65		0,78		0,83	
AS̄PI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,78*	0,01	*0,26*	0,00	*1,00*	-0,08	*0,14*	0,00	*0,91*	0,00	*0,88*	-0,04	*0,28*	-0,01	*0,62*	-0,02	*0,43*
MLt-Rf	**0,93**	*0,00*	**0,87**	*0,00*	**0,66**	*0,00*	**0,24**	*0,00*	**0,33**	*0,00*	**0,38**	*0,00*	**0,36**	*0,00*	**0,41**	*0,00*	**0,45**	*0,00*
HML	0,00	*0,95*	**0,03**	*0,00*	**0,05**	*0,00*	**0,06**	*0,00*	**0,02**	*0,07*	**0,02**	*0,09*	**0,05**	*0,00*	**0,04**	*0,01*	**0,03**	*0,01*
SMB	**0,19**	*0,00*	**0,35**	*0,00*	**0,33**	*0,00*	**0,22**	*0,00*	**0,22**	*0,00*	**0,24**	*0,00*	**0,27**	*0,00*	**0,28**	*0,00*	**0,29**	*0,00*
LBMHB	0,01	*0,77*	**0,07**	*0,00*	**0,23**	*0,00*	**0,53**	*0,00*	**0,45**	*0,00*	**0,43**	*0,00*	**0,46**	*0,00*	**0,41**	*0,00*	**0,38**	*0,00*
LRVMHRV	-0,01	*0,32*	**-0,05**	*0,00*	**0,04**	*0,00*	**0,19**	*0,00*	**0,16**	*0,00*	**0,15**	*0,00*	**0,10**	*0,00*	**0,08**	*0,01*	**0,06**	*0,03*
R^2 adj.	0,97		0,97		0,93		0,25		0,67		0,77		0,55		0,73		0,78	
ASPI	CW		1/n		ERC		MV		MV - 10%		MV - 5%		MD		MD - 10%		MD - 5%	
alpha	0,00	*0,65*	0,01	*0,47*	0,00	*0,69*	0,03	*0,13*	0,02	*0,28*	0,01	*0,53*	-0,01	*0,60*	-0,01	*0,80*	0,00	*0,83*
MLt-Rf	**1,03**	*0,00*	**0,98**	*0,00*	**0,81**	*0,00*	**0,33**	*0,00*	**0,36**	*0,00*	**0,48**	*0,00*	**0,30**	*0,00*	**0,40**	*0,00*	**0,51**	*0,00*
HML	0,00	*0,52*	**0,07**	*0,00*	**0,06**	*0,00*	-0,02	*0,19*	-0,01	*0,66*	0,01	*0,65*	**0,11**	*0,00*	**0,10**	*0,00*	**0,07**	*0,00*
SMB	**-0,08**	*0,00*	**0,16**	*0,00*	**0,11**	*0,00*	-0,05	*0,41*	-0,05	*0,41*	**0,05**	*0,09*	**-0,21**	*0,06*	-0,04	*0,48*	**0,10**	*0,00*
LBMHB	0,00	*0,62*	0,00	*0,76*	**0,20**	*0,00*	**0,69**	*0,00*	**0,68**	*0,00*	**0,50**	*0,00*	**0,91**	*0,00*	**0,69**	*0,00*	**0,47**	*0,00*
LRVMHRV	0,00	*0,65*	**-0,04**	*0,00*	**-0,03**	*0,10*	-0,04	*0,46*	-0,05	*0,29*	0,02	*0,26*	**-0,28**	*0,00*	**-0,16**	*0,00*	**-0,05**	*0,01*
R^2 adj.	1,00		0,98		0,97		0,71		0,75		0,84		0,75		0,81		0,85	

4.7.4 Appendix D: robustness to choice of risk model - absolute performance

Table 4.21 – Statistics on absolute performance for portfolios on the three universes - Constant VCV

In this table we report statistics on performance of all risk-based and CW strategies that are simulated on the respective universes from March 15, 2002 to May 1, 2012. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

		1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
EuroStoxx	PA	0.46	1.04	-6.98	2.03	3.63	1.04	1.04	1.04	-2.99
	p-val. bootstrap	*0.48*	*0.43*	*0.88*	*0.30*	*0.18*	*0.44*	*0.43*	*0.43*	*0.66*
	Sharpe ratio (realized)	0.02	0.05	-0.37	0.17	0.29	0.05	0.05	0.05	-0.13
	Max. drawdown (%)	-63.93	-61.66	-80.03	-53.12	-48.51	-61.66	-61.66	-61.66	-61.79
	Annual expected return(%)	2.72	2.89	-5.35	2.71	4.35	2.89	2.89	2.89	-0.36
	Volatility (%)	21.24	19.26	18.73	11.85	12.53	19.26	19.26	19.26	23.14
	Skewness daily return	-0.06	-0.07	-7.78	-0.12	0.08	-0.07	-0.07	-0.07	0.12
	Kurtosis daily return	8.11	8.81	150.43	12.27	14.86	8.81	8.81	8.81	8.37
AS̄PI	PA	1.27	1.71	-7.73	2.03	3.74	1.71	1.71	1.71	-1.97
	p-val. bootstrap	*0.42*	*0.39*	*0.90*	*0.29*	*0.17*	*0.38*	*0.39*	*0.39*	*0.62*
	Sharpe ratio (realized)	0.06	0.09	-0.41	0.17	0.30	0.09	0.09	0.09	-0.09
	Max. drawdown (%)	-63.65	-61.92	-80.65	-53.03	-51.12	-61.92	-61.92	-61.92	-65.69
	Annual expected return(%)	3.32	3.37	-6.14	2.73	4.46	3.37	3.37	3.37	0.31
	Volatility (%)	20.30	18.26	18.84	11.99	12.54	18.26	18.26	18.26	21.44
	Skewness daily return	-0.12	-0.15	-7.62	-0.15	-0.10	-0.15	-0.15	-0.15	-0.04
	Kurtosis daily return	8.36	8.95	147.14	10.43	11.93	8.95	8.95	8.95	8.38
ASPI	PA	-0.89	-0.18	**6.20**	4.48	3.73	-0.18	-0.18	-0.18	-3.41
	p-val. bootstrap	*0.55*	*0.51*	*0.10*	*0.18*	*0.24*	*0.52*	*0.51*	*0.52*	*0.67*
	Sharpe ratio (realized)	-0.04	-0.01	0.40	0.29	0.23	-0.01	-0.01	-0.01	-0.14
	Max. drawdown (%)	-64.63	-61.54	-44.51	-44.39	-46.43	-61.54	-61.54	-61.54	-60.30
	Annual expected return(%)	1.79	2.12	7.20	5.59	4.93	2.12	2.12	2.12	-0.55
	Volatility (%)	23.19	21.45	15.44	15.58	15.95	21.45	21.45	21.45	24.20
	Skewness daily return	0.04	0.04	0.65	0.65	0.38	0.04	0.04	0.04	0.18
	Kurtosis daily return	7.81	8.51	25.89	22.89	16.76	8.51	8.51	8.51	8.23

Table 4.22 – Statistics on absolute performance for portfolios on the three universes - Shrinkage toward 1 factor model VCV

In this table we report statistics on performance of all risk-based and CW strategies that are simulated on the respective universes from March 15, 2002 to May 1, 2012. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

Universe		**1/n**	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
EuroStoxx	PA	0.46	1.59	-3.17	4.47	**5.11**	0.72	3.37	3.10	-2.99
	p-val. bootstrap	*0.48*	*0.38*	*0.74*	*0.12*	*0.09*	*0.44*	*0.22*	*0.23*	*0.66*
	Sharpe ratio (realized)	0.02	0.09	-0.21	0.39	0.44	0.05	0.24	0.24	-0.13
	Max. drawdown (%)	-63.93	-61.20	-72.21	-47.28	-43.36	-59.50	-47.52	-48.26	-61.79
	Annual expected return(%)	2.72	3.04	-1.96	5.04	5.64	1.72	4.27	3.88	-0.36
	Volatility (%)	21.24	17.12	15.42	11.57	11.49	14.11	13.92	12.86	23.14
	Skewness daily return	-0.06	-0.16	-7.82	2.11	1.60	0.10	3.51	0.97	0.12
	Kurtosis daily return	8.11	9.40	160.64	49.58	41.66	64.73	100.56	29.45	8.37
AS̄PI	PA	1.27	1.69	-3.79	3.75	4.12	0.03	2.57	2.53	-1.97
	p-val. bootstrap	*0.42*	*0.38*	*0.78*	*0.15*	*0.13*	*0.49*	*0.26*	*0.27*	*0.62*
	Sharpe ratio (realized)	0.06	0.10	-0.24	0.34	0.37	0.00	0.21	0.20	-0.09
	Max. drawdown (%)	-63.65	-61.76	-73.11	-49.07	-45.61	-61.11	-49.63	-50.38	-65.69
	Annual expected return(%)	3.32	3.03	-2.56	4.30	4.68	0.91	3.30	3.31	0.31
	Volatility (%)	20.30	16.42	15.68	11.11	11.29	13.16	12.38	12.77	21.44
	Skewness daily return	-0.12	-0.23	-7.65	0.00	-0.29	-2.52	-0.32	-0.38	-0.04
	Kurtosis daily return	8.36	9.57	153.81	11.27	11.31	37.92	10.88	11.25	8.38
ASPI	PA	-0.89	0.81	**7.17**	**6.37**	3.81	5.17	5.05	3.94	-3.41
	p-val. bootstrap	*0.54*	*0.45*	*0.06*	*0.09*	*0.21*	*0.18*	*0.17*	*0.21*	*0.68*
	Sharpe ratio (realized)	-0.04	0.04	0.50	0.43	0.26	0.28	0.30	0.25	-0.14
	Max. drawdown (%)	-64.63	-59.75	-42.59	-43.28	-49.01	-47.89	-50.83	-50.87	-60.30
	Annual expected return(%)	1.79	2.78	7.94	7.24	4.77	6.70	6.28	5.07	-0.55
	Volatility (%)	23.19	19.85	14.37	14.66	14.39	18.55	16.59	15.52	24.20
	Skewness daily return	0.04	0.04	2.87	2.98	0.77	6.07	3.06	0.45	0.18
	Kurtosis daily return	7.81	8.97	70.54	73.07	23.17	192.72	81.58	18.13	8.23

Table 4.23 – Statistics on absolute performance for portfolios on the three universes - Shrinkage toward constant VCV

In this table we report statistics on performance of all risk-based and CW strategies that are simulated on the respective universes from March 15, 2002 to May 1, 2012. We test for statistical significance of the annualized realized performance with a bootstrap P-value for H0: annualized realized performance ≤ 0. Significant statistics at the robust confidence level of 10% and below are in bold. Annualized realized performance is discrete annual rate equivalent to total performance. Annual expected return is average daily return time 260, and volatility is standard deviation of daily return times $\sqrt{260}$.

		1/n	**ERC**	**MV**	**MV 10%**	**MV 5%**	**MD**	**MD 10%**	**MD 5%**	**CW**
EuroStoxx	PA	0.46	1.45	-4.66	4.27	5.17	1.02	3.56	3.01	-2.99
	p-val. bootstrap	*0.47*	*0.40*	*0.81*	*0.12*	*0.08*	*0.41*	*0.22*	*0.23*	*0.66*
	Sharpe ratio (realized)	0.02	0.08	-0.28	0.38	0.45	0.07	0.24	0.23	-0.13
	Max. drawdown (%)	-63.93	-60.99	-75.97	-48.92	-43.99	-59.62	-49.00	-49.08	-61.79
	Annual expected return(%)	2.72	3.04	-3.29	4.81	5.68	2.09	4.56	3.84	-0.36
	Volatility (%)	21.24	17.86	16.66	11.22	11.37	14.68	14.69	13.22	23.14
	Skewness daily return	-0.06	-0.13	-8.02	0.70	0.75	0.36	3.80	0.90	0.12
	Kurtosis daily return	8.11	9.32	162.30	19.04	24.12	71.25	110.77	27.18	8.37
A$\bar{\text{S}}$PI	PA	1.27	1.95	-5.39	3.27	3.88	0.59	2.89	2.42	-1.97
	p-val. bootstrap	*0.42*	*0.36*	*0.83*	*0.18*	*0.14*	*0.44*	*0.24*	*0.28*	*0.61*
	Sharpe ratio (realized)	0.06	0.11	-0.31	0.29	0.34	0.04	0.23	0.19	-0.09
	Max. drawdown (%)	-63.65	-61.28	-77.07	-52.13	-47.63	-59.78	-49.54	-50.21	-65.69
	Annual expected return(%)	3.32	3.38	-3.96	3.86	4.47	1.47	3.65	3.24	0.31
	Volatility (%)	20.30	17.04	17.17	11.27	11.49	13.23	12.68	13.05	21.44
	Skewness daily return	-0.12	-0.19	-8.10	0.04	-0.22	-2.18	-0.28	-0.34	-0.04
	Kurtosis daily return	8.36	9.46	164.69	11.11	11.63	32.52	10.70	10.94	8.38
ASPI	PA	-0.89	0.41	**7.60**	**6.07**	3.63	4.71	4.67	4.05	-3.41
	p-val. bootstrap	*0.55*	*0.47*	*0.04*	*0.09*	*0.22*	*0.22*	*0.20*	*0.22*	*0.67*
	Sharpe ratio (realized)	-0.04	0.02	0.56	0.43	0.25	0.25	0.27	0.26	-0.14
	Max. drawdown (%)	-64.63	-60.58	-42.95	-43.41	-49.66	-51.19	-52.99	-52.29	-60.30
	Annual expected return(%)	1.79	2.48	8.26	6.86	4.62	6.34	6.01	5.23	-0.55
	Volatility (%)	23.19	20.34	13.68	13.97	14.59	18.94	17.12	15.87	24.20
	Skewness daily return	0.04	0.00	0.95	1.01	0.73	5.47	2.74	0.39	0.18
	Kurtosis daily return	7.81	8.75	26.27	26.76	21.57	171.74	73.63	16.94	8.23

4.7.5 Appendix E: robustness to choice of risk model - multi-factor models

Table 4.24 shows how the different VCV matrices impact size of coefficients of factors in the eight-factor model. Regressions are estimated with an OLS estimator. We report H. White (1980) HC standard errors, HC and usual P-values. Significant coefficients at the robust confidence level of 10% and below are in bold. Portfolio size is average size divided by 100. Shrinkage 1 is shrinkage toward one-factor model, Shrinkage 2 is shrinkage toward constant.

The regressions of alphas and size of coefficients of factors against group dummies and size of portfolios (Table 4.24) show that using the ASPI universe with risk-based strategies leads to portfolios with higher alphas. Regarding size of coefficients of factors, the ASPI MV and the MD portfolios have a higher exposure to low-beta stocks than the average. We also note that risk-based portfolios tend to have higher exposure to small capitalization stocks than CW portfolios, by definition poorly exposed to the small capitalization factor. In the case of the ASPI universe, we again point out that CW portfolios have negative exposure to the SMB factor, and are therefore exposed to the large capitalization pricing anomaly. Finally, as previously noted the constant VCV matrix has the largest impact on size of coefficients of factors.

Table 4.24 – Impact of VCV matrix on size of coefficients of factors in the eight-factor model

	Mkt - Rf				SMB			
	coef.	**s.d.**	**HC p-value**	**p-value**	**coef.**	**s.d.**	**HC p-value**	**p-value**
Cst	-1,24	1,00	*0,22*	*0,18*	**-1,32**	**0,42**	*0,00*	*0,00*
ASPI	**1,40**	**0,62**	*0,03*	*0,02*	**0,72**	**0,26**	*0,01*	*0,01*
AS̄PI	**0,75**	**0,39**	*0,06*	*0,04*	**0,68**	**0,16**	*0,00*	*0,00*
EW	-0,08	0,06	*0,17*	*0,26*	**0,28**	**0,02**	*0,00*	*0,00*
ERC	**-0,26**	**0,04**	*0,00*	*0,00*	**0,27**	**0,02**	*0,00*	*0,00*
MV	1,21	0,87	*0,17*	*0,13*	**1,27**	**0,36**	*0,00*	*0,00*
MD	1,41	0,89	*0,11*	*0,09*	**1,28**	**0,37**	*0,00*	*0,00*
ASPI * EW	0,04	0,08	*0,65*	*0,71*	-0,03	0,03	*0,24*	*0,46*
ASPI * ERC	0,07	0,06	*0,24*	*0,44*	**-0,04**	**0,03**	*0,10*	*0,35*
ASPI * MV	**-1,12**	**0,57**	*0,05*	*0,04*	**-0,75**	**0,24**	*0,00*	*0,00*
ASPI * MD	**-1,18**	**0,58**	*0,05*	*0,03*	**-0,75**	**0,24**	*0,00*	*0,00*
AS̄PI	0,04	0,08	*0,62*	*0,68*	**-0,11**	**0,03**	*0,00*	*0,02*
AS̄PI	0,04	0,06	*0,47*	*0,64*	**-0,12**	**0,03**	*0,00*	*0,01*
AS̄PI	**-0,71**	**0,38**	*0,06*	*0,05*	**-0,59**	**0,16**	*0,00*	*0,00*
AS̄PI	**-0,71**	**0,38**	*0,06*	*0,05*	**-0,52**	**0,15**	*0,00*	*0,00*
Size	**0,70**	**0,32**	*0,03*	*0,02*	**0,42**	**0,13**	*0,00*	*0,00*
Constant	**0,19**	**0,03**	*0,00*	*0,00*	**0,07**	**0,01**	*0,00*	*0,00*
Shrinkage 1	0,00	0,01	*0,76*	*0,86*	0,00	0,01	*0,76*	*0,80*
Shrinkage 2	0,01	0,01	*0,31*	*0,57*	0,02	0,01	*0,13*	*0,20*
R^2 adj.		0,87				0,85		

	HML				LRVMHRV			
	coef.	**s.d.**	**HC p-value**	**p-value**	**coef.**	**s.d.**	**HC p-value**	**p-value**
Cst	**0,19**	**0,09**	*0,04*	*0,17*	0,22	0,30	*0,47*	*0,53*
ASPI	**-0,12**	**0,05**	*0,03*	*0,16*	0,22	0,30	*0,43*	*0,50*
AS̄PI	**-0,06**	**0,03**	*0,07*	*0,24*	-0,10	0,12	*0,38*	*0,46*
EW	**0,04**	**0,00**	*0,00*	*0,00*	**-0,03**	**0,01**	*0,01*	*0,21*
ERC	**0,05**	**0,00**	*0,00*	*0,00*	**0,03**	**0,01**	*0,03*	*0,23*
MV	**-0,14**	**0,08**	*0,07*	*0,25*	-0,07	0,26	*0,78*	*0,81*
MD	-0,12	0,08	*0,13*	*0,33*	-0,24	0,27	*0,38*	*0,45*
ASPI * EW	**0,03**	**0,00**	*0,00*	*0,07*	0,01	0,02	*0,49*	*0,74*
ASPI * ERC	0,00	0,00	*0,29*	*0,79*	-0,02	0,02	*0,28*	*0,61*
ASPI * MV	0,05	0,05	*0,27*	*0,48*	0,07	0,17	*0,70*	*0,74*
ASPI * MD	**0,12**	**0,05**	*0,02*	*0,14*	0,07	0,17	*0,58*	*0,63*
AS̄PI	**-0,02**	**0,00**	*0,00*	*0,21*	0,01	0,02	*0,77*	*0,89*
AS̄PI	**-0,01**	**0,00**	*0,05*	*0,56*	0,02	0,02	*0,40*	*0,62*
AS̄PI	**0,07**	**0,03**	*0,03*	*0,16*	0,13	0,11	*0,27*	*0,35*
AS̄PI	**0,06**	**0,03**	*0,06*	*0,23*	0,17	0,12	*0,15*	*0,22*
Size	**-0,06**	**0,03**	*0,04*	*0,18*	-0,08	0,10	*0,43*	*0,50*
Constant	**-0,01**	**0,00**	*0,02*	*0,03*	**0,05**	**0,01**	*0,00*	*0,00*
Shrinkage 1	**-0,01**	**0,00**	*0,10*	*0,16*	0,01	0,01	*0,27*	*0,34*
Shrinkage2	0,00	0,00	*0,35*	*0,41*	0,01	0,01	*0,13*	*0,20*
R^2 adj.		0,79				0,79		

	LBMHB				Annual Alpha			
	coef.	**s.d.**	**HC p-value**	**p-value**	**coef.**	**s.d.**	**HC p-value**	**p-value**
Cst	**2,73**	**0,98**	*0,01*	*0,01*	**-0,43**	**0,16**	*0,01*	*0,05*
ASPI	**-1,65**	**0,61**	*0,01*	*0,01*	**0,27**	**0,10**	*0,01*	*0,05*
AS̄PI	**-1,01**	**0,38**	*0,01*	*0,01*	**0,16**	**0,06**	*0,01*	*0,07*
EW	0,04	0,07	*0,60*	*0,64*	**0,01**	**0,00**	*0,00*	*0,51*
ERC	**0,19**	**0,05**	*0,00*	*0,01*	**0,00**	**0,00**	*0,01*	*0,77*
MV	**-1,78**	**0,85**	*0,04*	*0,05*	**0,35**	**0,14**	*0,01*	*0,07*
MD	**-1,86**	**0,86**	*0,03*	*0,04*	**0,37**	**0,14**	*0,01*	*0,06*
ASPI * EW	-0,04	0,09	*0,68*	*0,71*	**-0,01**	**0,00**	*0,07*	*0,81*
ASPI * ERC	-0,05	0,08	*0,51*	*0,64*	0,00	0,00	*0,53*	*0,95*
ASPI * MV	**1,49**	**0,56**	*0,01*	*0,01*	**-0,19**	**0,09**	*0,04*	*0,13*
ASPI * MD	**1,50**	**0,57**	*0,01*	*0,01*	**-0,23**	**0,09**	*0,01*	*0,08*
AS̄PI	0,02	0,09	*0,85*	*0,87*	**0,01**	**0,00**	*0,03*	*0,77*
AS̄PI	-0,01	0,08	*0,92*	*0,94*	**0,00**	**0,00**	*0,06*	*0,84*
AS̄PI	**0,91**	**0,37**	*0,02*	*0,02*	**-0,16**	**0,06**	*0,01*	*0,06*
AS̄PI	**0,84**	**0,37**	*0,02*	*0,03*	**-0,15**	**0,06**	*0,01*	*0,07*
Siz	**-0,85**	**0,31**	*0,01*	*0,01*	**0,14**	**0,05**	*0,01*	*0,06*
Constant	**-0,23**	**0,03**	*0,00*	*0,00*	0,01	0,01	*0,19*	*0,20*
Shrinkage 1	0,00	0,02	*0,97*	*0,98*	0,00	0,00	*0,78*	*0,82*
Shrinkage 2	**-0,03**	**0,02**	*0,07*	*0,25*	0,00	0,01	*0,70*	*0,74*
R^2 adj.		0,81				0,34		

Chapter 5

Risk Based Strategies Properties:

The Social Responsibility of Investment Universes Does Matter

5.1 Risk Based strategies and Socially Responsible Investment

Against a background of market disappointments, such as poor performance of market capitalisation weighted indices and active portfolios, risk-based strategies stand out as financial vehicles for sophisticated institutional investors. Risk based strategies are heuristic and quantitative asset allocation strategies that are special cases of the risk budgeting allocation approach; the approach itself is one type of alternative weighting approach to asset allocation, the other being the fundamental allocation (Arnott et al. 2005). The different alternative weighting strategies are also known as risk-based strategies. These risk-based strategies define the weights of assets in portfolios as functions of individual and common asset risks. The strategies are heuristic because they do not rely on any formal equilibrium model of expected return.

The adoption of risk-based strategies is commonly justified by three principal arguments (Maillard et al. 2010, Demey et al. 2010). First, while they implicitly use estimations of expected returns, risk-based strategies do not require any stock return forecasts, which eliminates the challenge of estimating them. This is an advantage compared to Mean-Variance approaches. Second, risk-based strategies aim to improve the risk/return ratio by improving risk diversification. This is an advantage compared to the capitalisation-weighted (CW) strategy, which is usually not mean-variance efficient in practice. Third, when back-tested, risk-based strategies outperform the traditional CW investment strategy.

However, risk-based strategies have two drawbacks. Not only there is a lack of theoretical background proving their historical efficiency, but these strategies also involve issues of stability (i.e. turnover) and concentration in terms of weighting of the components of portfolios. To overcome these drawbacks, asset managers follow different implementation approaches. The consequence is that for a given risk-based strategy, institutional investors are faced with the costs involved in choosing from a wide range of implementation approaches[1], which will have major implications for the subsequent characteristics of their portfolios.

In parallel with the rise of risk-based strategies and fuelled by the increasing public concern for sustainable development (Brundtland et al. 1987), a type of investment generally called socially responsible investment (SRI), is rapidly gaining favour with institutional investors. Briefly, SRI incorporates non-financial criteria into the construction of financial portfolios. These criteria include respecting simple subjective rules (e.g. no investment in gambling or tobacco businesses), or meeting a minimum level of extra-financial performance (e.g. investment in issuers that have low carbon emissions or low rate of fatalities compared to industry competitors). The latter criterion is evaluated by extra-financial rating agencies such as VIGEO.

[1] Some of the implementation choices will be discussed in this paper, in the section on data and methodology.

The popularity of SRI is partly explained by a large literature showing that being involved in corporate social responsibility (CSR) can lead to superior economic and/or financial performance through different mechanisms (Renneboog et al. (2008), Kitzmueller and Shimshack 2012). However, a review of these mechanisms is outside the scope of this paper and is covered in a companion paper that focuses on the question of the performance of SRI (see Chapter 4). One of the motivations to adopt SRI is therefore to capture unpriced extra-financial characteristics so as to obtain higher risk-adjusted returns when market decide to price them[2].

In the light of these two parallel trends, risk-based strategies and SRI, a key question arises for institutional investors. If firms that demonstrate a high degree of involvement in CSR (henceforth - high CSR firms) are different from those low level of involvement in CSR (henceforth - low CSR firms), are the characteristics of risk-based portfolios modified by an SRI universe? A positive answer would imply that institutional investors should run a new selection process, to decide which implementation approach for a risk-based strategy is in their best interests for the SRI universe. A negative answer would imply that institutional investors could keep their current risk-based portfolio managers and just switch to an SRI universe.

Here, we seek to extend the research on risk-based allocation by examining the impact of using an SRI universe on certain characteristics of risk-based portfolios. We look at four risk-based strategies, the Equally Weighted (EW), the Most Diversified Portfolio (MD), which is equivalent to the modified Maximum Sharpe Ratio (MSR) portfolio, the Minimum Variance (MV) and the Equal Risk Contribution (ERC). Using different estimators of the matrix of covariances, we apply these strategies to the EuroStoxx universe of stocks, the

[2]The financial motivation for adoption of SRI ressembles the intuition justifying alternative weighting schemes. Actually, SRI can be considered a risk-based approach, between fundamental and risk-based allocations, where assets that do not match extra-financial criteria are given a weight equal to zero. Fundamental allocations define the weights as a function of issuers' fundamental statistics. See Arnott et al. (2005).

Advanced Sustainability Performance Index (ASPI)[3] and the complement of the ASPI in the EuroStoxx universe[4].

Six types of impact of using the ASPI universe of stocks emerge from our study. First, risk-based strategies applied on the EuroStoxx favour stocks that do not belong to the ASPI universe. The reason is the mathematical properties of risk-based allocations associated to the size bias created by the extra-financial selection of stocks. Second, there is a modification of diversification of the weight and risk measure distributions. Third, risk-based portfolios built on the ASPI universe tend to present higher weight and component turnovers. The reason is that turnover of the ASPI adds up to turnovers of the EuroStoxx and the risk-based allocations. Fourth, the distributions of returns of portfolios built on the ASPI universe have positive skewness, while with the two other universes, portfolios have distributions of returns with negative skewness. It is consistent with the idea that low CSR firms are riskier than high CSR firms. Fifth, the volatility of tracking error against EuroStoxx of risk-based strategies built on the ASPI universe is lower than that of their respective counterparts built on the two other universes. The reason is the size bias created by the extra-financial selection of stocks. Finally, on the ASPI universe, all the risk-based strategies dominate the CW strategy, which is similar to findings on the two other universes and consistent with the empirical literature.

Thus we are able to conclude that combining the risk-based strategies with the SRI approach does modify some properties of risk-based portfolios. This means that the adoption of SRI is not neutral, and needs particular attention from the institutional investors.

[3]The ASPI is a best in class index provided by VIGEO until beginning of 2013. It selects the 120 best rated firms in the EuroStoxx, according to VIGEO extra-financial performance rating.

[4]The EuroStoxx is a subset of the EuroStoxx 600 that contains a variable number of stocks, roughly 300, traded in Eurozone countries. The ASPI is a subset of EuroStoxx that contains the 120 best rated stocks. This social performance rating is given by VIGEO. The complement of the ASPI in the EuroStoxx universe is the universe of about 180 stocks that are in the EuroStoxx but not in the ASPI.

In the rest of the paper we first present the four risk-based strategies examined. Section 2 gives the data and methodology for our back-tests and in section 3 we analyze portfolios characteristics. The two last sections review the robustness of our results regarding risk models and conclude.

5.2 Risk based strategies: calculation of weights

According to Demey et al. (2010) there are four common types of risk-based strategies yielding four types of risk-based portfolios. In this section we review these four strategies and their particular risk contribution properties.

The first type is the EW portfolio. The EW portfolio depends solely on the number n of components and its weights w_i are given by:

$$\forall i, w_i = \frac{1}{n} \tag{5.1}$$

This portfolio is straightforward and presents good out-of-sample performance compared to optimal portfolios (DeMiguel et al. 2009). It is perfectly diversified in weights, by construction.

The second type is the MV portfolio. The vector of weights w of the MV portfolio, with the variance-covariance matrix Σ, is given by the following optimisation program:

$$\begin{aligned} w &= \arg\min(w'\Sigma w) \\ \text{s.t.} \ &\sum_{i}^{n} w_i = 1 \\ \forall i, &0 \leq w_i \leq 1 \end{aligned} \tag{5.2}$$

This portfolio is straightforward to understand: it has the lowest ex ante volatility, does not rely on expected return input and offers good relative performance (Clarke et al. 2006, Scherer 2011). In addition, marginal risks

(MR) are equal for all the components with a weight different from zero.

$$\forall i, j, (w_i \neq 0 \wedge w_j \neq 0 \Rightarrow \frac{\delta\sigma(w)}{\delta w_i} = \frac{\delta\sigma(w)}{\delta w_j}) \tag{5.3}$$

The third type of portfolio, the MD (Choueifaty and Coignard 2008) or modified MSR (Martellini 2008), is more complicated. To obtain the vector of weights w of this portfolio, Choueifaty and Coignard (2008) introduce a diversification measure that is maximized:

$$\begin{aligned} & w = \arg\max(\frac{w'\sigma}{\sqrt{w'\Sigma w}}) \\ & \text{s.t. } \sum_i^n w_i = 1 \\ & \forall i, 0 \leq w_i \leq 1 \end{aligned} \tag{5.4}$$

This portfolio does not explicitly rely on expected return input (see the introduction of Martellini 2008); it is more diversified and less sensitive to small modifications in inputs than the MV portfolio. In addition, relative marginal risk (RMR) is equal for all the components with a weight different from zero.

$$\begin{aligned} & \forall i, j, (w_i \neq 0 \wedge w_j \neq 0 \\ & \quad \Rightarrow \frac{1}{\sigma_i}\frac{\delta\sigma(w)}{\delta w_i} = \frac{1}{\sigma_j}\frac{\delta\sigma(w)}{\delta w_j}) \end{aligned} \tag{5.5}$$

The last type is the ERC portfolio (Maillard et al. 2010), also rather complicated, where the risk contribution (RC) of each asset is the same.

$$\forall i, j, (w_i\frac{\delta\sigma(w)}{\delta w_i} = w_j\frac{\delta\sigma(w)}{\delta w_j}) \tag{5.6}$$

The composition of this portfolio is given by the following program:

$$
\begin{aligned}
& w = \arg\min\left(\sum_{i=1}^{n}\sum_{j=1}^{n}(w_i(\Sigma w)_i - w_j(\Sigma w)_j)^2\right) \\
& \text{s.t. } \sum_{i}^{n} w_i = 1 \\
& \forall i, 0 \leq w_i \leq 1
\end{aligned}
\tag{5.7}
$$

This portfolio does not explicitly rely on expected return input, by construction it is well diversified in terms of weights[5] and risk, and it is less sensitive to slight modifications in inputs than the MV or MD portfolios (Demey et al. 2010).

Table 5.1 – Risk based strategies: a comparison

The table lists the conditions (columns) on stocks necessary for each strategy (lines) to be equivalent either to one other strategy or to the tangent portfolio.

	Conditions on stocks				
Strategies	Same volatility	Same expected return	Same correlation	Same Sharpe ratio	Equivalent to
EW	X	X	X		Tangent
MV		X			Tangent
MD/mMSR	X				MV
MD/mMSR				X	Tangent
ERC			X	X	Tangent
ERC			X		MD/mMSR
ERC			X ($\rho = \frac{-1}{N-1}$)		MV
ERC	X		X		EW

Table 5.1, based on the literature, summarizes how the different risk-based strategies stand in relation to each other, and to the tangent portfolio. Note that depending on the statistical properties of the stocks included in the portfolios, different strategies can yield the same allocation and the latter can be the tangent portfolio. In particular, the ERC and the MD portfolios are to be identical when pairwise correlation is uniform. Since we use the constant correlation matrix of covariances in our analyses, it is important to control for

[5] There is no weight equal to zero in the original theory, but in practice see the numerical approach of Carvalho et al. (2012), and the analytical work of Clarke et al. (2013) that shows why stocks with particular negative values of the beta with an ERC portfolio can be excluded from the ERC.

this case.

Finally these different approaches, apart from the EW portfolio, rely on the matrix of variances and covariances Σ. In the next section we present the different risk models we use to estimate our four portfolios.

5.3 Data and methodology of the study

We run our back-tests using daily returns (adjusted price and arithmetic returns) for three different universes of stocks: the EuroStoxx, the ASPI and the complement of the ASPI in the EuroStoxx universe. We use data from March 15, 2002 to May 1, 2012. This period of time is rather short but has the advantage of covering very different economic contexts. Our data sources are, Datastream for prices and composition of the EuroStoxx, and IEM[6] for composition of the ASPI index. We check the reliability of our in-house-built universes by calculating the volatility of the tracking error (TEV) of the CW portfolios with the respective indices. We obtain a TEV of 26.9 bps for the replication of ASPI and a TEV of 11.6 bps for the replication of EuroStoxx, which are common levels of TEV (Table 5.2). Because the ASPI is a best-in-class index, we can verify that the industrial composition of the different universes are similar (exhibit 5.3). However as previously introduced in Chapter 4, we note that for most of the ten industries we statistically reject equality of weights. Finally, we use arithmetic returns and calculate all returns in Euros[7] and, following the indices calculation methodology, we rebalance the portfolios at closing on the third Friday of March, June, September and December. The portfolios weights are allowed to drift between rebalancing dates.

For the EuroStoxx and the complement universes of stocks, the weights of CW portfolios are calculated using free float market capitalisation based on Datas-

[6]IEM is the firm in charge of calculation methodology for the ASPI. VIGEO is a provider of social performance ratings and sponsor of the ASPI.

[7]By construction EuroStoxx is a Euro Zone universe.

Table 5.2 – Performance of real and replication of CW indices

Performance of real and replication of CW indices from March 15, 2002 to May 1, 2012. The two replicated CW portfolios are benchmarked against their respective real counterparts (i.e. real EuroStoxx and ASPI). We also report statistics on performances and crossed benchmark for the two real indices. Sharpe ratio is calculated against a zero risk free rate. Annualized realized performance is annual rate equivalent to total performance.

	EuroStoxx Replication	**EuroStoxx Real**	**ASPI Replication**	**ASPI Real**
		Historical performance		
Total realized perf. (%)	- 26.58	- 26.37	- 29.74	- 29.67
Annualized perf. (%)	- 2.99	- 2.97	- 3.41	- 3.40
Volatility (%)	23.14	23.49	24.20	24.52
Sharpe ratio	- 0,02	- 0,01	- 0,02	- 0,02
Max. drawdown (%)	- 61.79	- 61.75	- 60.30	- 60.10
		Performance of tracking		
Daily TE (pts)	- 0.0004	0.0008	- 0.0003	- 0.0008
TEV (pts)	0.1160	0.2623	0.2699	0.2623
Information ratio	- 0.0037	0.0030	- 0.0012	- 0.0030
Correlation	0,9969	0,9854	0,9841	0,9854

Table 5.3 – Industrial average composition

Column A is Consumer Discretionary, B is Consumer Staples, C is Energy, D is Financials, E is Health Care, F is Industrials, G is Information Technology, H is Materials, I is Telecommunication Services, J is Utilities.

Nb	A	B	C	D	E	F	G	H	I	J	NA	TOTAL
EuroStoxx	41,4	23,2	12,0	66,6	14,2	48,8	15,3	26,1	12,5	18,4	34,2	312,7
Comp	22,9	12,2	7,5	42,9	10,5	30,7	6,0	16,6	7,2	12,5	22,8	191,9
Aspi	18,5	11,0	4,4	23,4	3,6	18,0	9,2	9,5	5,3	5,9	11,0	119,9
%	A	B	C	D	E	F	G	H	I	J	NA	TOTAL
EuroStoxx	13,2%	7,4%	3,8%	21,3%	4,6%	15,6%	4,9%	8,4%	4,0%	5,9%	10,9%	100%
Comp	12,0%	6,4%	3,9%	22,3%	5,5%	16,0%	3,2%	8,7%	3,8%	6,5%	11,9%	100%
Aspi	15,4%	9,2%	3,7%	19,5%	3,0%	15,0%	7,7%	7,9%	4,4%	4,9%	9,2%	100%

tream information. The EW portfolios weights are given by the number of components, which is around 300 for EuroStoxx and around 180 for the complement of ASPI in the EuroStoxx universe[8]. For MV, MD, ERC portfolios, we estimate weights by optimizing the respective objective functions introduced in the previous section. For the three optimisation programs, constraints are no short-sells and no cash holdings. For the ASPI universe of stocks, the weights of CW portfolios are calculated using information given by IEM. The EW portfolio weights are given by N=120, the number of components of ASPI[9].

[8]As previously stated, the EuroStoxx is a subset of the EuroStoxx 600 that contains a variable number of stocks, roughly 300.

[9]For 2 rebalancing dates ASPI is defined by N=118 and N=119.

For MV, MD, ERC portfolios, we estimate weights by optimizing the respective objective functions introduced in the previous section. For EuroStoxx and the complement universe, optimisation constraints are no short-sells and no cash holdings.

Note that the solutions of the MV, MD and ERC optimisation programs depends on the matrix of variances and covariances (the VCV matrix) of stock returns. The estimation of the VCV matrix is challenging, and consequently the solutions given by the optimisations are not stable, leading to high turnover. To improve the stability of solutions given by MV, MD and ERC optimisations, different estimators of the VCV matrix have been proposed in the literature, a reminder of the diversity of implementation that investors may face. To control for the possible impact of the VCV matrices, we use four estimators: the empirical, the constant correlation, the shrinkage estimator with the constant correlation VCV matrix, and the shrinkage estimator with the one-factor model VCV matrix (Ledoit and Wolf 2004). At the outset and at each rebalancing, we update the VCV matrix from a 260-day rolling window of the most recent historical data[10]. Another problem in MV and MD optimisations is the high concentration of solutions. As examined and proposed by Maillard et al. (2010), we run MV and MD optimisation programs with upper-bound constraints (5% or 10%) for weights.

As for our method of analysis, we first describe the portfolios that we obtain in terms of number of components, number of differences between portfolios yielded by the same strategy on different universes and, differences in weights for identical components in portfolios yielded by the same strategy applied to different universes. This enables us to compare portfolios. Second we focus on diversification, by reporting for each portfolio and universe, the relative

[10]For some stocks historical series are shorter than the VCV estimation window. For the ASPI universe, this concerns two stocks out of 238, the smallest window is 100 days. For EuroStoxx and complement of ASPI universe, this concerns 53 stocks out of 536, the smallest windows is 12 days.

mean difference coefficients for weights, risk budget[11], marginal risk, relative marginal risk and risk contribution. The use of relative mean difference will be explained later. Third we focus on turnover, by reporting for each portfolio and universe, turnover of components and turnover of weights. Regressions are performed for all three steps to analyze the correlation of particular characteristics of portfolios with the strategy and the universe used. These regressions give us the economic and statistical significance of the relations of interest while controlling for particular parameters. Finally, we briefly focus on absolute and relative performance. For each portfolio and universe we report descriptive statistics regarding the statistical properties of the distribution of returns of the different portfolios. We report annualized historical performance, annualized historical volatility, expected Sharpe ratio, historical maximum drawdown, correlation with benchmark (i.e. the replications of ASPI or EuroStoxx), mean of daily return, its standard error, their two annualized values, mean daily tracking error[12], volatility of daily tracking error and daily information ratio. Note that a complete analysis of performance is done in a companion paper (see Chapter 4).

Our default case is the empirical VCV matrix. To develop analyses that are not dependent on the VCV matrix, we also run the regressions on datasets that pool the back tests obtained with the four VCV matrices. We discuss the impact of changing the risk model in section 6.

5.4 Analysis of portfolios characteristics

Composition and differences in composition of portfolios

We first report and analyze the composition and differences in composition of portfolios (Figures 5.1, 5.2), so as to describe the portfolios obtained and to

[11] Risk budget is defined as the product of the weight of component i combined with its volatility.

[12] The benchmarks used are our replications of ASPI and EuroStoxx CW indices.

measure degrees of similarity between portfolios yielded by the same strategy applied to the different universes.

First, we analyzed portfolio composition. By simply counting the number of components (Figure 5.1), we distinguished two types of strategy: strategies that invest in the entire available universe (i.e. CW, EW, ERC) and strategies that pick some stocks from the available universe (i.e. MV, MD and their bounded versions). Although this typology is obtained with the empirical VCV matrix, it is stable when we switch to other types of VCV. Only the MD strategy with a constant VCV matrix is modified (cf. Table 5.1).

Second, we calculated differences in portfolio using two measures of difference. Measure D_1 is the absolute difference in weights w_i between the components of portfolios A and B. With n as overlapping components, this measure is given by the following formula[13]:

$$D_1(A, B) = 1 - \sum_{i}^{n} \min(w_{Ai}, w_{Bi}) \tag{5.8}$$

Measure D_2 is the relative number of differences in the list of components of portfolio A with respect to the list of components of portfolio B. It is given by the following formula[14]:

$$D_2(A, B) = 1 - \frac{\text{card } A \cap B}{\min(\text{card } A, \text{card } B)} \tag{5.9}$$

[13] When D_1 equals 1, it means that the two portfolios do not overlap. The portfolios have different lists of components. When D_1 equals 0, it means that the two portfolio are identical (Annex A).

[14] When D_2 equals 1, it means that the two lists of components do not intersect. When D_2 equals 0 it means that one list is equal to, or included in, the other (Annex A).

Figure 5.1 – Number of components of portfolios

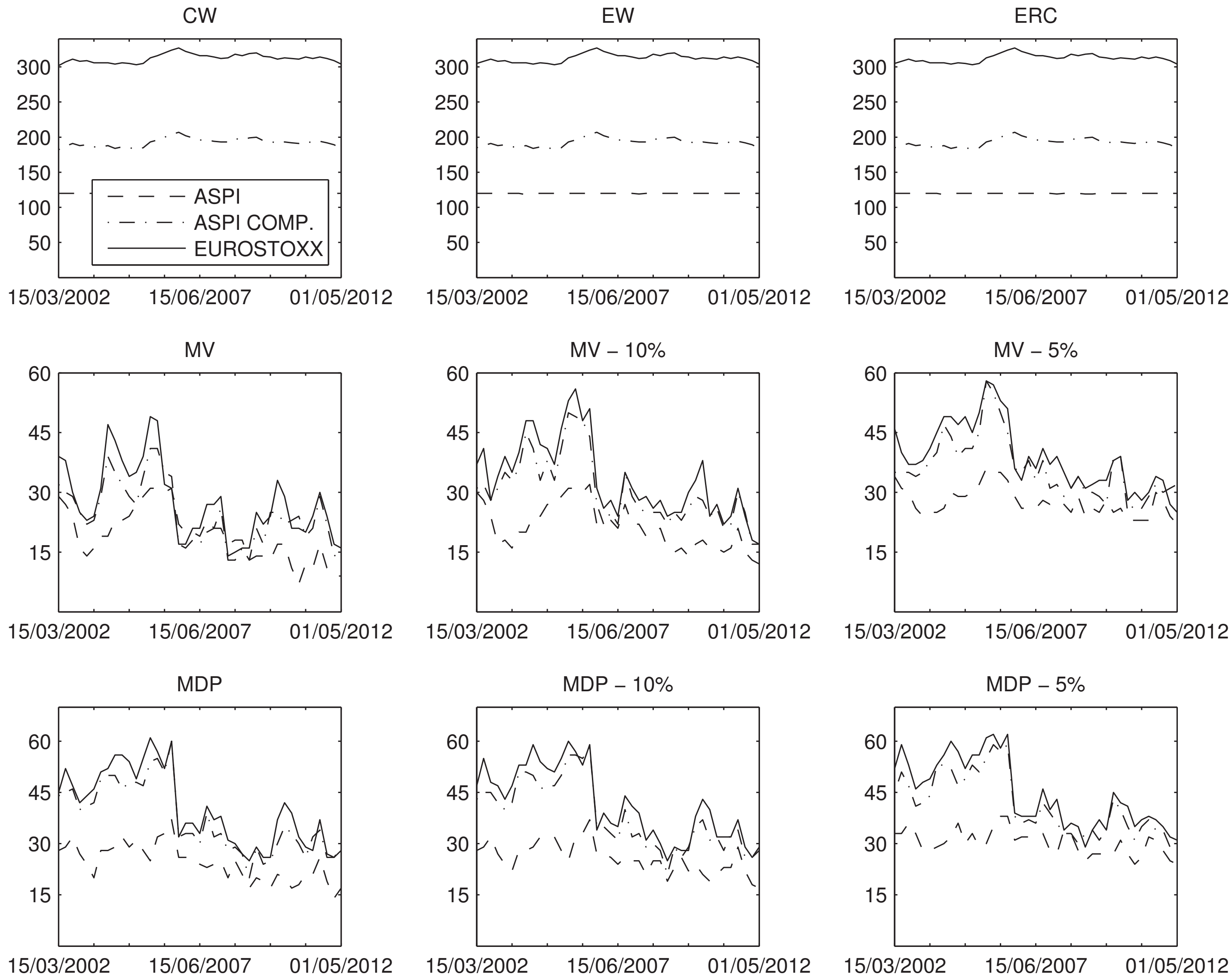


Figure 5.2 – Weights differences

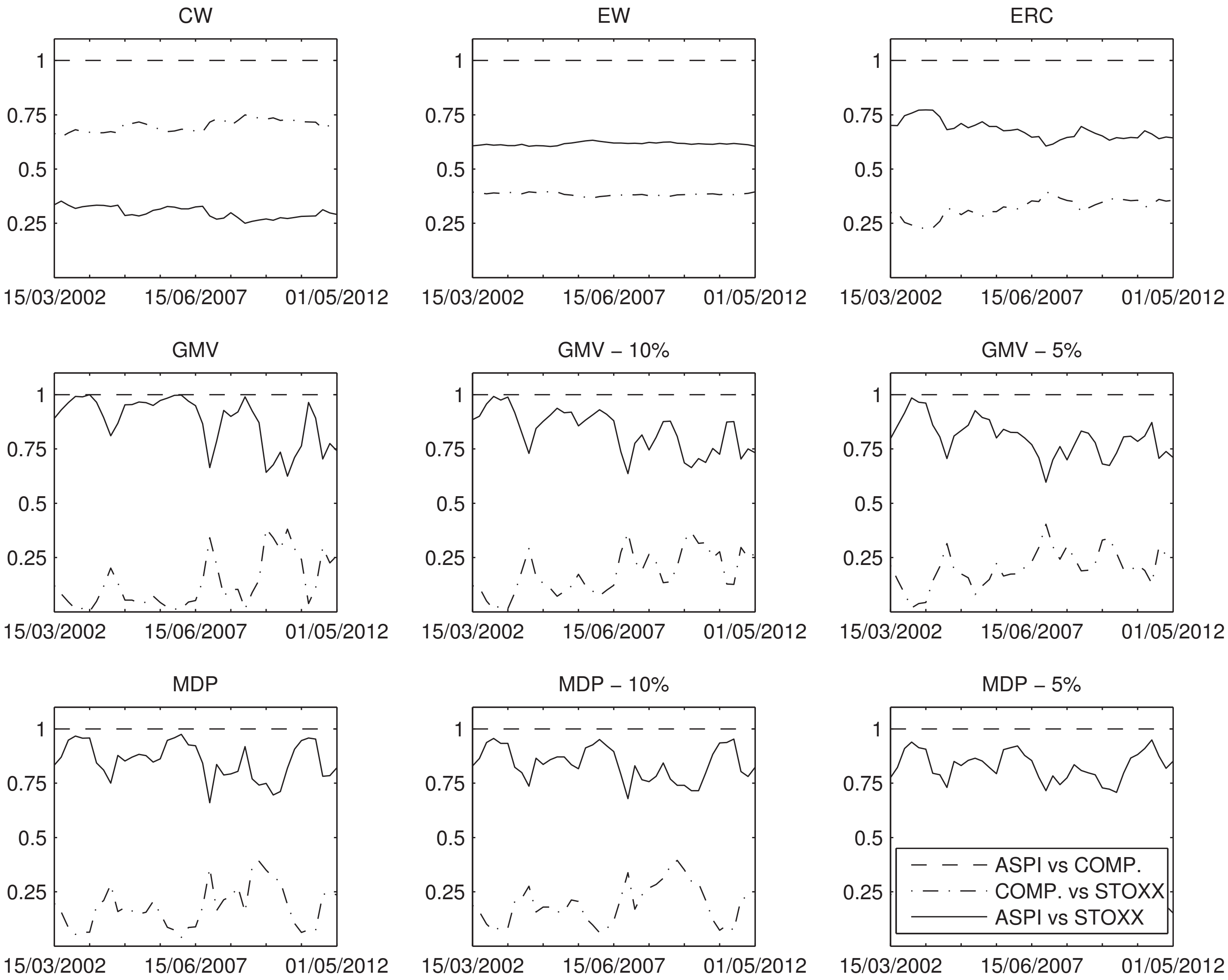


Figure 5.3 – Turnover of weights

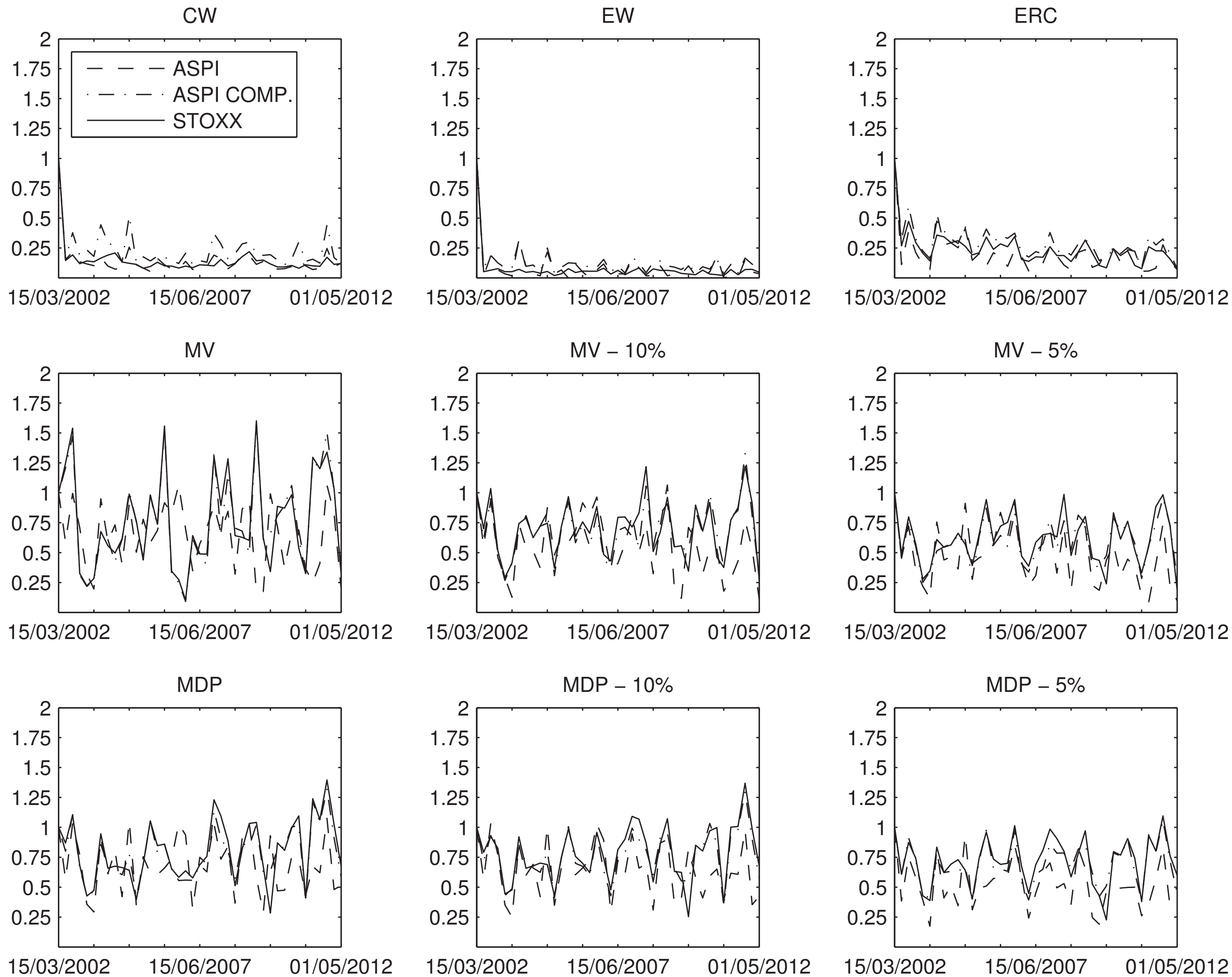


Figure 5.4 – Turnover of components

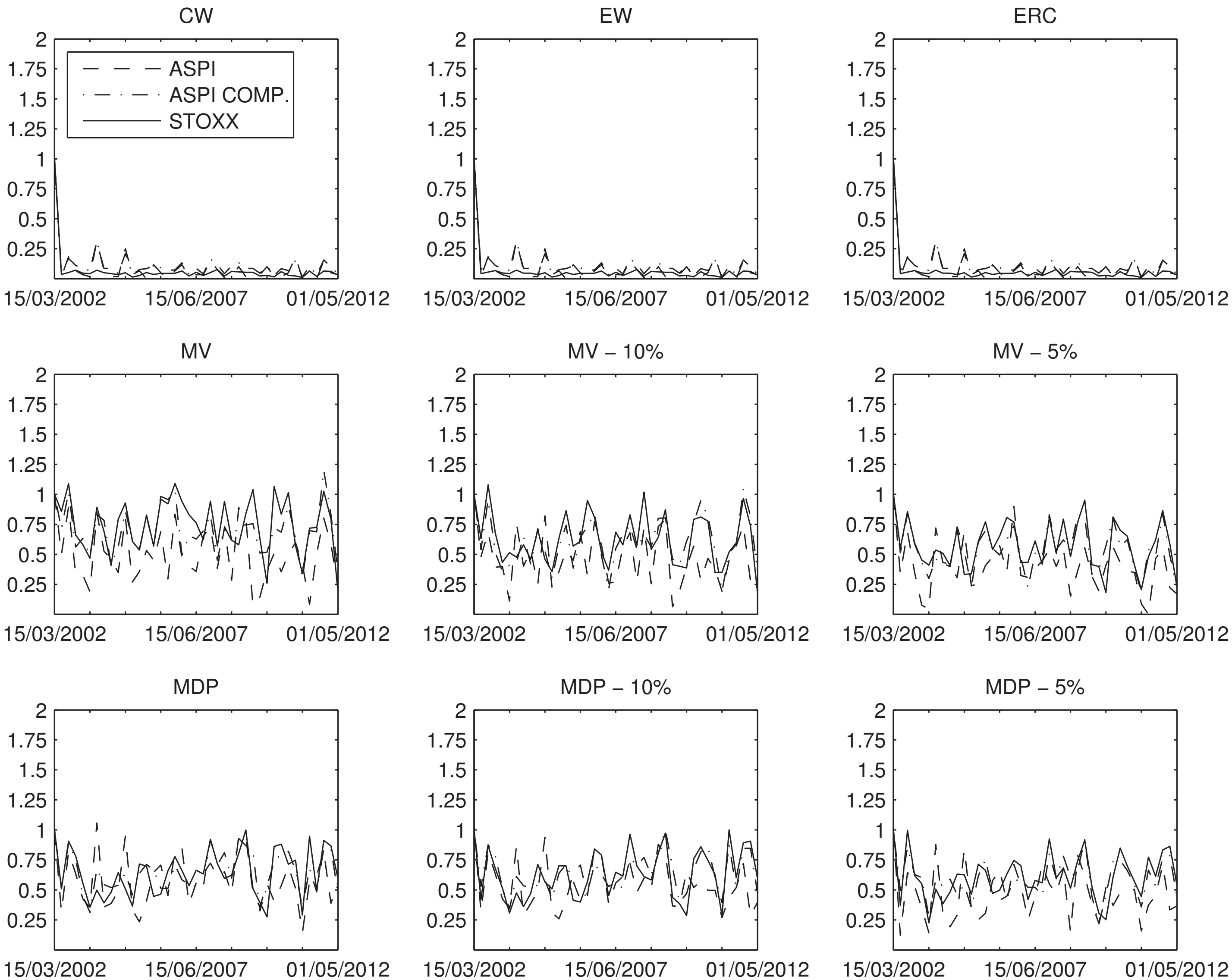
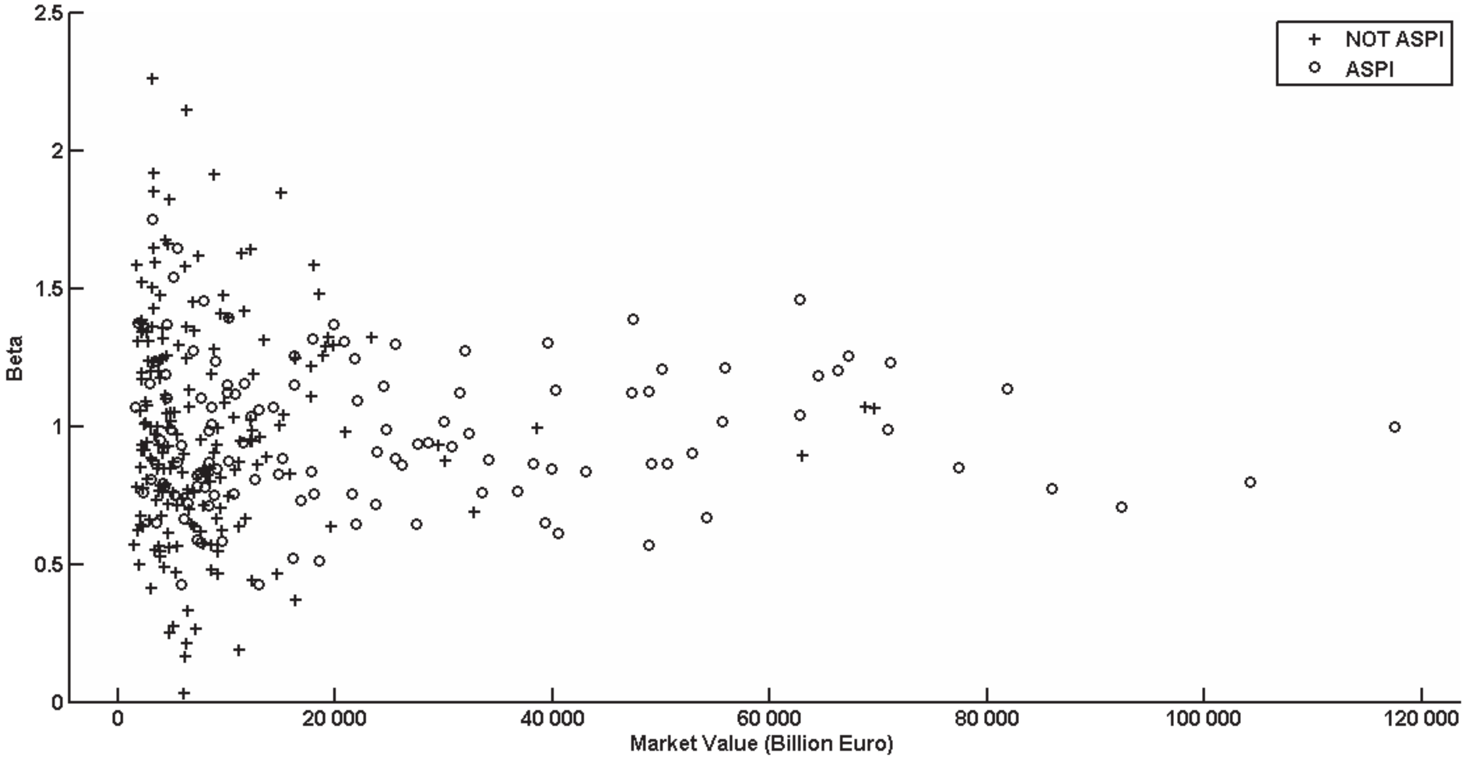


Figure 5.5 – Beta versus Market value as of June 15, 2007



Using D_1 in combination with D_2, enables us to allow for the fact that certain strategies only pick some stocks from the available universe. Hence, while the two measures are consistent in the two extreme situations (perfect overlap and perfect difference), they can differ in other situations, especially where there are highly concentrated solutions. Thus, we think it is important to explicitly track differences in lists of components to avoid misleading comparisons based solely on differences in weights.

This second analysis of the overlap of components yields two main findings. First, weight overlapping is much higher with CW than with the other strategies (Figure 5.2). The CW portfolio built on the ASPI has few differences in weights (i.e. high weight overlapping), while the other strategies built on the ASPI universe have wide differences in weights (i.e. low weight overlapping). Our proposed explanation is the positive correlation between belonging to ASPI and size of firms in our sample. We recall that D_1, our difference in weight, is one minus the sum of the lowest weights of stocks that are in the two portfolios based on the two different universes. As ASPI rules discard about 60% of the EuroStoxx stocks, while we observe only 30% of weight differences, the remaining 40% stocks then must concentrate about 70% of the weights. Consistent with this explanation by size of firms, on average the market values of firms in the ASPI are 3.11 times greater than the market values of firms in complement of ASPI in EuroStoxx universe (the median is 2.80 times greater, and the market value free-float is 3.73 times greater.). Finally, the relative mean differences of weights in the CW ASPI we calculate in the next sub-section indicate that firms in the ASPI are in general larger than in the EuroStoxx.

Second, risk-based allocations built on the ASPI universe have very low overlap with portfolios built on the EuroStoxx universe (Figure 5.2). This means that the optimisation programs behind the risk-based allocations concentrate the program solution on firms that are not socially responsible. Hence, on an ex ante basis, portfolios built on the ASPI universe are less optimal than portfolios built on the EuroStoxx and complement of ASPI universes; the latter will be recalled in the section on performance. Because ASPI universe is smaller than $\bar{\text{ASPI}}$ universe this remark is particularly relevant for the MD and the MV asset allocation strategies. We recall that these two risk-based strategies only invest in a subset on the available universe of stocks, and therefore could have concentrate their allocation on SRI universe. Our proposed explanation for this tendency to invest in the complement of ASPI universe is the combination of two facts: the characteristics of stocks selected in the ASPI universe, and theoretical exposure of the different risk-based strategies to usual factors (see Chapter 4).

Indeed by construction large firms are correlated to market, their beta tend to be close to one. For medium and small firms their beta diverge below and above one. Hence because of size bias, firms in ASPI universe have a beta closer to one than firms in $\bar{\text{ASPI}}$ universe, which have a beta that can diverge from one (Figure 5.5). Here the historical median of beta for stocks in ASPI is 0.93 while median of beta for stocks in $\bar{\text{ASPI}}$ is 0.79[15]. Finally we note that the MV and the MD allocation strategies favor low-beta stocks. So the tendency to invest in the complement of ASPI universe is explained by differences in size of universe and by low-beta exposition of universes[16].

Diversification of portfolios

The literature suggests that the advantage of risk-based allocations is better diversification than with the CW allocation. Thus, given that SRI is criticized for reducing opportunities for diversification, our main objective is to analyze how using an SRI universe impacts this strong point of risk-based strategies. We now analyze the diversification of portfolios through diversi-

[15]Note that the historical median of market value for stocks in ASPI is 10.47 billion euros the historical median of market value for stocks in $\bar{\text{ASPI}}$ is 3.74 billion euros.

[16]Note that in Chapter 4 we surprisingly observe that LBMHB factor tend to be negatively correlated with SMB factor. We stress that this relationship is not significant but puzzling.

fication of weights and diversification of risk budget, marginal risk, relative marginal risk and risk contribution.

First, we measure diversification of the previously listed characteristics of portfolios. Usually, diversification is measured with the Gini coefficient; however the Gini coefficient is valid only if the support of the analyzed distribution is null or positive. Since some of the characteristics we analyze can take negative values, we measure diversification via relative mean difference[17] (RMD). For a given distribution of measure m, with n observations, we apply the following formula:

$$\text{RMD}_m = \frac{\frac{1}{n^2}\sum_{i=1}^{n}\sum_{j=1}^{n}|m_i - m_j|}{\bar{m}} \tag{5.10}$$

For each strategy, for each universe and for each VCV matrix, we calculate the RMDs on the entire universe available and at each rebalancing date, for the weight distributions and the four risk measures. We obtain four samples of time series of RMDs that are used in the second step of our diversification analysis.

Second, after analysing these RMD time series we analyze jointly the measures of diversification of the different characteristics of portfolios. Indeed the diversification of a portfolio is a notion that covers different characteristics of the studied portfolio. We pool the five portfolios' characteristics of interest (i.e. weight, risk budget, marginal risk, relative marginal risk and risk contribution) and run regressions of the RMDs on different factors we detail latter. The purpose is to identify, in an unconditional and controlled statistical approach the relationship between diversification and the use of the ASPI universe, while testing for statistical significance. The approach consists in

[17] The RMD is closely related to the Gini coefficient. The closer the relative mean difference gets to zero the less concentrated the distribution is.

regressing two samples of pooled RMDs of weights and risk measures on universe dummies, strategy dummies, interaction dummies, control dummies and number of components in respective portfolios and universes. Sample A groups RMDs obtained with the empirical VCV. Sample B groups RMDs obtained with the four VCV matrices. The control dummies control for size of portfolio, size of universe of reference, time and other technical controls[18].

The results of the analysis of time series are two-fold. First, when we focus on the degree of diversification of strategies built on the same universe, we observe rankings similar to Maillard et al. (2010). The most diversified are the EW and the ERC, followed by the CW, and finally the MD and the MV, the most concentrated in risk and weights. Second, when we focus on the degree of diversification of strategies over the three universes and the five measures, we observe no modification in ranking when switching from ASPI to EuroStoxx or to the complement of the ASPI in the EuroStoxx universe of stocks. However, it emerges that portfolios constructed on the ASPI universe tend to be the most diversified.

The results of the controlled regressions (Table 5.4) confirm that the ASPI universe is correlated with higher diversification, how strongly depending on the strategy used. With the MV and the MD, the effect on diversification is weaker than with the CW, the EW, the ERC, whatever the VCV matrix used. The regressions also confirm that the four risk-based strategies yield more diversified distributions than the CW strategy, and that the EW and ERC strategies are the most strongly correlated with higher diversification. Signs of interactions between strategies and universe constraints are consistent with cost of constraining optimisations with a reduced universe. Note that for the MV and the MD allocations, interactions are significant only with the ASPI universe. It is consistent with the fact that risk-based allocations favour stocks

[18] We control for the case of perfect diversification for the different VCV matrices. That is, the EW and weights, the MD, ERC and the risk contribution. We control for the different types of characteristics analyzed.

Table 5.4 – Analysis of diversification

$$\text{RMD}_{it} = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{A\bar{S}PI} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{A\bar{S}PI} * \text{D}_i^{Strategies} + \sum_j \beta_j * \text{Control}_{ijt} + \varepsilon_{it}$$

We regress on group dummies measure of concentration of the distributions of the different characteristics of interest. These regressions are estimated with a FGLS estimator with HC p-values Beck and Katz (1995). Sample A is a panel of 135 series with 41 dates that groups RMDs obtained with the empirical VCV. Sample B is a panel of 450 series with 41 dates that groups RMDs obtained with the four VCV matrices. Universe size and Portfolio size are actual size divided by 100. We control for the type of measure and for the cases of perfect diversification that are predicted by theory. These regressions show significant positive correlation between diversification and use of the ASPI universe. Significant coefficients at the confidence level of 10% and below are in bold.

		Sample A				Sample B		
		coef.	**s.d.**	**p-value**		**coef.**	**s.d.**	**p-value**
cst		**2.02**	**0.30**	*0.00*		**1.99**	**0.34**	*0.00*
ASPI	**-**	**0.40**	**0.18**	*0.03*	**-**	**0.41**	**0.20**	*0.04*
A$\bar{S}$PI	-	0.29	0.27	*0.28*	-	0.30	0.35	*0.38*
ERC	-	0.41	0.32	*0.20*	-	0.46	0.29	*0.12*
EW	**-**	**0.41**	**0.22**	*0.07*	-	0.42	0.30	*0.16*
MD	-	0.28	0.24	*0.24*	-	0.39	0.26	*0.14*
MV	-	0.23	0.22	*0.29*	-	0.31	0.26	*0.22*
ASPI*ERC		0.03	0.21	*0.89*		0.05	0.19	*0.81*
ASPI*EW		0.06	0.12	*0.60*		0.06	0.15	*0.68*
ASPI*MD		**0.35**	**0.21**	*0.09*		0.30	0.22	*0.18*
ASPI*MV		**0.34**	**0.19**	*0.08*		**0.39**	**0.21**	*0.07*
A$\bar{S}$PI*ERC		0.10	0.31	*0.73*		0.10	0.34	*0.77*
A$\bar{S}$PI*EW		0.11	0.26	*0.67*		0.11	0.34	*0.75*
A$\bar{S}$PI*MD		0.28	0.28	*0.31*		0.25	0.35	*0.48*
A$\bar{S}$PI*MV		0.30	0.28	*0.28*		0.32	0.34	*0.35*
Port. Size	**-**	**0.20**	**0.02**	*0.00*	**-**	**0.22**	**0.02**	*0.00*
Univ. Size		0.04	0.06	*0.54*		0.05	0.05	*0.34*
Time	-	0.00	0.00	*0.25*	-	0.00	0.00	*0.47*
Bound 5%	-	0.05	0.11	*0.66*	-	0.05	0.09	*0.59*
Bound 10%	-	0.02	0.09	*0.86*	-	0.01	0.08	*0.86*
Controls			Yes				Yes	
Adj. R squared			0.29				0.28	

in the A$\bar{S}$PI universe.

Finally reducing the universe has two opposite effects. It increases the diversification by grouping SRI and not SRI stocks together, and it decreases the diversification effect of risk-based strategies. Three further observations emerge from the regressions: first, adding bounds to the MV and MD strategies improves diversification but this improvement is not statistically significant; second, the complement of the ASPI universe is also correlated with more diversified distributions; once again, however this is not statistically significant. Third, portfolio size is positively related to diversification of distributions: the larger the portfolio, the more diversified it is.

Turnover of portfolios

The literature identifies one drawback of risk-based allocations as being a higher level of turnover than with CW allocation, leading to higher transaction costs. Here, therefore, we examine how using an SRI universe impacts this disadvantage of risk-based allocations, in two steps.

First, we calculate two measures of the turnover of portfolios. T_1 measures the turnover of the weights, and is defined by the following formula[19] (Demey et al. 2010):

$$T_1(t) = \sum_{i}^{n} |w_i(t) - w_i(t-1)| \tag{5.11}$$

T_2 measure the turnover of components at a rebalancing date. For a portfolio that contains set of stocks A_t at time t, with IN_t the set of entering components at time t and OUT_t the set of exiting components at time t, component turnover is given by the following formula[20]:

$$T_2(t) = \frac{\text{card } IN_t}{\text{card } A_t} + \frac{\text{card } OUT_t}{\text{card } A_{t-1}} \tag{5.12}$$

Using measure of turnover T_1 with measure T_2 enables us to allow for the fact that some strategies only pick some stocks out of the available universe. Since there is a difference between handling concentrated turnover and handling a diversified turnover, we think it is important to explicitly keep track of the number of components that change at rebalancing date. We calculate the two measures of turnover at each rebalancing date, for each strategy, for each

[19] By definition T_1 is between 0 and 2 for one rebalancing and, for the first rebalancing, the turnover equals 1.

[20] By definition T_2 is between 0 and 2 for one rebalancing and, for the first rebalancing, the turnover equals 1.

universe and for each VCV matrix. In total, we obtain 8 samples of time series of measures of turnover, which are used in the second step of our turnover analysis.

Table 5.5 – Analysis of turnover of weights

$$\text{Tw}_{it} = \beta_0 + \beta_1 * \text{D}_i^{ASPI} + \beta_2 * \text{D}_i^{\bar{ASPI}} + \beta_3 * \text{D}_i^{ERC} + \beta_4 * \text{D}_i^{EW} + \beta_5 * \text{D}_i^{MD} + \beta_6 * \text{D}_i^{MV} + \beta_7 * \text{D}_i^{ASPI} * \text{D}_i^{Strategies} + \beta_8 * \text{D}_i^{\bar{ASPI}} * \text{D}_i^{Strategies} + \sum_j \beta_j * \text{Control}_{ijt} + \varepsilon_{it}$$

This regression is estimated with a FGLS estimator with HC p-values Beck and Katz (1995). The sample A is a panel of 27 series with 41 dates. It groups measures obtained with empirical VCV matrix. The sample B is a panel of 90 series with 41 dates. For the two regressions we control for the turnover at the first date. It groups measures obtained with the four VCV matrices. We control for the size of the portfolio, the size of the universe of reference and the time. For the sample B regressions we control for the MD strategies with constant VCV. Universe size and Portfolio size are actual size divided by 100. These regressions stress out positive correlation between turnover and using the ASPI universe. Significant coefficients at the confidence level of 10% and below are in bold.

	Sample A			Sample B		
	coef.	**s.d.**	**p-value**	**coef.**	**s.d.**	**p-value**
cst	-0,83	1,36	*0,54*	-0,53	1,39	*0,70*
ASPI	0,58	0,84	*0,49*	0,40	0,86	*0,64*
ASPI Comp.	0,45	0,52	*0,39*	0,34	0,53	*0,53*
ERC	**0,10**	**0,01**	*0,00*	**0,05**	**0,01**	*0,00*
EW	**-0,07**	**0,01**	*0,00*	**-0,07**	**0,01**	*0,00*
MD	0,85	0,78	*0,28*	0,46	0,53	*0,39*
MV	0,78	0,81	*0,33*	0,38	0,57	*0,50*
ASPI*ERC	**-0,04**	**0,01**	*0,01*	-0,02	0,01	*0,11*
ASPI*EW	**0,02**	**0,01**	*0,05*	**0,02**	**0,01**	*0,05*
ASPI*MD	-0,26	0,51	*0,61*	-0,02	0,35	*0,94*
ASPI*MV	-0,24	0,52	*0,64*	0,01	0,37	*0,97*
ASPI Comp.*ERC	**-0,03**	**0,01**	*0,00*	**-0,04**	**0,01**	*0,00*
ASPI Comp.*EW	**-0,03**	**0,01**	*0,00*	**-0,03**	**0,01**	*0,00*
ASPI Comp.*MD	-0,18	0,34	*0,59*	-0,03	0,23	*0,90*
ASPI Comp.*MV	-0,17	0,34	*0,61*	-0,02	0,24	*0,94*
Port. size	0,06	0,29	*0,83*	-0,07	0,20	*0,74*
Uni. size	0,24	0,44	*0,58*	0,28	0,45	*0,54*
Time	0,00	0,00	*0,82*	0,00	0,00	*0,94*
Bound 5%	**-0,15**	**0,03**	*0,00*	**-0,12**	**0,03**	*0,00*
Bound 10%	**-0,05**	**0,03**	*0,03*	**-0,05**	**0,03**	*0,04*
Controls		Yes			Yes	
Adj. R squared		0,86			0,84	

Second, after a basic analysis of these times series, we run regressions of each measure of turnover on different factors. As with diversification, the aim is to have controlled statistical measurements of the relationship between turnover and use of the ASPI universe while testing for statistical significance. The approach consists in regressing two samples of measure T_1 and two samples of measure T_2 against universe dummies, strategy dummies and number of components in portfolios and universes. For each measure, sample A groups the measures of turnover obtained with the empirical VCV, while sample B groups the measures of turnover obtained with the four VCV matrices.

Our basic analysis reveals that the weight turnover is the lowest for EW portfolios (Figure 5.3), the second lowest turnover being for the CW strategy. The CW strategy is not the one with the lowest turnover in our case, contrary to Carvalho et al. (2012). The third lowest turnover is for the ERC strategy. MV and MD portfolios have similar weight turnovers, those of the MV portfolios, however, being more volatile than the turnovers of the MD portfolios. Similarly, component turnover is the lowest for the EW, the CW and the ERC strategies (Figure 5.4).

Table 5.6 – Analysis of turnover of components

$$\mathrm{Tc}_{it} = \beta_0 + \beta_1 * \mathrm{D}_i^{ASPI} + \beta_2 * \mathrm{D}_i^{A\bar{S}PI} + \beta_3 * \mathrm{D}_i^{ERC} + \beta_4 * \mathrm{D}_i^{EW} + \beta_5 * \mathrm{D}_i^{MD} + \beta_6 * \mathrm{D}_i^{MV} + \beta_7 * \mathrm{D}_i^{ASPI} * \mathrm{D}_i^{Strategies} + \beta_8 * \mathrm{D}_i^{A\bar{S}PI} * \mathrm{D}_i^{Strategies} + \sum_j \beta_j * \mathrm{Control}_{ijt} + \varepsilon_{it}$$

This regression is estimated with a FGLS estimator with HC p-values Beck and Katz (1995). The sample A is a panel of 27 series with 41 dates. It groups measures obtained with empirical VCV matrix. The sample B is a panel of 90 series with 41 dates. For the two regressions we control for the turnover at the first date. It groups measures obtained with the four VCV matrices. We control for the size of the portfolio, the size of the universe of reference and the time. For the sample B regressions we control for the MD strategies with constant VCV. Universe size and Portfolio size are actual size divided by 100. These regressions stress out positive correlation between turnover and using the ASPI universe. Significant coefficients at the confidence level of 10% and below are in bold.

	Sample A			Sample B		
	coef.	**s.d.**	**p-value**	**coef.**	**s.d.**	**p-value**
cst	-0,83	0,97	*0,39*	-0,47	0,91	*0,60*
ASPI	0,58	0,60	*0,33*	0,35	0,56	*0,53*
ASPI Comp.	0,40	0,37	*0,29*	0,26	0,35	*0,47*
MD	-0,10	0,58	*0,86*	-0,30	0,38	*0,44*
MV	-0,11	0,60	*0,86*	-0,34	0,41	*0,40*
ASPI*MD	0,35	0,38	*0,36*	**0,44**	**0,25**	*0,08*
ASPI*MV	0,26	0,38	*0,50*	0,41	0,26	*0,12*
ASPI Comp.*MD	0,25	0,25	*0,31*	**0,31**	**0,17**	*0,06*
ASPI Comp.*MV	0,23	0,25	*0,36*	**0,30**	**0,17**	*0,08*
Port. size	-0,26	0,21	*0,21*	**-0,32**	**0,14**	*0,02*
Uni. size	**0,55**	**0,30**	*0,07*	**0,49**	**0,29**	*0,09*
Time	0,00	0,00	*0,46*	0,00	0,00	*0,58*
Bound 5%	**-0,09**	**0,02**	*0,00*	**-0,07**	**0,01**	*0,00*
Bound 10%	**-0,04**	**0,01**	*0,00*	**-0,04**	**0,01**	*0,00*
Controls		Yes			Yes	
Adj. R squared		0,90			0,87	

However, when measure T_2 is used, the three strategies have the same component turnover. Since they invest in the entire available universe, this component turnover requests solely from universe modifications. MV and MD strategies have similar component turnovers; however the turnover of the MV strategy is more volatile than that of the MD strategy. No modification in these results is observed when switching from ASPI to EuroStoxx or to the complement of the ASPI in the EuroStoxx universe of stocks. And overall we cannot tell whether using ASPI leads to higher turnover or not by simply looking at these time series.

The results of the controlled regressions (tables 5.5 and 5.6) show that using the ASPI universe is associated to a larger turnover than the complement of ASPI and the EuroStoxx universe, but this relationship is not statistically significant.

Absolute and relative performance of portfolios

Table 5.7 reports annual performance, expected Sharpe ratio, historical maximum drawdown, annualized mean of daily return, historical volatility, skewness and kurtosis of daily returns for all the strategies, and for the three universes. In Table 5.8, we report the correlation with the respective universe benchmark (i.e. the replications of ASPI or EuroStoxx), the average daily tracking error[21], the volatility of that daily tracking error and the daily information ratio. Finally, in Table 5.9 we report the correlation of all the strategies on the three universes with the replication of EuroStoxx, the average daily tracking error[22], the volatility of that daily tracking error and the daily information ratio[23].

When we analyze the impact of the ASPI universe on the performance of strategies, all the risk-based strategies dominate the CW strategy, which is similar to findings on the two other universes and consistent with the empirical literature. In addition the unbounded MV and MD strategies on the ASPI universe outperform all the other strategies on all the other universes (Table

[21]The benchmarks used are our replications of ASPI and EuroStoxx CW indices.

[22]The benchmarks used are our replications EuroStoxx CW indices.

[23]The results in these three tables are obtained with empirical covariance matrices, using daily returns for three different universes of stocks, the EuroStoxx, the ASPI and the complement of the ASPI in the EuroStoxx universe.

5.7). In Sharpe ratio, the unbounded MV outperforms the other strategies, and the risk-based strategies built on the ASPI universe generally outperform their counterparts built on the two other universes. The information ratios obtained with their respective benchmarks and those obtained with the replication of the EuroStoxx (Tables 5.8, 5.9) show similar results, with the exception that unbounded MV no longer outperforms the others. In all cases, the unbounded MV and MD strategies on the ASPI universe, yield better mean-variance portfolios with high kurtosis and positive skewness. The latter is also true for the strategies that invest in the entire universe (i.e. CW, EW, ERC). However, despite their positive skewness, the CW, EW and ERC strategies yield significantly poorer mean-variance portfolios. Finally, the risk-based strategies on the ASPI, except for the 1/n, are seen to have lower volatility of tracking error against the EuroStoxx than any of the risk-based strategies applied on the two other universes (Table 5.9). It is consistent with the size bias created by the extra-financial selection of stocks.

When the complement of ASPI universe is used, the strategies investing in the entire universe yield the best performing portfolios, with highest returns and lowest ex-post volatility (Table 5.7). However the distribution of returns of the CW, EW and ERC portfolios built on the complement of ASPI tends to be exposed to negative extreme returns. This trend gets stronger when we switch to strategies that pick some stocks out of the available universe. Hence, the distribution of returns of the MV and MD portfolios built on the complement of ASPI have high kurtosis and negative skewness. This is consistent with the observation that investors perceive a correlation between extreme specific risk and weak social performance (Waddock and Graves 1997, Hong and Kacperczyk 2009), and with empirical findings (Boutin-Dufresne and Savaria 2004).

Table 5.7 – Statistics of performance for the three universes

In this table we report statistics of performance of all risk-based and CW strategies that are simulated on the respective universe from March 15, 2002 to May 1, 2012. According to annualized performance, the two best strategies are the MV and MD risk-based strategies applied to the ASPI universe. According to Sharpe ratio the two best strategies, excluding the constrained ones, are also the MV and MD risk-based strategies applied to the ASPI universe. Note the positive skewness of portfolios built on the ASPI universe. The Sharpe ratio is calculated against a zero risk free rate. Annual expected return is average daily return time 260. Volatility is standard deviation of daily return times $\sqrt{260}$. Annualized realized performance is annual rate equivalent to total performance.

		1/n	**ERC**	**MV**	**MV - 10%**	**MV - 5%**	**MD**	**MD - 10%**	**MD - 5%**	**CW**
EuroStoxx	Annualized perf. (%)	0.46	1.52	-3.43	4.51	4.73	0.97	3.75	2.72	-2.99
	Sharpe ratio (expected)	0.13	0.18	-0.14	0.43	0.47	0.14	0.33	0.27	-0.02
	Max. drawdown (%)	-63.93	-61.28	-72.97	-46.84	-43.38	-60.68	-48.52	-49.58	-61.79
	Annual expected return (%)	2.72	2.98	-2.18	5.14	5.29	2.20	4.81	3.56	-0.36
	Volatility (%)	21.24	17.19	15.73	12.18	11.59	15.77	15.13	13.29	23.14
	Skewness daily return	-0.06	-0.15	-7.51	3.15	1.53	1.41	4.09	0.87	0.12
	Kurtosis daily return	8.11	8.34	154.87	78.65	39.73	101.95	120.21	26.55	8.37
ASPI	Annualized perf. (%)	-0.89	0.77	7.42	6.15	3.86	4.79	4.62	3.95	-3.41
	Sharpe ratio (expected)	0.08	0.14	0.58	0.49	0.34	0.34	0.36	0.33	-0.02
	Max. drawdown (%)	-64.63	-59.82	-42.44	-44.49	-49.79	-50.41	-53.35	-52.76	-60.30
	Annual expected return (%)	1.79	2.75	8.24	7.08	4.83	6.64	5.96	5.12	-0.55
	Volatility (%)	23.19	19.91	14.85	15.11	14.45	20.29	17.13	15.84	24.20
	Skewness daily return	0.04	0.05	3.57	3.64	0.72	7.11	2.76	0.36	0.18
	Kurtosis daily return	7.81	8.94	93.99	94.34	22.19	235.63	74.50	16.60	8 .23
COMP. ASPI	Annualized perf. (%)	1.27	1.91	-4.30	3.28	3.53	0.22	2.68	1.90	-1.97
	Sharpe ratio (expected)	0.17	0.20	-0.19	0.35	0.37	0.09	0.28	0.21	0.01
	Max. drawdown (%)	-63.65	-61.84	-74.29	-50.63	-46.99	-61.16	-48.75	-50.57	-65.69
	Annual expected return (%)	3.32	3.24	-3.01	3.87	4.13	1.15	3.46	2.75	0.31
	Volatility (%)	20.3	16.39	15.93	11.26	11.43	13.57	12.79	13.13	21.44
	Skewness daily return	-0.12	-0.22	-7.43	0.03	-0.32	-2.69	-0.28	-0.36	-0.04
	Kurtosis daily return	8.36	9.62	149.35	11.11	10.92	41.38	10.80	11.06	8.38

Table 5.8 – Statistics of performance: benchmark is respective CW portfolio for the three universes

All strategies are benchmarked against the respective in-house CW portfolio from March 15, 2002 ti May 1, 2012. According to information ratio, the best strategy is the 1/n applied on the EuroStoxx and complementary of ASPI universes, followed by the MV, the ERC and the MD strategies built on the ASPI universe.

		1/n	**ERC**		**MV**	**MV - 10%**	**MV - 5%**	**MD**	**MD - 10%**	**MD - 5%**	**vs CW**
EuroStoxx	Daily TE (pts)	0.0118	0.0129	-	0.0070	0.0212	0.0217	0.0099	0.0199	0.0151	-
	Standard dev. daily TE (pts)	0.3443	0.5491		1.3786	1.1413	1.0363	1.2246	1.1347	0.9740	-
	Information ratio	0.0344	0.0235	-	0.0051	0.0186	0.0210	0.0081	0.0175	0.0155	-
	Correlation	0.97	0.95		0.40	0.61	0.73	0.54	0.61	0.76	-
ASPI	Daily TE (pts)	0.0090	0.0127		0.0338	0.0294	0.0207	0.0276	0.0250	0.0218	-
	Standard dev. daily TE (pts)	0.3246	0.4415		1.1338	1.0801	0.8884	1.2798	1.0286	0.8486	-
	Information ratio	0.0277	0.0287		0.0298	0.0272	0.0233	0.0216	0.0243	0.0257	-
	Correlation	0.98	0.97		0.66	0.70	0.84	0.58	0.73	0.85	-
COMP. ASPI	Daily TE (pts)	0.0116	0.0113	-	0.0129	0.0137	0.0147	0.0032	0.0121	0.0094	-
	Standard dev. daily TE (pts)	0.2619	0.4638		1.2770	0.9362	0.8510	0.9656	0.8320	0.7786	-
	Information ratio	0.0443	0.0243	-	0.0101	0.0146	0.0173	0.0033	0.0146	0.0120	-
	Correlation	0.98	0.96		0.42	0.74	0.82	0.69	0.81	0.84	-

Table 5.9 – Statistics of performance: benchmark is EuroStoxx for the three universes

All strategies are benchmarked against the in-house EuroStoxx CW portfolio from March 15, 2002 to May 1, 2012. According to the information ratio, the best strategies are the 1/n, applied to the three universes, then the ERC and MV built on the ASPI universe. The volatility of tracking error of the 1/n, ERC and MV risk-based strategies applied on the ASPI universe is smaller than the volatility of tracking error of the same strategies on the other universes.

		1/n	**ERC**	**MV**	**MV - 10%**	**MV - 5%**	**MD**	**MD - 10%**	**MD - 5%**	**vs CW**
EuroStoxx	Daily TE (pts)	0.0118	0.0129	- 0.0070	0.0212	0.0217	0.0099	0.0199	0.0151	-
	Standard dev. daily TE (pts)	0.3443	0.5491	1.3786	1.1413	1.0363	1.2246	1.1347	0.9740	-
	Information ratio	0.0344	0.0235	- 0.0051	0.0186	0.0210	0.0081	0.0175	0.0155	-
	Correlation	0.97	0.95	0.40	0.61	0.73	0.54	0.61	0.76	-
ASPI	Daily TE (pts)	0.0083	0.0120	0.0331	0.0286	0.0200	0.0269	0.0243	0.0211	- 0.0007
	Standard dev. daily TE (pts)	0.2618	0.3733	1.0909	1.0376	0.8314	1.2572	0.9870	0.7881	0.1398
	Information ratio	0.0317	0.0321	0.0303	0.0276	0.0240	0.0214	0.0247	0.0268	- 0.0050
	Correlation	0.98	0.97	0.65	0.69	0.84	0.57	0.73	0.85	1.00
COMP. ASPI	Daily TE (pts)	0.0142	0.0139	- 0.0103	0.0163	0.0173	0.0058	0.0147	0.0120	0.0026
	Standard dev. daily TE (pts)	0.4559	0.6403	1.3806	1.0551	0.9768	1.0922	0.9678	0.9202	0.3201
	Information ratio	0.0311	0.0216	- 0.0075	0.0154	0.0177	0.0053	0.0152	0.0130	0.0081
	Correlation	0.95	0.92	0.40	0.71	0.79	0.65	0.77	0.80	0.98

When the EuroStoxx universe is used, we obtain statistics that are similar to these obtained with the complement of ASPI. This is consistent with the high level of overlapping previously revealed. The MV portfolios built on the EuroStoxx and complement of ASPI universes also have ex-post volatilities higher than the volatility of the ASPI MV portfolio. This observation, together with that on the optimality of risk-based solutions (cf. page 178), illustrates the gap between ex ante optimisation and ex post realisation. It may also illustrate the lower quality of the statistical inputs obtained with the EuroStoxx and complement of ASPI universes[24].

5.5 Robustness

As previously introduced, to treat the issue of stability of solutions given by MV, MD and ERC optimisations we used four different estimations of the VCV matrix: the empirical, the constant correlation and two shrinkage estimators[25] (Ledoit and Wolf 2004). The different analysis we report in this paper are done with the empirical VCV matrix sample, and with the sample pooling the four different VCV matrices.

Whatever the estimator, using an SRI universe is seen to impact the characteristics (i.e. diversification) of risk-based portfolios to the same degree. However, we find some differences in the degree to which use of risk-based strategies affects the performance of SRI portfolios. For example, using the Sharpe ratio, non-reported regression shows that the constant VCV matrix yields portfolios with significantly poorer performance. We observe lower returns and higher variance of returns than for portfolios built with other VCV matrices. In addition, the shrinkage estimators of the VCV matrix yield portfolios with better performance than portfolios built with empirical estimators

[24] As investigated by Syriopoulos 2007 who obtained rather negative results.

[25] Shrinkage targets are the constant correlation and the one-factor market model VCV matrices.

of the VCV matrix; but this latter observation is not statistically significant.

However, the use of more sophisticated estimators of the VCV matrix leads to other significant advantages. Non-reported regressions show that more sophisticated VCV matrices significantly decrease the turnover of weights and components. The smallest improvement is obtained with the shrinkage toward the constant VCV matrix. The shrinkage toward the one-factor model and the constant VCV matrix are equivalent.

5.6 Conclusion

Our intention here was to further explore risk-based allocation by examining how using an SRI universe impacts the characteristics of risk-based portfolios. We studied four risk-based strategies, the EW, the MD, the MV and the ERC, using three universes of stocks, the EuroStoxx, the ASPI and the complement of ASPI universe. We worked with four different estimators of the VCV matrix: the empirical, the constant, the matrices shrunk towards a constant and towards a one-actor model.

Six types of impact of using the ASPI universe of stocks emerge from our study. First, risk-based strategies applied on the EuroStoxx favour stocks that do not belong to the ASPI universe. In fact, the lists of components and the weights of overlapping components in EuroStoxx and ASPI differ widely. The reason is a combination of mathematical properties of risk-based allocations and size bias created by extra-financial selection of stocks. Second, grouping SRI firms together increases diversification of the weight and risk measure distributions, but decreases the effect of risk-based asset allocation strategies on diversification. These observations do not depend on type of VCV and are consistent with the constraints imposed on optimisations program. Third, risk-based portfolios built on the ASPI universe tend to present higher weight and component turnovers. The reason is that turnover of the ASPI adds up to turnovers of the EuroStoxx and the risk-based allocations. Again, these observations do not depend on type of VCV. Fourth, the distributions of returns of portfolios built on the ASPI universe have positive skewness, while with the two other universes, portfolios have distributions of returns with negative skewness. It is consistent with the idea that low CSR firms are riskier than high CSR firms. Fifth, the volatility of tracking error against EuroStoxx of risk-based strategies built on the ASPI universe is lower than that of their respective counterparts built on the two other universes. The reason is the size bias created by the extra-financial selection of stocks. Finally, on the ASPI universe, all the risk-based strategies dominate the CW strategy, which is similar to findings on the two other universes and consistent with the empirical literature.

Hence, while recalling the usual limitations of back-testing, we conclude that using risk-based strategies in combination with the SRI approach somewhat modifies the properties of risk-based portfolios. Adopting SRI thus cannot be considered neutral and warrants careful attention from the institutional investor. A valuable extension of this work would be to check the robustness of our results using a different SRI universe with different rating methodology and covering different geographical zones.

5.7 Appendixes

5.7.1 Appendix A: measure of differences and turnovers

We calculate differences in portfolio using two measures of difference. Measure D_1 is the absolute difference in weights w_i between the components of portfolios A and B. This measure is given by the following formula:

$$D_1(A,B) = 1 - \sum_i \min(w_{Ai}, w_{Bi})$$

In our framework by definition we have $\forall i, 0 \leq w_i \leq 1$ and $\sum_i w_i = 1$ therefore we state that:

1)

$$0 \leq D_1(A,B) \leq 1$$

2)

$$D_1(A,B) = 0 \Leftrightarrow \forall i, w_{Ai} = w_{Bi}$$

3)

$$D_1(A,B) = 1 \Leftrightarrow A \cap B = \emptyset$$

Elements of proof:

2)

$$\begin{aligned}
&\forall i, w_{Ai} = w_{Bi} \\
\Rightarrow &\forall i, \min(w_{Ai}, w_{Bi}) = w_{Ai} = w_{Bi} \\
\Rightarrow &\sum_i \min(w_{Ai}, w_{Bi}) = \sum_i w_{Ai} = 1 \\
\Rightarrow &1 - \sum_i \min(w_{Ai}, w_{Bi}) = 0
\end{aligned}$$

$$
\begin{aligned}
&D_1(A, B) = 0 \\
\Rightarrow &1 - \sum_i \min(w_{Ai}, w_{Bi}) = 0 \\
\Rightarrow &\exists j \neq k, \sum_j w_{Aj} + \sum_j w_{Bk} = 1
\end{aligned}
$$

by definition

$$\forall j, w_{Aj} \leqslant w_{Bj} \text{ and } \forall k, w_{Bk} \leqslant w_{Ak}$$

$$
\begin{aligned}
&\text{if } \forall j, w_{Aj} < w_{Bj} \text{ and } \forall k, w_{Bk} < w_{Ak} \\
\Rightarrow &\sum_j w_{Aj} + \sum_k w_{Ak} > 1 \text{ and } \sum_j w_{Bj} + \sum_k w_{Ak} > 1
\end{aligned}
$$

which is not allowed by definition so

$$D_1(A, B) = 0 \Rightarrow \forall j, w_{Aj} = w_{Bj} \text{ and } \forall k, w_{Bk} = w_{Ak}$$

3)

$$
\begin{aligned}
&A \cap B = \emptyset \\
\Rightarrow &\forall i, \min(w_{Ai}, w_{Bi}) = 0 \\
\Rightarrow &\sum_i \min(w_{Ai}, w_{Bi}) = 0 \\
\Rightarrow &D_1(A, B) = 1
\end{aligned}
$$

$$
\begin{aligned}
&D_1(A,B) = 1\\
\Rightarrow &\sum_i \min(w_{Ai}, w_{Bi}) = 0\\
\Rightarrow &\forall i, \min(w_{Ai}, w_{Bi}) = 0\\
\Rightarrow &A \cap B = \emptyset
\end{aligned}
$$

Measure D_2 is the relative number of differences in the list of components of portfolio A with respect to the list of components of portfolio B. It is given by the following formula:

$$D_2(A,B) = 1 - \frac{\text{card } A \cap B}{\min(\text{card } A, \text{card } B)}$$

In our framework by definition we have card $A \neq 0$ and card $B \neq 0$ therefore we state that:

1)

$$0 \leq D_2(A,B) \leq 1$$

2)

$$D_2(A,B) = 0 \Leftrightarrow A \subseteq B \text{ and card } A \leq \text{card } B$$

3)

$$D_2(A,B) = 1 \Leftrightarrow A \cap B = \emptyset$$

Elements of proof:

2)

$$\begin{aligned}
&A \subseteq B \text{ and card } A \leq \text{card } B\\
\Rightarrow &\text{card } A \cap B = \text{card } A \text{ and } \min(\text{card } A, \text{card } B) = \text{card } A\\
\Rightarrow &D_2(A, B) = 0
\end{aligned}$$

$$\begin{aligned}
&D_2(A, B) = 0\\
\Rightarrow &\text{card } A \cap B = \min(\text{card } A, \text{card } B)\\
\Rightarrow &A \subseteq B \text{ and card } A \leq \text{card } B \text{ or } B \subseteq A \text{ and card } B \leq \text{card } A
\end{aligned}$$

3)

$$\begin{aligned}
&A \cap B = \emptyset\\
\Rightarrow &\text{card } A \cap B = 0\\
\Rightarrow &D_2(A, B) = 1
\end{aligned}$$

$$\begin{aligned}
&D_2(A, B) = 1\\
\Rightarrow &\frac{\text{card } A \cap B}{\min(\text{card } A, \text{card } B)} = 0\\
\Rightarrow &\text{card } A \cap B = 0\\
\Rightarrow &A \cap B = \emptyset
\end{aligned}$$

We calculate two measures of the turnover of portfolios. T_1 measures the turnover of the weights, and is defined by the following formula:

$$T_1(t) = \sum_i^n |w_i(t) - w_i(t-1)|$$

In our framework by definition we have $\forall i, 0 \leq w_i \leq 1$ and $\sum_i w_i = 1$ therefore we state that:

1)

$$0 \leq T_1(t) \leq 2$$

2)

$$T_1(t) = 0 \Leftrightarrow D_1(A(t), A(t-1)) = 0$$

3)

$$T_1(t) = 2 \Leftrightarrow D_1(A(t), A(t-1)) = 1$$

T_2 measure the turnover of components at a rebalancing date. For a portfolio that contains set of stocks A_t at time t, with IN_t the set of entering components at time t and OUT_t the set of exiting components at time t, component turnover is given by the following formula:

$$T_2(t) = \frac{\text{card } IN_t}{\text{card } A_t} + \frac{\text{card } OUT_t}{\text{card } A_{t-1}}$$

1)

$$0 \leq T_2(t) \leq 2$$

2)

$$T_2(t) = 0 \Leftrightarrow D_2(A(t), A(t-1)) = 0$$

3)

$$T_2(t) = 2 \Leftrightarrow D_2(A(t), A(t-1)) = 1$$

5.7.2 Appendix B: Beck-Katz

We estimate model on Time Series Cross Section data. We have verified whether our samples are subject to within correlation and between heteroskedasticity. For autocorrelation we run a simple AR(1) model and test whether the coefficient is different from zero. It is the case for the sample of Relative Mean Differences (Table 5.4), of weights and components turnover (Tables 5.5 and 5.6). To correct this autocorrelation we use the Prais-Winston quasi-difference transformation (Prais and Winston 1954, Wooldridge 2009). With the modified data we test for homoskedasticity, which is rejected.

In that case we have autocorrelation and heteroskedasticity, we can estimate with OLS and treat these issues with HAC variance covariance matrix (Arellano 1987), or we can transform data, estimate with OLS and treat heteroskedasticity with Panel Corrected Standard Errors (Beck and Katz 1995).

We choose the second solution because of the lentgh of our time series. Arellano (1987) is valid with short time series panel.

Chapter 6

Conclusion

This thesis examined corporate social responsibility (CSR) and how it is linked to a firm's economic and financial performance, as well as socially responsible investment (SRI). Our goal was to explore the research on CSR and SRI, especially recent developments in this field of research. We also aimed to contribute to a better understanding of the mechanisms governing the financial performance of SRI. As a conclusion, we would like to highlight two main points.

The first concerns the evolution observed over the past four years in economic research on CSR, on its links to economic and financial performance of firms, and on SRI. Since the article of Friedman (1970), despite the fact that economists were working towards a better understanding of what was driving pro-social actions by firms, and their consequences, they continued to base their work on the assumption that a firm has one sole purpose within society. This objective of maximizing utility of shareholders is contradictory to that proposed by the supporters of a more broad approach to CSR. However, following calls for more economic research such as that of Bénabou and Tirole (2010a), Magill et al. (2013) reveal strong formal factors that argue in favor of a line of research taking a broader approach to CSR and to firms' objective function. Conversely, this paper negates one of the main arguments in support of the profit maximization assumption: its social optimality. Although the paper of Magill et al. (2013) has some controversial elements[1], it could well put an end to the ongoing debate in the research on the relationship between financial performance and firms' pro-social behaviors. This research area is fuelled by economic criticism of misallocation of shareholders' funds, and its objective is to empirically prove that this is not true. Actually, Magill et al. (2013) formally prove this under some conditions. Thus, by using the stakeholders' instead of the shareholders' utility maximization program, it is possible to increase employees' and customers' well-being without decreasing that of shareholders.

Debate and research will now probably switch to the issue of measuring the social impact of firms' pro-social actions so as to deal with the issue of including stakeholders' utility in management's objective function. New issues could emerge, such as: who should decide on measurement and control processes? What kind of incentive contracts should be designed for management? What differences might there be between pro-social actions motivated by ethics and those motivated by profit? Note that increased emphasis on the question of extra-financial performance measurement, particularly the measurement of social impact, is also observed in the research on SRI, as illustrated by the new definition of SRI proposed by the AFG. We can therefore speak of the rise of CSR and SRI 2.0.

The second point concerns the mechanisms underlying the financial performance of SRI. Our second chapter empirically shows that the firm's degree of involvement in CSR can impact both its stocks' liquidity and the size of its investor base. These observations are explained by an information effect and by the fact that low CSR firms are perceived as riskier than high CSR firms. These results support recent contributions showing that high CSR firms have a lower implied cost of capital (i.e. an actualization rate that makes the stock's price equal to forecasts of free cash flows) than low CSR firms. This chapter

[1] In particular the extensive use of the market process following the contributions of Coase (1960).

also shows the importance of stocks' visibility, in relation to the markets? information efficiency. To conclude, this chapter empirically demonstrates that it is possible to generate a positive abnormal return by investing systematically in small and high CSR firms before their cost of capital is modified by the market. Note that once the firm's market value is modified, the expected return of high CSR firms is lower than expected returns of low CSR firms.

With these elements in mind, in Chapter 3 we investigate whether the drawbacks of CW allocation neutralize the possible positive effects generated by investing only in stocks of high CSR firms (i.e. the SRI process). Since risk-based allocations are introduced in the literature as an answer to the drawbacks of CW allocation, we investigate the impact of such allocation methods on the performance of SRI portfolios. The answer to our question depends on the type of performance that is studied. For relative performance, we observe that the positive correlation between the firm's size and the evaluation of the firm's degree of involvement in CSR generate a size bias that can be a severe handicap for CW SRI funds that are benchmarked against an ordinary index. In that case, we observe that risk-based allocations significantly improve the relative performance of SRI portfolios and are advantageous to investors benchmarked against CW indexes. However, for risk-adjusted performance, we observe that the premium for a high level of CSR interacts negatively with the risk-based premiums. This can be explained by the mathematical characteristics of risk-based allocations and by the SRI universe size bias. Both constrain the optimizations and impose a cost on the optimality of the MV and the MD allocations. In that case, the CW portfolio and the ERC portfolio have the largest premium for a high level of CSR, closely followed by the EW portfolio. In addition, we observe that the main driver of the performance generated by best-in-class selection is the exclusion of firms that suffer extreme negative events. Although the effects of these specific and rare events on normal funds' performance are generally small thanks to the diversification effect, they can be far more significant with concentrated allocations (i.e. investing in few components).

In Chapter four we investigate the impact on risk-based allocations of using a universe of high CSR firms. We observe that the composition, the diversification, the turnover and the distribution of return of risk-based portfolios are modified by using an SRI universe. The size bias generated by the selection of high CSR firms and the interaction of the latter with the mathematical characteristics of risk-based allocations explain these different modifications. Moreover, the tendency to extreme and negative returns of portfolios of low CSR firms is due to the high probability of environmental, social and governance crises with such firms. Adopting SRI thus cannot be considered neutral and warrants careful attention from the institutional investor. Finally, on the ASPI universe, all the risk-based strategies dominate the CW strategy, which is similar to findings on the two other universes and consistent with the empirical literature.

To conclude, we highlight two mechanisms driving the financial performance of SRI portfolios. First, firms involved in CSR seem to increase market value over the long term because of lower risk and because of strategic opportunities that improve their profits. Depending on the firm's visibility (i.e. efficiency of information), it is possible to systematically capture this long-term value increase. Second, the exclusion of low CSR firms seems to protect the portfolio from negative and extreme events. Depending on the portfolio's concentration and on the frequency of these negative events, their impact on portfolios' performance is more or less significant.

Note that Chapter 2 of our thesis Bertrand, Guyot, et al. (Forthcoming) is to be published in Bankers, Markets and Investors during 2014. Chapter 3 and 4 have been submitted to international academic journals.

Chapter 7

Conclusion in French

Cette thèse traite des thématiques de la responsabilité sociétale des entreprises (RSE), de sa relation avec la performance économique et financière de l'entreprise, et finalement de l'investissement socialement responsable (ISR). Ainsi nous avons souhaité mieux comprendre le champ de la recherche sur la RSE et l'ISR, ainsi que ses récentes évolutions. Nous avons également souhaité contribuer à une meilleure compréhension des mécanismes à l'origine de la performance financière de l'ISR. De ce travail de thèse nous voulons ainsi mettre en avant deux principales conclusions.

La première porte sur l'évolution, durant les quatre dernières années, des recherches économiques sur la RSE, sur sa relation avec la performance économique et financière de l'entreprise, et sur l'ISR. Depuis l'article de Friedman (1970) bien que les économistes aient évolués et contribués à une meilleure compréhension de certaines motivations à l'origine de la réalisation d'actions pro-sociales par les entreprises et de leurs conséquences, leurs contributions à la littérature sont toujours subordonnées au présupposé d'un objectif unique de l'entreprise dans la société: la maximisation de l'utilité des actionnaires. Cet objectif reste en opposition avec les défenseurs d'une approche large de la RSE. Néanmoins, à la suite d'appels à plus de recherche économique tels que celui de Bénabou et Tirole (2010a), le récent papier de Magill et al. (2013) apporte des éléments formels forts, en faveur des courants qui appellent à un changement de l'objectif de l'entreprise, et de son rôle dans la société. Réciproquement ce papier retire un argument primordial aux défenseurs de la maximisation du profit: l'argument de son optimalité social. Bien que comportant un certain nombre d'éléments polémiques[1], ce papier peut clore le débat sous-jacent au champ de recherche sur la relation entre performance financière et comportement pro-sociaux de l'entreprise. En effet ce champ de recherche est motivé par la critique économique de mauvaise allocation des fonds de l'actionnaire, et il cherche à montrer empiriquement qu'avoir une politique de RSE (i.e. réaliser des actions pro-sociales) ne réduit pas le profit de l'entreprise. Magill et al. (2013) le montre théoriquement sous certaines hypothèses. Ainsi en passant de l'objectif de maximisation de l'utilité des actionnaires à l'objectif de maximisation de l'utilité des différentes parties prenantes, il est possible d'améliorer le bien-être des employés et des clients tout en conservant le bien-être des actionnaires.

Le débat et la recherche vont ainsi probablement et d'autant plus s'orienter vers la mesure de l'impact sociétale des actions pro-sociales de l'entreprise pour répondre à la problématique de l'intégration de l'utilité des parties prenantes aux objectifs de gestion du management. De nouvelles problématiques pourraient émerger telles que: la désignation des agents qui devront décider de la mesure et de sa vérification, l'étude de la forme que devront prendre les contrats d'incitations du management, l'étude d'une possible différence entre les actions pro-sociales faites par des entreprises motivées moralement et celles qui le font pour le profit. On remarquera que ce glissement vers la problématique de la mesure de la performance extra-financière, en particulier de la mesure de l'impact sociétale, s'observe également dans la recherche sur l'ISR comme l'illustre la nouvelle définition de l'ISR proposée par l'AFG. On peut ainsi parler de l'émergence de l'ISR et de la RSE 2.0.

La seconde conclusion porte sur les mécanismes à l'origine de la performance

[1] En particulier celui d'une utilisation extensive du système de marché, suivant les apports de Coase (1960).

financière de l'ISR. Ainsi notre second chapitre montre empiriquement que le niveau d'engagement dans une politique de RSE d'une entreprise peut influer sur la liquidité de ses titres, et sur la taille de sa base d'investisseur. Ces observations se justifient par un effet information et le fait que les entreprises n'ayant pas de politique de RSE soient perçues par le marché comme étant plus risquées. Ces résultats sont en faveur des récentes contributions qui montrent que les entreprise réalisant une quantité importante d'actions pro-sociales ont un coût du capital implicite (i.e. taux d'actualisation qui égalise le prix de l'action de l'entreprise aux prévisions de ses profits) plus bas. Ce chapitre montre également l'importance de la visibilité des titres de l'entreprise sur le marché et renvoie à l'efficience informationnelle des marchés. En conclusion ce chapitre valide la possibilité de générer un rendement positif anormal en investissant systématiquement dans les petites entreprises cotées qui réalisent une quantité importante d'actions pro-sociales avant que leur coût du capital, et donc leur valorisation, ne soit ré-estimé par le marché. Par ailleurs, une fois la revalorisation effectuée, les rendements attendus des entreprises ayant une politique de RSE sont plus bas que les rendements attendus des entreprises ne réalisant pas ou peu d'actions pro-sociales.

Avec ces éléments à l'esprit, dans le troisième chapitre nous nous demandons si les limites de la pondération par les capitalisations ne neutraliseraient par les éventuels effets positifs de la restriction de l'univers d'investissement aux actions d'entreprises ayant une politique de RSE (i.e. processus d'investissement socialement responsable). Les allocations basées sur le risque étant présentées dans la littérature comme une réponse aux limites de la pondération par les capitalisations, nous cherchons à connaitre l'impact de ces méthodes sur la performance des portefeuilles d'ISR. En conclusion la réponse à notre question dépend de la performance étudiée. Lorsque nous nous intéressons à la performance relative, nous observons que la corrélation positive entre l'évaluation des politiques de RSE et la taille des entreprises notées crée un biais taille qui peut être un sérieux handicap pour les fonds d'ISR pondérés par les capitalisations et comparés à un indice classique. Nous observons alors que les allocations basées sur le risque améliorent significativement la performance relative des portefeuilles d'ISR, et présentent donc un avantage pour des investisseurs comparés à un indice pondéré par les capitalisations. Néanmoins, lorsque nous nous intéressons à la performance ajustée des risques, nous observons que la performance liée à l'utilisation d'un univers d'ISR tend à être dégradée par les allocations basées sur le risque. Cela peut s'expliquer par les caractéristiques mathématiques de ces allocations et par le biais taille de l'univers d'ISR. L'ensemble contraint l'optimisation et génère un coût d'optimalité, tout particulièrement pour le Minimum Variance et le Maximum Diversification. Dans ce cas le portefeuille Cap-Weighted et le portefeuille Equal Risk Contribution présentent la meilleure performance liée à la sélection best-in-class, suivi de près par le portefeuille Equally-Weighted. Par ailleurs, nous avons constaté que la principale source de performance générée par la sélection best-in-class est l'exclusion d'entreprises qui subissent des événements extrêmes négatifs. Bien que les effets de ces événements spécifiques rares sur la performance des fonds classiques soient généralement minimes, en accord avec le principe de diversification, ils peuvent être beaucoup plus significatifs dans le cadre d'une gestion utilisant des allocations alternatives concentrées (i.e. investissant dans peu de composants).

Dans le quatrième chapitre nous nous demandons quel est l'impact d'un univers d'investissement composé d'actions d'entreprises réalisant une quantité importante d'actions pro-sociales sur les propriétés des portefeuilles basés sur le risque. En conclusion nous observons que la composition, la diversification, le taux de rotation et la distribution des rendements des portefeuilles pondérés selon des méthodes d'allocations basées sur le risque sont modifiés par l'utilisation d'un univers ISR. Le biais taille crée par la sélection des entreprises ayant une politique de RSE, ainsi que l'interaction de ce biais avec les caractéristiques mathématiques des allocations basées sur le risque expliquent tout ou partie de ces différentes modifications. De plus, la tendance aux rendements extrêmes négatifs que nous observons pour les portefeuilles construits sur l'univers des entreprises ne réalisant pas ou peu d'actions pro-sociales s'explique par un risque d'occurrence d'événements environnementaux, sociaux ou de gouvernance catastrophiques plus élevé pour ces entreprises. Ainsi le choix d'un univers d'ISR n'est pas neutre, et il nécessite une analyse spécifique de la part des investisseurs. Seule leur performance des allocations alternatives face au portefeuille pondéré par les capitalisations reste inchangée, en accord avec la littérature empirique sur le sujet.

Finalement nous listons deux mécanismes à l'origine de la performance financière de portefeuille d'ISR. Premièrement, les entreprises réalisant une quantité importante d'actions pro-sociales semblent à terme être mieux valorisées par le marché à cause d'un risque plus faible, et d'opportunités stratégiques bénéfiques pour leur profit. Selon le niveau de visibilité (i.e. d'efficience informationnelle) de l'entreprise il est possible de capter systématiquement ces revalorisations. Deuxièmement, l'exclusion d'entreprise n'effectuant pas ou peu d'actions pro-sociales semble protéger le portefeuille d'événements extrêmes négatifs. Selon le degré de concentration du portefeuille et la fréquence de ces événements, l'impact sur la performance est plus ou moins significatif.

Nous faisons remarquer que le second chapitre de cette thèse Bertrand, Guyot, et al. (Forthcoming) fera l'objet d'une publication dans Bankers, Markets and Investors durant l'année 2014. Le troisième et le dernier chapitres sont actuellement en cours de soumission dans des revues académiques internationales.

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