# Analysis of the idiosyncratic volatility in Europe : common factors and determinants

Ahmed Khaled Farouk Soliman

# ÉCOLE DOCTORALE DE MANAGEMENT PANTHÉON-SORBONNE

# ANALYSE DE LA VOLATILITÉ IDIOSYNCRASIQUE EN EUROPE : FACTEURS COMMUNS ET DETERMINANTS

**THÈSE**

pour l'obtention du titre de

**Docteur en Sciences de Gestion**

(Arrêté du 30 mars 1992)

Présentée et soutenue publiquement par

**Ahmed KHALED FAROUK SOLIMAN**

Le 6 décembre 2021

**COMPOSITION DU JURY**

| | |
|---|---|
| **Directeur de Recherche** | **Erwan LE SAOUT**<br>Maître de conférences HDR à l'Université Paris 1 Panthéon-Sorbonne |
| **Rapporteurs** | **Sofiane ABOURA**<br>Professeur des Universités à l'Université Paris 13<br>**Radu BURLACU**<br>Professeur des Universités à l'Université Grenoble Alpes |
| **Suffragant** | **Philippe TOURON**<br>Professeur des Universités à l'Université Paris 1 Panthéon-Sorbonne |

# Remerciements

C'est incroyable comment le temps passe trop vite. Ça m'étonne de percevoir que je suis arrivé à la fin de la thèse. J'ai eu l'honneur d'avoir effectué ma thèse à l'Université Paris 1 Panthéon-Sorbonne, une des plus anciennes institutions universitaires au monde. Elle m'a permis de vivre une expérience spéciale et d'être entouré de personnes non seulement intelligentes mais aussi sympathiques et serviables dont chacun a contribué à l'aboutissement de cette thèse.

Tout d'abord, je tiens à remercier mon directeur de thèse Monsieur Erwan LE SAOUT pour son encadrement, sa présence continue et son encouragement. Le travail sous la direction de Monsieur LE SAOUT a été un privilège. J'ai beaucoup appris tant au niveau scientifique qu'au niveau personnel et disciplinaire. J'aimerais le remercier vivement pour sa patience et sa considération. Je suis reconnaissant.

Je tiens à remercier le Professeur Sofiane ABOURA et le Professeur Radu BURLACU pour avoir accepté d'être mes rapporteurs et pour leurs précieuses remarques à l'occasion de la pré-soutenance qui m'ont permis d'améliorer le present manuscrit.

Je tiens à dire un grand merci à Professeur Phillipe TOURON, pour avoir accepté d'être membre du jury. Je souhaite également le remercier pour m'avoir fourni des données nécessaires et primordiales au développement de cette these de doctorat durant la période de confinement.

Je remercie Professeur Jean-Paul LAURENT, Professeur Yannick MALEVERGNE et Professeur Bahram SOLTANI et toute l'équipe Finance de l'Ecole de Management de la Sorbonne pour leurs conseils et remarques qu'ils m'ont prodigués à l'occasion de mes présentations lors des séminaires organises par le PRSIM.

Je remercie Professeur Stijn G.VAN NIEUWERBURGH pour m'avoir accueilli à Columbia Business School lors de ma mobilité internationale. La pertinence de ses remarques ont considérablement enrichi mon travail de recherche.

J’aimerais remercier Madame Abida SAYDYASSINE pour ses immenses efforts et son soutien continu. J’en profite pour addresser un salut amical à l’ensemble des doctorantes et doctorants du PRISM que j’ai cotoyés tout au long de cette période doctorale.

Je remercie Madame Virginie DUTERTRE et Monsieur Loïc SOREL pour leur gentillesse et pour m’avoir aidé en tout ce qui concerne les démarches administratives.

Je remercie Mademoiselle Lamiaä SOLIMAN, ma sœur, pour son soutien et ses aides qui ont été primordiaux.

Enfin, cette thèse n’aurait jamais existé sans ma mère, mon père, et mes frères qui m’ont soutenu et d’avoir cru en moi.

Mille mercis à toute personne qui a contribué à la réalisation de ce travail immense de recherche. Aucun mot pourrait exprimer ma gratitude à vous tous.

À ma famille,

À ma mère.

# SOMMAIRE

# ANALYSE DE LA VOLATILITÉ IDIOSYNCRASIQUE EN EUROPE : FACTEURS COMMUNS ET DETERMINANTS

# Introduction générale

La définition de la volatilité idiosyncrasique trouve ses origines dans la théorie moderne de portefeuille (Markowitz, 1952 ; Sharpe, 1964 ; Lintner ;1965). Selon cette théorie, le risque d'un titre est constitué de deux composantes, systématique et idiosyncrasique. Le risque systématique désigne la partie de la volatilité du titre qui devrait avoir un coût et pour laquelle les investisseurs devraient recevoir une compensation. C'est un risque non-diversifiable et dont le coût entre dans l'estimation de la rentabilité exigée par les investisseurs. On mesure le risque non-diversifiable par le coefficient béta d'un modèle de marché. Ce risque est lié à l'état global d'une économie. Il dépend des variables macroéconomiques, comme les taux d'intérêt, les taux de change, les taux de croissance économique, les taux de chômage, la situation politique, etc. Nous nous intéressons dans ce travail à la deuxième composante de la volatilité du titre qui correspond à la volatilité idiosyncrasique. Ce type de risque est appelé également le « risque spécifique » parce qu'il émane de la performance de la firme elle-même indépendamment de la situation économique. Il est donc associé nécessairement aux variables liées à l'entreprise. A titre d'exemple, ces variables pourraient être la rentabilité économique, la rentabilité des capitaux propres, la structure financière de l'entreprise, sa solvabilité et sa gouvernance.

Bien que la volatilité idiosyncrasique ait la part la plus importante de la volatilité du titre (Campbell et al., 2001 ; Goyal et Santa-Clara, 2001 ; Cotter, O'Sullivan and Rossi, 2014 ; Nam, Khaksari et Kang, 2016), elle n'est pas rémunérée. La théorie moderne du portefeuille considère le risque idiosyncrasique comme diversifiable. En d'autres termes, ce risque pourrait être diminué, voir éliminé, par la construction d'un portefeuille qui regroupe plusieurs titres appartenant à différents secteurs d'activité. Par la diversification, l'investisseur peut réduire le risque idiosyncrasique de son portefeuille sans baisser la rentabilité espérée. En revanche, la diversification peut être empêchée pour diverses raisons. Ces raisons sont liées soit aux caractéristiques du marché, comme les coûts de transactions (Constantinides, 1986 ; Uppal, 1993 ; Rowland, 1999) et les coûts d'information (Merton, 1987 ; Brockman et al., 2009, 2020), soit aux caractéristiques de l'investisseur (Barber and Odean, 1999, 2000, 2001 ; Liu, 2008 ; Malkiel et Xu, 2004). Ainsi, un résidu de la volatilité idiosyncrasique pourrait exister dans la volatilité du portefeuille, par conséquent, l'investisseur serait exposé à ce risque.

L'analyse de la volatilité idiosyncrasique est intéressante à plus d'un titre. Tout d'abord, différents auteurs dont Campbell et al. (2001) démontrent l'existence d'une tendance positive dans la volatilité idiosyncrasique aux Etats Unis. Les auteurs observent une augmentation continuelle de la volatilité idiosyncrasique sur la période de 1962-1997, et ils proposent plusieurs possibles raisons. Ensuite, nous pouvons citer les travaux de Ang et al. (2006, 2009). Les auteurs mettent en exergue un « puzzle du risque idiosyncrasique ». Ils trouvent une relation négative entre la volatilité idiosyncrasique et les rentabilités espérées. Cette relation apparaît contrintuitive dans la mesure où la rentabilité est supposée être une fonction positive du risque. Les études sur la volatilité idiosyncrasique s'avèrent intéressantes en raison l'impossibilité pour les investisseurs de détenir un portefeuille suffisamment diversifié (Constantinides, 1986 ; Merton, 1987 ; Uppal, 1993 ; Barber et Odean, 1999, 2000, 2001 ; Rowland, 1999 ; Malkiel et Xu, 2004 ; Liu, 2008 ; Brockman et al., 2009, 2020). Sur la base de ces trois points, nous pouvons identifier quatre axes dont dépendent les études de volatilité idiosyncrasique : évolution de la série de volatilité idiosyncrasique et de ses méthodes d'estimation, les facteurs affectant le risque idiosyncrasique, la relation entre le risque idiosyncrasique et la rentabilité requise, et les raisons de la relation négative entre le risque idiosyncrasique et la rentabilité.

En ce qui concerne l'estimation de la volatilité idiosyncrasique, il est estimé comme l'écart type du terme d'erreur dans le MEDAF. Cependant, le MEDAF présente plusieurs limites, et d'autres modèles ont été développé (Brenan, 1970 ; Stulz, 1981 ; Merton, 1973 ; Lucas, 1678 ; Breeden, 1979 ; Campbell et al. 2001 ; Malkiel and Xu, 2002). Les modèles à facteurs sont les modèles les plus couramment utilisés dans l'estimation de la volatilité idiosyncrasique.

Le débat sur la présence d'une tendance déterministe dans la série de la volatilité idiosyncrasique se tient à partir l'apparition de l'article de Campbell et al. (2001). Les auteurs observent une tendance déterministe positive dans la série temporelle de la volatilité idiosyncrasique aux Etats-Unis sur la période 1962-1997. Les travaux se poursuivent en soutenant la présence de la tendance positive (Goyal et Santa Clara, 2001 ; Malkiel et Xu, 2004 ; Dennis et Strickland, 2004 ; Irvine et Pontiff, 2005 ; Fu, 2009 ; Herskovic, Kelly, Lustig et Van Nieuwerburgh, 2016 ; Abdoh et Varela, 2017). Herskovic et al. (2016) démontre l'existence d'un facteur commun dans les volatilités idiosyncrasique des firmes américaines. Ils montrent que ce risque a un coût. D'autres auteurs soutiennent la présence de ce facteur commun dans les volatilité idiosyncrasique (Nam, Khaksari et Kang, 2016 ; Caglayan, Xue et Zhang, 2020).

Selon la théorie financière, plus le risque est élevé, plus la rentabilité sera élevée. Cependant, il n'y a pas de consensus sur la direction de cette relation. Tandis qu'ils existent des articles qui nient la présence de relation entre la volatilité idiosyncrasique et les rentabilités (Fama et MacBeth, 1973 ; Wei et Zhang, 2005 ; Han et Lesmond, 2011 ; Fink , Fink et He, 2012 ; Beggrun, Lizarzaburu and Cardona ; 2016), une autre famille d'articles trouvent une relation significative négative (Ang et al., 2006,2007, Stambaugh et al., 2015 ; Gu, Kang et Xu, 2016 ; Zhong, 2017) ou positive (Fu, 2009 ; Brockman et al., 2009,2020 ; Nartea, Ward et Yao, 2011, Malagon et al., 2018).

Ainsi, nous constatons que l'étude de la volatilité idiosyncrasique est toujours pertinente parce que la plupart des investisseurs restent exposés à ce type de risque, surtout les investisseurs non-institutionnels (Goestzmann et Humar, 2008). L'évolution du risque idiosyncrasique dans le temps et sa relation avec les rentabilités affecteront les stratégies d'investissement, surtout ceux des investisseurs non-institutionnels. Ceci intervient dans un contexte où la gestion passive (gestion indicielle, assurance de portefeuille) domine l'industrie de la gestion collective bien aidée en cela par le développement des *exchange-traded funds* dont les encours ne cessent de croître.

De nombreux débats sont loin d'être clos. Notre contribution aux débats s'articule autour de 3 chapitres. Dans un premier chapitre, notre objectif principal est de mettre en exergue l'importance la volatilité idiosyncrasique et la pertinence de son inclusion dans le processus de l'évaluation des risques et la valuation des titres. L'étude est réalisée sur les quinze principaux marchés d'actions européens pendant 18 ans (2000-2018). Dans un premier temps, nous examinons la tendance des séries temporelles de la volatilité idiosyncrasique et tentons de valider l'existence ou non d'un facteur commun dans la volatilité idiosyncrasique au niveau régional et continental. Nous estimons la volatilité idiosyncrasique en utilisant modèle d'évaluation des actifs à six-facteur ; un modèle EGARCH, et un modèle de marché qui se fonde sur une analyse en composantes principales des excès des rentabilités des firmes européennes. Nous utilisons le modèle

VAR pour vérifier la relation de causalité entre le facteur commun européen de la volatilité idiosyncrasique et la volatilité du portefeuille du marché. Dans un second temps, nous investiguons la relation entre le risque idiosyncrasique et la rentabilité espérée. La relation entre la volatilité idiosyncrasique et les rentabilités des titres est testée par la régressions transversales de Fama et MacBeth (2003). Enfin, nous cherchons à valider l'hypothèse que la sous-diversification explique la prime du risque idiosyncrasique.

En ce qui concerne la manière dont les informations spécifiques à l'entreprise sont incorporées dans les rentabilités idiosyncrasiques des actions, aucun consensus se dégage. Une volatilité idiosyncrasique relativement élevée est supposée être liée à des échanges basés sur l'information et à une meilleure information (Morck, Yeung et Yu, 2000 ; Durnev, Mork, Yeung et Zarowin, 2003 ; Jin et Myers, 2006). Dans leur étude, Morck, Yeung et Yu (2000) testent les mouvements communs des cours des actions dans les pays à revenu faible et les pays à revenu élevé. Ils découvrent que la synchronicité des cours des actions est plus forte dans les états à revenu faible qu'aux états à revenu élevé. Étant donné que les pays à revenu faible se caractérisent par des systèmes financiers et d'une gouvernance des entreprises moins développés que ceux des pays riches. Ce résultat est dû à la faible protection des droits à la propriété privée qui empêche l'échange informé (*informed trading*). Tandis que le poids de l'information spécifique dans le cours du titre diminue, le poids de la partie systématique augmente à cause du bruit des transactions (*noise trading*). Dans leur analyse, le coefficient de détermination ($R^2$) devient plus faible dans les pays développés qu'aux pays émergents. Durnev, Mork, Yeung et Zarowin (2003) trouvent que de la variabilité du cours du titre spécifique à la firme est corrélée positivement au contenu informatif (*informativeness*) du cours de l'action. En d'autres termes, les firmes dont la volatilité idiosyncrasique est importante, leurs cours contiennent plus d'information sur leurs bénéfices futurs. C'est-à-dire que les échanges sur ce titre se font plus sur la base de l'information spécifique à l'entreprise que sur la situation générale du marché. Jin et Myers (2006) cherchent à établir un lien entre l'opacité d'une firme et la synchronisation des cours des titres échangés sur un marché (*stock market synchronicity*). Ils montrent qu'ils existent une relation positive entre le coefficient de détermination ($R^2$) et les *proxies* de l'opacité. Dans les marchés opaques, l'information spécifique à l'entreprise ne s'intègre pas dans le processus de la décision d'investissement des investisseurs, par conséquent, sa part diminue dans le cours du titre. Ceci est traduit par une appréciation de la part systématique dans le cours du titre concrétisée par la hausse de $R^2$. Haggard, Martin et Pereira (2008) montrent que la divulgation volontaire réduit le mouvement commun entre les cours des titres sur un marché. Ainsi, le coefficient de détermination d'une entreprise est une fonction négative de sa transparence.

Dans des études intéressées sur le marché chinois, Hasan, Song et Wachtel (2014) découvrent que le développement des institutions légales et politiques a été accompagné par une réduction du mouvement commun entre les cours des titres mesuré par le coefficient de détermination. Gul, Kim et Qiu (2010) soulignent une relation inverse entre la qualité de l'audit et l'existence des investisseurs étrangers, d'une part, et la synchronicité du cours du titre, d'une autre part. Selon Zhai et al (2021), l'adoption du KAM (Key Audit Matters) dans la divulgation engendre plus d'information idiosyncrasique ce qui réduit la synchronicité des cours des titres chinois.

Contrairement aux études précédentes, il existe un volet de la littérature qui montre que la volatilité idiosyncrasique pourrait être une « frénésie occasionnelle » telle que décrite par Roll (1988) et liée positivement à une mauvaise évaluation (*mispricing*) (De Long et al., 1990 ; Dontoh, Rhadhakrishnan et Ronen, 2004 ; Pontiff, 2006 ; Kelly, 2014). En d'autres termes, une augmentation de la volatilité idiosyncrasique est considérée en raison d'un accru bruit des transactions (*noise trading*). Une augmentation de la volatilité idiosyncrasique indiquerait donc un écart du cours de l'action par rapport à sa valeur fondamentale.

Dans nos essais, nous essayons de démontrer l'importance du risque idiosyncrasique en cherchant à vérifier l'existence d'un facteur commun de la volatilité idiosyncrasique en Europe qui pourrait avoir un effet sur les volatilités des portefeuilles de marché et en démontrant une relation entre elle et les rentabilités des entreprises. Ensuite, comme la volatilité idiosyncrasique reflète l'information spécifique à la firme, nous cherchons à identifier les déterminants de cette volatilité dans la divulgation non-financière, comme les informations relatives à la responsabilité sociétale de l'entreprise, et dans la qualité de l'information comptable divulguée, comme les informations portant sur la qualité des bénéfices.

Le concept de développement durable connaît un essor sans précédent depuis la publication du rapport Bruntland *Our Common Future* par la commission des Nations Unies sur l'environnement et le développement en 1987. Ce concept a pour objet de concilier le développement économique et social, la protection de l'environnement et la conservation des ressources naturelles. Transposé à l'entreprise, le développement durable s'est concrétisé dans la notion de *triple bottom line* (triple résultat) qui conduit à évaluer la performance des sociétés, non seulement en fonction de critères financiers, mais également en fonction de critères environnementaux et sociaux. Est alors évoquée la notion de responsabilité sociétale ou sociale de l'entreprise (Le Saout, 2006). Cette notion signifie qu'une entreprise doit non seulement se soucier de sa rentabilité et de sa croissance mais également de ses impacts environnementaux et sociaux. Plus précisément, la Responsabilité Sociétale de l'Entreprise se définit comme étant « l'intégration volontaire des préoccupations sociales et écologiques des entreprises à leurs activités commerciales et leurs relations avec toutes leurs parties prenantes internes et externes, (actionnaires, personnels, clients, fournisseurs et partenaires, collectivités humaines…) et ce afin de satisfaire pleinement aux obligations juridiques applicables et investir dans le capital humain et l'environnement » (Livre vert de la commission des Communautés Européennes – 18 juillet 2001). Le concept de responsabilité sociétale de l'Entreprise n'est pas un phénomène nouveau. Comme le signalent Ballet et de Bry (2001), la question de la morale des dirigeants et des codes de conduite remonte aux années trente sous la plume de Berle et Means (1932) ou encore Barnard (1938).

Selon Friedman (1970), la responsabilité sociétale de l'entreprise se limite à la maximisation du profit pour l'actionnaire (*Shareholder Theory*). En effet, l'accroissement du profit des entreprises bénéficierait directement aux acteurs internes de l'entreprise par la redistribution de la richesse créée et indirectement à la société dans son ensemble.

Cette vision n'est pas aussi réductrice qu'il y paraît et pourrait paraître légitime dans des conditions de fonctionnement d'une économie parfaitement concurrentielle. La définition proposée par la Communauté Européenne, comme de nombreuses autres, renvoie à la théorie des *stakeholders* développée à partir de l'ouvrage de Freeman (1984). Cette théorie a pour objet de proposer une tentative de théorie de la firme intégrant son environnement. La maximisation du profit ne suffit pas à elle-même, il faut également prendre en compte les intérêts des parties prenantes qui au sens large du terme correspondent à l'ensemble des individus en relation avec la firme. L'entreprise doit prendre en considération les externalités négatives qu'elle produit. La production de richesse doit être considérée comme une activité sociale.

Le regain d'intérêt pour la responsabilité sociétale des entreprises s'appuie sur la montée en puissance de l'investissement socialement responsable qui se traduit par le désir des investisseurs de connaître la destination de leur argent mais également l'utilité de leurs investissements (Le Saout et Buscot, 2009). Cette approche de l'investissement n'est pas nouvelle puisqu'un regard sur le passé nous indique que ces origines sont très anciennes. Celles-ci remontent aux textes fondateurs des principales religions. John Wesley, fondateur du mouvement Méthodiste, rappelait ainsi que l'emploi de l'argent était l'un des sujets les plus importants évoqué par les enseignements du Nouveau Testament. Il n'en demeure pas moins que depuis le début des années 2000, les encours vont croissants bien aidés en cela par la prise de conscience des milieux politiques comme en atteste la COP26 qui se déroule à l'heure où les lignes de cette introduction générale sont rédigées. De nombreuses lois et réglementations sont ainsi entrées en vigueur au cours de ces dernières années afin de réorienter les flux de capitaux vers des investissements durables, d'intégrer systématiquement la durabilité dans la gestion des risques et de favoriser la transparence dans les activités économiques et financières.

A titre d'exemple, nous pouvons citer la loi française du 17 août 2015 relative à la transition énergétique pour la croissance verte qui étend les obligations en matière de placements socialement responsables aux investisseurs institutionnels, la SFDR (*Sustainable Finance Disclosure Regulation*) de mars 2021 destinée à permettre aux investisseurs de comparer plus facilement les différentes stratégies d'investissement durable disponibles en établissant notamment des règles de transparence harmonisées quant à l'intégration des risques de durabilité , et des incidences négatives en matière de durabilité, la directive *Corporate Sustainability Reporting* qui permet d'étendre l'application de la divulgation non-financière aux grandes entreprises non cotées et aux PME cotées, et d'améliorer la qualité et la comparabilité des informations environnementales et sociales divulguées, et la taxonomie verte attendue en 2022 destinée à établir une classification des activités économiques permettant de déterminer celles qui peuvent être considérées comme « durables sur le plan environnemental » ou « vertes ». L'Union européenne vise ainsi à définir et à améliorer les réglementations pour placer la durabilité au cœur de l’union des marchés de capitaux de l’Union Européenne en établissant un plan d'action sur la croissance de la finance durable. En raison de la demande croissante des investisseurs pour l'analyse de développement durable et de la volonté de l’UE de l'intégrer dans la réglementation, les fonds conventionnels adoptent l'analyse ESG dans leur analyse de gestion des risques afin d'éviter et de contenir les effets négatifs de la crise (Gangi et Trotta, 2015 ; Mercedes Alda, 2020).

Aux États-Unis, *BlackRock* et *State Street Global advisors* (SSGA), deux des principaux cabinets de gestion d'actifs, ont souligné sur l'importance de la divulgation extra-financière et durable pour les sociétés cotées en bourse. Ils ont aussi recommandé de suivre les directives de *Sustainability Accounting Standards Board* (SASB). L’institut de la Gouvernance et la Responsabilisation a rapporté que 90 % des entreprises répertoriées dans l'indice S&P 500 publient désormais des rapports de développement durable contre moins de 20 % en 2011.

Tout ceci conduit à une forte augmentation de l'investissement socialement responsable et le développement d’instruments financiers en lien avec les principes de développement durable parmi lesquels nous pouvons citer les ETF répliquant les indices socialement responsables, les fonds *best in class* et *best in universe* ainsi que les instruments de dettes ESG dont les montants émis ne cessent de croître (obligations vertes, obligations durables, *sustainability linked bonds*…).

Étant donné que l'argument sur la nature de la relation entre la volatilité idiosyncrasique et les informations spécifiques à l'entreprise tient toujours, cela soulève des questions sur la direction de la relation entre la performance RSE de l'entreprise et la composante idiosyncrasique de la volatilité des actions. Les conclusions sont ambiguës. Par exemple, Luo et Bhattacharya (2009), Mishra et Modi (2012) et Brooks et Oikonomou (2018) trouvent une relation négative, mais Beccheti, Ciciretti et Hasan (2015) trouvent une relation positive.

Toutes les études précédentes présentent la relation entre la performance comme si elle était mécanique et existait naturellement comme la relation entre la volatilité, ou la performance, et les informations financières d’une entreprise, comme le niveau des bénéfices réalisés. L’information non financière de l’entreprise a été disponible depuis les années 80. La relation entre la RSE et la volatilité, ou la performance, est un phénomène très récent. Robertson (1976) a observé un changement de rapport de force entre les parties prenantes de différentes entreprises, comme les investisseurs, les clients et le public. Les droits des travailleurs ont été légalisés, et des discussions ont eu lieu pour améliorer l'état du travail et pour permettre aux employés de participer à la gestion. Néanmoins, des pays comme la France avaient déjà réglementé les informations destinées aux salariés à travers « Bilan social ». Autrement dit, le pilier social des facteurs ESG est établi dans les années 1970 parce que les informations liées aux conditions de travail étaient en quelque sorte accessibles aux investisseurs. La question écologique, par contre, est apparue tardivement dans les années 80 et a été cristallisée par Brundtland. Bien que l'établissement des lignes directrices de la *Global Reporting Initiative* en 1999 mettent en place les prémices de l'institutionnalisation des normes de la divulgation environnementale et social ou de la divulgation durable, avant cette année, ces normes étaient des normes de comportement (Larrinaga et Bebbington, 2021). En d'autres mots, des éléments de l'information financière ont été disponibles à l'univers des investisseurs. Si la relation est mécanique, la relation devra exister à partir du moment où des évaluations de la performance RSE seraient disponibles.

Au sein de ce chapitre 2, nous abordons l'impact de la responsabilité sociétale des entreprises sur la volatilité idiosyncrasique dans neuf pays européens sur la période 2003-2018. Nous souhaitons découvrir si la relation entre la responsabilité sociétale des entreprises (évaluée par sa notation ESG) et volatilité idiosyncrasique est mécanique ou un phénomène très récent, expliqué par un changement dans le comportement des investisseurs (UNEP Fi, 2019). Cette étude inclut des firmes cotées sur les marchés financiers de neuf pays Européens qui produisent plus de 70% du PIB de l'Europe. À partir des composantes ESG proposées par la base de données Refinitiv, nous calculons un indice global, pour la responsabilité environnementale et sociétale de l'entreprise (ES), et deux sous-indices, un pour l'environnement et un pour la société. Nous étendons notre recherche pour identifier les composantes ESG qui sont susceptibles d'affecter considérablement la volatilité idiosyncrasique.

De plus, nous cherchons à démontrer l'importance pratique de l'examen de l'impact de la performance ESG (Environnement, Sociale, Gouvernance) sur la volatilité idiosyncrasique des entreprises pays par pays afin de tenir compte et observer l'hétérogénéité entre les pays européens due à la différence du système légal ou développement économique. Cela nous permet de tirer profit cette hétérogénéité en identifiant les pays qui où la relation semble plus prononcée. Les études précédentes en Europe étudient cette relation au niveau continental sans tenir compte des différences entre les différents pays européens. Cai, Pan et Statman (2016) montrent que les variations des notations ESG entre les différents pays s'expliquent par les caractéristiques du pays, telles que le développement économique et le système politique. Ils documentent une relation positive entre les scores médians de RSE de toutes les entreprises et le développement économique, représenté par le revenu par habitant, et une relation négative entre les scores médians ESG dans un pays et une forte liberté civile et des droits politiques. Dans la même optique, Liang et Renneboog (2017) constatent que les origines juridiques du pays ont un fort impact sur la notation RSE de l'entreprise. Les scores RSE sont plus élevés dans les pays de droit civil que dans les pays de *common law*. Ils soutiennent également que l'effet de l'origine légale du pays sur les notations RSE est plus important que les autres attributs du pays ou de l'entreprise.

Notre troisième chapitre a trait l'effet de la qualité de l'information comptable, qui est considérée comme une information spécifique à la firme, sur la volatilité idiosyncrasique. L'objectif de ce dernier chapitre consiste à valider ou non la présence d'un impact significatif de la qualité des bénéfices sur le risque idiosyncrasique en France. Nous essayons de mettre en relief le caractère conditionnel, de cette relation, à l'environnement informationnel de l'entreprise. Nous cherchons également à mettre en exergue la réaction asymétrique de la volatilité idiosyncrasique vis-à-vis de la qualité de bénéfices, dans le sens où la détérioration de la gestion des (*accruals*) attiserait une réaction plus importante des rentabilités idiosyncrasiques négatives (*idiosyncratic downside volatility*). Notre étude porte sur les sociétés franaçaises cotées sur Euronext Paris. Afin de mener à bien notre recherche, nous avons retenu l'approche réalisée par Dechow et Dichev (2002) sur la qualité des bénéfices. Les bénéfices sont de haute qualité lorsqu'ils reflètent les flux de trésorerie passés, présents et futurs. C'est la définition la mieux adaptée aux besoins des analystes financiers. Les analystes trouvent des bénéfices de « haute » qualité lorsqu'ils reflètent les performances d'exploitation actuelles et futures de l'entreprise. Ils peuvent donc être utilisés pour évaluer la valeur de l'entreprise. Cependant, les flux de trésorerie réalisés, qui sont déclarés dans les états financiers, souffrent d'un problème de synchronisation et d'appariement, ce qui les rend moins informatifs pour les différentes parties prenantes, d'où l'utilisation des provisions pour fonds de roulement (*Accruals*). Nous utilisons les modèles des données de panel pour tester l'effet de la qualité de bénéfices sur la volatilité idiosyncrasique.

Les études sur la qualité des bénéfices attirent l'attention au sein de la recherche comptable dès le début des années 2000 à la suite de scandales financiers en Europe et aux USA (*Enron, Merrill Lynch, Peregrine Systems, WorldCom, AIG* pour citer les plus médiatiques) ont suscité l'importance de la qualité des rapports financiers, en particulier la qualité des bénéfices. Cependant, il n'existe pas une définition unique largement acceptée pour la qualité des bénéfices. Teets (2002) soutient que la qualité des revenus est un concept multidimensionnel. La façon dont il est aperçu dépend de la nature de l'information que l'intéressé recherche. Ces derniers peuvent être des gestionnaires, des auditeurs, des régulateurs ou des investisseurs. Le concept est conditionnel au contexte de la décision et du décideur.

Dans la mesure où la qualité des bénéfices est une information spécifique à l'entreprise, elle devrait avoir un impact sur la volatilité idiosyncrasique. La littérature établit qu'il existe une association négative entre la qualité des bénéfices et la volatilité totale ainsi que la volatilité idiosyncrasique du titre (Diamond et Verrecchia, 1991 ; Rajgopal et Venkatachalam ; 2011). De plus, l'environnement informationnel aurait un impact sur l'importance et la signification de la relation entre la volatilité idiosyncrasique et l'information financière, en général, ou la qualité financière, en particulier. Selon la théorie du Signal (Spence, 1973), l'entreprise tire de nombreux avantages en envoyant des signaux afin de se différencier des autres concurrents. Cependant, l'effet d'un certain signal peut être réduit lorsque d'autres signaux sont plus cohérents avec la juste valeur de l'entreprise (Christensen et Feltham, 2006). La littérature antérieure a mis en évidence l'effet de l'environnement informationnel sur la relation entre la volatilité idiosyncrasique et les différents aspects de l'information financière (Botosan, 1997 ; Aman, 2011 ; Kitagawa et Okuda, 2016).

Des théories ont été développées pour établir un lien entre la rentabilité et la volatilité du titre du titre, d'un côté, et la volatilité des rentabilités négatives, d'un autre côté. Elles supposent que les investisseurs considèrent des conditions de marché plus défavorables (Bawa et Lindenberg, 1977 ; Kahneman et Tversky, 1979 ; Gul, 1991). L'idée de la réaction asymétrique de l'investisseur aux pertes à la baisse et aux gains à la hausse a toujours été acceptée (Roy, 1952 ; Markowitz, 1959). Récemment, de nombreuses études discutent le rôle et du coût du risque du *downside* (systématique) dans la coupe transversale des rentabilités financières (Ang el al., 2006 ; Lettau et al., 2014, Bollerslev et al., 2021). Patton et Sheppard (2015) démontrent que la demi-variance négative réalisées est plus corrélées à la variance future du titre que la volatilité des rentabilités positives. En plus, ils trouvent que la variance des rentabilités négatives a un pouvoir prédictif de la variance totale et des demi-variances positive et négative. C'est pour cela que nous trouvons pertinent de tester l'effet de la qualité des bénéfices sur la volatilité des rentabilités idiosyncrasiques négatives.

En conclusion de cette compilation d'essais sur la volatilité idiosyncrasique en Europe, nous rappelons les différents résultats théoriques et empiriques obtenus, et ouvrons de nouvelles perspectives de recherche afin de compléter ces travaux.

# Chapter 1

# Idiosyncratic Risk in Europe: its common factor and the cross-sectional relation with returns[1]

[1] This chapter is based on the analyses of two articles:

-KHALED FAROUK SOLIMAN, A. et E. LE SAOUT, "The Idiosyncratic Volatility of European Stocks: Commonality and Effect on the Market Volatility."*10th International Conference of the Financial Engineering and Banking Society*, Lille, september 2021.

- KHALED FAROUK SOLIMAN, A. et E. LE SAOUT, "The idiosyncratic volatility in European markets: Evolution, cross-sectional relation with returns and How Common Could be The Idiosyncratic Volatility."*10th International Research Meeting in Business and Management*, Nice, july 2019.

## 1.1. Introduction

The relation between risk and return is fundamental in the financial world. Modern portfolio theory (Markowitz, 1952; Sharpe, 1964; Lintner, 1965) shows that stock volatility is composed of two types of risks: first, the systematic risk which is non-diversifiable and related to market volatility; and second, an idiosyncratic risk which is specific to the firm. Modern portfolio theory assumes that the investor can decrease or eliminate idiosyncratic risk through diversification. However, some studies have shown that idiosyncratic volatility has been the main component of stock and portfolio return volatilities (Goyal and Santa-Clara, 2001; Cotter, O'Sullivan, and Rossi, 2014; Nam, Khaksari and Kang, 2016). Modern portfolio theory assumes that the investor can diversify to decrease or eliminate idiosyncratic risk by constructing portfolios that include different stocks covering different sectors. The main advantage of diversification is that it reduces exposure to idiosyncratic risk without reducing the expected returns. Furthermore, there are many factors such as transaction costs (Constantinides, 1986; Uppal, 1993; Rowland, 1999), information costs (Merton, 1987; Brockman, Schutte and Yu, 2009), and investor characteristics (Barber and Odean, 1999, 2000, 2001; Liu, 2008; Malkiel and Xu, 2004) which might deter investors from holding a fully diversified portfolio. Recently, Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2016) proved the existence of a factor structure in the idiosyncratic volatility that is priced.

Thus, studying idiosyncratic risk is important because most investors and especially private investors (Goetzmann and Kumar, 2008) are exposed to this type of risk. Movements of idiosyncratic volatility and its relation with returns will affect their investment strategies. In addition, according to the theory of efficient markets, many portfolio managers lose interest in the active management of their portfolios. As a result, we have seen a shift towards passive portfolio management techniques, especially indexing. According to the modern portfolio theory, idiosyncratic volatility is not priced. Therefore, it is not considered by the portfolio managers. However, the idiosyncratic volatility is a risk that will actually be present and will continue to affect the market portfolio if not fully eliminated. In this study, we present a new and comprehensive method to study the aggregate (common) idiosyncratic volatility in the major European economies. In other words, we examine how the idiosyncratic risk could affect the most possible diversified portfolio in the market. Then, we discuss the relationship between the idiosyncratic risk and expected stock returns for firms listed on European stock markets. First of all, we explore the aggregate idiosyncratic volatility and its behavior presented in a sample of 15 European countries using multiple proxies for idiosyncratic volatility. Next, we examine the presence of a common factor in their aggregate idiosyncratic volatilities. Then, we explain how the European common idiosyncratic volatility (ECIV) is affecting each country's stock market portfolio volatility and to what extent the ECIV improves each country's market portfolio volatility predictions over a period of time. Finally, we examine as well the relation between idiosyncratic volatility and cross-section of returns and the determinants of the idiosyncratic risk premium.

This chapteris organized as follows. Section 2 discusses the state of the art of the idiosyncratic risk. It summarizes the main results and highlights three of the commonly used risk estimation measures: market portfolio volatility, average stock volatility, and three measures of idiosyncratic volatility. Section 3 presents the empirical analysis. Its first subsection focusses on the behavior idiosyncratic volatility, its common factor and some global risk measures. It provides evidence of the presence of European and regional common factor. The second subsection discusses the relationship between idiosyncratic risk and cross-section of returns and present under diversification proxies as determinants of the idiosyncratic risk premium. Finally, we conclude.

## 1.2. Analysis of idiosyncratic risk

Interests in the idiosyncratic volatility are increasing. Our study of idiosyncratic volatility begins with a review of the prior literature, highlighting the main results, followed by a presentation of the measures used as proxy global and idiosyncratic risks.

### 1.2.1. Main findings

This section discusses the main findings related to idiosyncratic volatility. We focus on firm specific risk in relation to modern portfolio theory and the strand of studies on the behavior of idiosyncratic volatility series. This section concludes with subsections discussing the identified relationships between idiosyncratic volatility and expected stock returns.

#### 1.2.1.1. Idiosyncratic risk in the Modern Portfolio Theory

The first studies on modern portfolio theory (Markowitz, 1952; Sharpe, 1964.; Lintner, 1965) differentiate between market, or systematic, risk and firm specific or idiosyncratic risk. These authors consider that the systematic risk should be priced and considered when estimating the required rate of return. It is represented by beta in the capital asset pricing model (CAPM). Moreover, an investor holding a market portfolio, which by definition is the most diversifiable, will bear only the market risk which cannot be eliminated through diversification. Since it is assumed that the idiosyncratic risk is eliminated by diversification, this should not affect the required return or the asset pricing. By definition, the idiosyncratic risk (volatility) is the difference between the stock return volatility and the systematic volatility. It is the part of the stock volatility which cannot be explained by the common risk factors. However, the concept of idiosyncratic volatility differs among different theories and perspectives. For example, in a valuation theory context, the firm specific risk is affected by firm characteristics (Malagon et al., 2015). On the other hand, the costly arbitrage theory considers that the idiosyncratic volatility reflects only the investor’s preferences. In this case, the idiosyncratic volatility is the stock specific risk and is not related to the firm’s characteristics.

The study of idiosyncratic risk was triggered by fourth main findings. First, the positive deterministic trend identified by Campbell, Lettau, Malkiel and Xu (2001) in the idiosyncratic volatility series in the United States stock market. Second, the fact that there are many reasons why investors are deterred from maintaining a well-diversified portfolio due to market characteristics (Constantinides, 1986; Merton, 1987; Uppal, 1993; Rowland, 1999; Brockman, Schutte and Yu, 2009), and investor characteristics (Barber and Odean, 1999, 2000, 2001; Liu, 2008; Malkiel and Xu, 2004). Third, the idiosyncratic risk puzzle proposed by Ang, Hodrick, Xing and Zhang (2006; 2009) based on their observation of a negative relation between idiosyncratic risk and stock returns for the United States market and 23 other developed markets. In other words, idiosyncratic risk is negatively priced. Recently, studies started to be interested in examining the existence of a common factor within idiosyncratic volatilities (Herskovic, Kelly, Lustig, and Van Nieuwerburgh, 2016; Nam, Khaksari and Kang, 2016; Caglayan, Xue and Zhang, 2020). Based on these four findings, we can identify four axes on which idiosyncratic volatility studies depend: behavior of the idiosyncratic volatility series and its estimation methods, the factors affecting idiosyncratic risk, the relation between the idiosyncratic risk and the required return, and the reasons for the negative relation between idiosyncratic risk and stock return.

#### 1.2.1.2. Idiosyncratic risk estimation and time series behavior

Initially, idiosyncratic risk was estimated as the standard deviation of the error term in the CAPM. However, the CAPM has several limitations. Many authors have tried to relax the model's assumptions such as the effect of taxes and dividends effect (Brenan, 1970), consideration of inflation and international assets (Stulz, 1981), or including an intertemporal dimension by relating the factors affecting consumption to the return on assets (Merton, 1973; Lucas, 1978; Breeden, 1979; Cox, Ingersoll and Ross; 1985). Malkiel and Xu (2002) tried to relax the perfectly diversified portfolio hypothesis. Campbell et al. (2001) developed a method to calculate firm idiosyncratic volatility without the need to estimate every firm's beta. Many studies employ the three-factor and five-factor models developed by Fama and French (1992, 2015) which are considered the most relevant asset pricing models.  In the three-factor model, in addition to the market return, a high book to market ratio suggests that the firm is a persistent poor earner relative to a low book to market ratio. In addition, small firms experience longer periods of poor earnings than do big firms. Thus, they propose that firm size and the book to market ratio represent the cross section of average returns. In the latest version of their multifactorial model, their five-factor model includes operating profitability and investment.

Debate on the behavior of idiosyncratic volatility started with Campbell et al. (2001) who provided evidence of a strong positive deterministic trend in idiosyncratic volatility in the United States stock market during the period of 1962-1997. They found also that firm level volatility accounted for the largest share of stock volatility and the largest share of the variation in stock volatility. Other authors such as Goyal and Santa Clara (2001), Malkiel and Xu (2004), Dennis and Strickland (2004), Irvine and Pontiff (2005), Fu (2009) and Abdoh and Varela (2017) have observed positive trends for the United States market. Guo and Savickas (2003) estimated idiosyncratic risk using the CAPM, the Fama and French three factor model and found that and increase in both cases. Fu (2009) shows that the idiosyncratic risk does not follow a random walk but is persistent. Other studies focus on the behavior of the average stock variance shows that it tends to increase (Whitelaw, 1994; Goyal, and Santa Clara, 2001; Guo and Savickas, 2003). Herskovic, Kelly, Lustig, and Van Nieuwerburgh (2016) confirm the existence of a positive trend in the idiosyncratic volatility of American companies, and found also that idiosyncratic volatilities across different industries show a substantial common variation. They argue that the common factor in the idiosyncratic volatility is priced[2]. While Herskovic and colleagues link common idiosyncratic volatility[3](CIV) to the income risk faced by households, Nam, Khaksari and Kang (2016) explain aggregate idiosyncratic volatility (AIV) time series behavior as a change in the price interaction among stocks. Caglayan, Xue, and Zhang (2020) show that stock market characteristics such as turnover, information disclosure, avoidance of investor uncertainty, and macroeconomic factors such as GDP growth, exchange rate stability, and foreign debt health, are determinants of the country level idiosyncratic volatility[4].

Several studies try to explain this positive trend. Xu and Malkiel (2003) and Dennis and Strickland (2004) explain it as due to an increase in institutional ownership, and although Kitagawa and Okuda (2016) do not discuss the trend in idiosyncratic volatility, they find a similar positive relation between idiosyncratic volatility and the foreign institutional ownership in the case of Japan. Both, Irvine and Pontiff (2009) and Abdoh and Varela (2017) suggest that increased product market competition is behind the increase in idiosyncratic volatility while Fink, Fink, Grullon and Weston (2010) observe a relation with the new listings. In a study of the Chinese stock market however, Nartea, Wu and Liu (2013) identify episodic behavior characterized by an autoregressive process of regime switches coinciding with reforms but do not observe a deterministic trend in idiosyncratic volatility. Similarly, Bekaert, Hodrick and Zhang (2012) find no evidence of an upward trend for 23 developed stock markets. This information is important for investors with undiversified portfolios. Brandt, Brav, Graham and Kumar (2010) studied United States stock markets and found that in 2003 that idiosyncratic volatility had dropped to below pre-1990 levels contradicting any evidence of a time trend during the 1962-1997 period. They point out that idiosyncratic volatility increases during attention-grabbing events and

---

[2] They document a negative relation between the exposure of the stock to common idiosyncratic volatility and the stock returns.

[3] We call it aggregate idiosyncratic volatility.

[4] They estimate country-level idiosyncratic volatility using the Morgan Stanley Capital International investable market indexes for each country as the dependent variable in the Fama and French three factor-model. The volatility of the model residuals are the country-level idiosyncratic volatility.

retail investor trading behaviors such as splitting, and is associated with increases in retail trading density. The rise in the idiosyncratic risk was an episodic phenomenon rather than a time trend. Nam, Khaksari, and Kang (2016) found a similar pattern, and suggested also that the price interaction which increases with the increase in the number of listed firms, has a positive relationship with the idiosyncratic volatility.

#### 1.2.1.3. The relation between idiosyncratic risk and returns

Due to its consequences for the portfolio investment strategy, the relation between idiosyncratic risk and stock returns has been strongly debated. According to financial theory, with higher the risk, the higher will be the return. However, there is no consensus on the direction of this relationship. Fama and MacBeth (1973) and Wei and Zhang (2005) reject the idea of a relation between idiosyncratic risk and the return. Similarly, Han and Lesmond (2011) and Fink, Fink and He (2012) find no association between idiosyncratic volatility and the expected return.[5] In a study of the MILA (Mercado Integrado Latino-Americano) markets, Beggrun, Lizarzaburu and Cardona (2016) show that the relation between idiosyncratic volatility and returns is non-existent.

However, Ang et al.'s (2006) seminal paper provides evidence of a negative relation between idiosyncratic risk and stock returns in the case of the US stock market. This result is counter intuitive and goes against the financial theory of higher risk accompanied by higher returns. Ang et al. used lagged idiosyncratic volatility, calculated by the Fama and French three-factor model, to proxy for idiosyncratic risk. Fu (2009) critiqued their work, arguing that the negative relation was due to the idiosyncratic volatility series properties. Fu maintains that the positive abnormal returns in months of high idiosyncratic volatility lead, in the case of small firms, to negative abnormal returns in the subsequent months. Thus, he shows that Ang et al.'s (2006) findings are driven by a subset of small firms. He proposed another method to estimate idiosyncratic risk, which is the expected idiosyncratic volatility, using the firm specific conditional volatilities derived from the EGARCH (Exponential Generalized Autoregressive Conditional Heteroscedastic) model. Using his method, he finds a positive relation between idiosyncratic risk and firm returns. Brockman

[5] Han and Lesmond (2011) argue that there is a liquidity bias inducing the lagged idiosyncratic volatility estimated using daily data. For Fink, Fink and He (2012), the positive relation between conditional idiosyncratic volatility found in Fu (2009) is induced by a forward looking bias resulting from use of contemporaneous data.

et al. (2020) replicated Fu's study for 57 countries and 21 years and also observed a positive significant relation. Several others confirm this positive relation between idiosyncratic volatility and returns (Merton, 1987; Malkiel and Xu, 2002). In the case of emerging markets, Nartea, Ward and Yao (2011) report a positive relation between idiosyncratic volatility and cross-sectional returns for Indonesia, Malaysia, Singapore and Thailand, while Malagon, Moreno and Rodriguez (2018) observe a positive relation between idiosyncratic risk and returns only during period of recession.

Ang et al. (2006) responded by extending their sample to include 22 developed markets in addition to the US stock markets. They found the same relation between idiosyncratic risk and the expected returns. Following this, several other studies observed a negative relation (Stambaugh et al., 2015; Gu, Kang and Xu, 2016; Zhong 2017). For example, for the case of China, an emerging market, Nartea, Wu and Liu (2013) document a negative relation and most other studies that use Ang et al.'s (2006) methodology also find a negative relation for other markets. This has resulted in a focus on this idiosyncratic volatility puzzle and attempts to explain it. Gu, Kang and Xu (2016) found that the negative relation between idiosyncratic risk and returns is much stronger and more persistent in stocks with high arbitrage limits. Stambaugh, Yu and Yuan (2015) and Cao and Han (2016) point to a conditional relation with mispricing. They suggest that the idiosyncratic risk-return relation is negative for overpriced stocks, but positive for under-priced stocks. Thus, they show that the negative relation is stronger than the positive relation and, consequently, that the observed relation is negative, on average.

### 1.2.2. Construction of risk measures

In this section we describe the methods used to estimate each risk measure considered in this paper. First, we compute the all share index volatility and the average stock volatility to proxy for global market risk. We estimate idiosyncratic volatility using two methods. First, we apply Fama and French's (1992, 2016) five-factor model and Carhart's (1997) momentum factor. Second, we compute the idiosyncratic volatility using principal component analysis.

#### 1.2.2.1. Global volatility measures

In this subsection, we compute the market portfolio volatility and average stock volatility as measures of the stock market global risk, and assess their co-movement with idiosyncratic volatility.

##### a) Portfolio volatility

We compute the market portfolio variance using daily data. The portfolio considered is the equally weighted index for all shares. We use daily data to calculate the market portfolio variance $V_{pt}$ for each month, based on the firms publicly traded on the stock market. We compute the monthly volatility of the portfolio as the square root of the portfolio variance multiplied by the square root of the number of trading days in a month:

$$V_{pt} = \sum_{d=1}^{D_t} r_{Pd}^2 + 2 \sum_{d=2}^{D_t} r_{Pd}\, r_{pd-1}$$

where $D_t$ is the number of days in the month *t* and $r_{pd}$ is the portfolio returns in day *d*.The second term on the right-hand side was proposed by French, Schwert and Stambaugh (1987) and adjusts for autocorrelation of daily returns.

##### b) Average stock volatility

We calculate the average stock variance as the arithmetic mean of the daily variance in the stock returns:

$$V_t = \frac{1}{N_t} \sum_{i=1}^{N_t} \left[ \sum_{d=1}^{D_t} r_{id}^2 + 2 \sum_{d=2}^{D_t} r_{id} r_{id-1} \right]$$

where $r_{id}$ is the return on the stock *i* on day *d* and $N_t$ is the number of stocks existing during the month *t*. It should be noted that this is not a strict variance measure because our expectations are not based on the de-meaned returns. In the case of stocks maintained over short periods, removing the mean is not important. The advantage of this approach is that it does not require calculation of the conditional mean for each stock; this is calculated for all the firms traded on the market. Finally, we calculate average stock volatility as the square root of the average stock variance multiplied by the square root of the number of trading days in the month.

#### 1.2.2.2. Estimation of idiosyncratic volatility estimation

As already mentioned, the idiosyncratic volatility can be estimated using a six-factor model (Fama and French, 1992, 2016; Carhart, 1997) or a three-factor model based on principal component analysis.

##### a) The realized idiosyncratic volatility

We can estimate the firm specific risk as the realized idiosyncratic volatility. We follow Ang et al. (2006, 2009) to estimate idiosyncratic volatility. For each month and each country, we regress the excess return on the stock for different daily Fama and French (1992, 2016) risk factors and Carhart's (1997) momentum factor. The model can be written as:

$$R_{it} - r_t = \alpha_{it} + \beta_{mi}(R_{mt} - r_t) + \beta_{SMBi} SMB_t + \beta_{HMLi}\, HML_t + \beta_{RMWi}\, MOM_t + \beta_{RMWi}\, RMW_t + \beta_{CMAi}\, CMA_t + \varepsilon_{it}$$

where $R_{it}$ is the return on the stock $i$ during the month t ; $r_t$is the risk free rate; $\alpha_{it}$is the intercept ; $\beta_{mi}$is the market coefficient; $R_{mt}$ is the value weighted European market return ; $\beta_{SMBi}$ is the size factor coefficient ; $SMB_t$ is the portfolio return small minus big ; $\beta_{HMLi}$is the book to market coefficient ; $HML_t$ is the difference between the portfolio return including the high book to market ratio firms and the low book to market ratio portfolio returns ; $MOM_t$ is the average return from high momentum portfolios minus the average return of low momentum portfolios; $RMW_t$ is the average return on robust operating profitability portfolios minus the average return on the two weak operating profitability portfolios; $CMA_t$is an investment factor estimated as the difference between the average return on the conservative investment portfolio and the average return on the aggressive investment portfolio; $\varepsilon_{it}$ is the residual. The realized idiosyncratic volatility is considered as the standard deviation of this residual. Since we use daily data, the standard deviation of the estimated residuals is also daily and is converted into a monthly standard deviation by multiplying the daily standard deviation by the square root of the number of trading days in the corresponding month.

##### b) Conditional idiosyncratic volatility (Expected)

To examine the relation between the expected idiosyncratic volatility and the expected stock returns, we need to take account of time-varying nature of the idiosyncratic volatility.

We use Fu's (2009) method and employ the EGARCH (p,q) model to estimate idiosyncratic volatility which we call conditional idiosyncratic volatility.

The ARCH (Autoregressive Conditional heteroskedasticity) model and its generalized models are recognized tools to model returns volatility. The ARCH models were initially developed by Engle (1982) and became important in the field of financial economics because they provide a systematic framework to model volatility. Their main advantage is that they allow joint modelling of variance and expected returns. The EGARCH model, proposed by Nelson (1991), has the same basic properties of the ARCH and GARCH (Bollersev, 1986, 1997) models in terms of clustering and fat tails. Thus, EGARCH (p,q) takes account of the leverage effect observed in the return volatility series. The EGARCH model that we use to estimate expected idiosyncratic volatility is written as follows:

$$R_{it} - r_t = \alpha_{it} + \beta_{mi}(R_{mt} - r_t) + \beta_{SMBi} SMB_t + \beta_{HMLi}\, HML_t\, \beta_{RMWi}\, MOM_t + \beta_{RMWi}\, RMW_t + \beta_{CMAi}\, CMA_t + \varepsilon_{it}$$

$$o\text{ù } \varepsilon_{it} \sim N(0, \sigma_{it})$$

$$ln\sigma_{it}^2 = \alpha_{it} + \sum_{i=1}^{p} b_{it}\, ln\sigma_{it-1} + \sum_{k=1}^{q} C_{ik} \left\{ \theta \left( \frac{\varepsilon_{it-k}}{\sigma_{it-k}} \right) + \gamma \left[ \left| \frac{\varepsilon_{it-k}}{\sigma_{it-k}} \right| - \sqrt{2 / \pi} \right] \right\}$$

The monthly returns are described according to a six-factor model (the Fama and French 5-factor model plus the momentum factor). The model residual, $\varepsilon_{it}$, follows a normal distribution with zero mean and $\sigma_{it}^2$ variance. The variance depends on past residual variances for the (p) period and the return shocks for the (q) period, as shown in the formula. We tested several EGARCH (p,q) specifications on different stocks, chosen randomly from our sample. The best specification is often based on the Akaike Information Criterion (AIC). In accordance with Brockman et al. (2009), no EGARCH setting has the least AIC to dominate the others. Therefore, we follow Brockman et al. and use the EGARCH model (3, 1).

### c) Principal component-idiosyncratic volatility

Principal component-idiosyncratic volatility (PCIV) is estimated using a return factor model; this is a purely statistical method since its factor $F_t$ estimations rely on the first three principal components[6] of the cross section of returns within the same day. The model is described as:

$$R_{it} - r_t = \alpha_{it} + \beta_{Fi} F_t + \upsilon_{it}$$

where $R_{it}$ is the return of the stock *i* during the month t; $r_t$ is the risk-free rate; $\alpha_{it}$ is the intercept; $\beta_{Fi}$ is the component loadings; $F_t$ are the first three principal components in the cross section of returns of all firms in the sample; $\upsilon_{it}$ is the residual.

**d) Common idiosyncratic volatilities**

At the country level, we consider the cross-sectional average idiosyncratic volatility as the country's AIV. We then consider the first principal component of the cross-section of all countries' AIV as the ECIV. Based on correlations[7] between countries' AIVs, we identify three groups of countries and estimate the first principal component of the AIVs of the countries within each group.

## 1.3. Empirical analysis

We dedicate this section to discuss all results. It contains three subsections. First, we present our sample, data and our risk proxies that we estimate and use in our empirical tests. The second subsection focuses on characteristics of the common component of the idiosyncratic volatility. We highlight its relation with national stock exchanges portfolio volatility. In the last subsection, we discuss the pricing of the idiosyncratic risk before identifying its determinants of its premium.

### 1.3.1. Sample and different risk measures

We present in this subsection our sample and data that we collect and use in different tests throughout the study. Then, present summary statistics and time series behavior of risk proxies, global and idiosyncratic.

[6] Since the first principal component accounts for most of the variance, roughly 10%, we estimate a factor model using only this component. We report the cross-section average of idiosyncratic volatility based on this model (see figure 2).

[7] These are discussed in section 3.3. Dynamic correlation structure.

#### 1.3.1.1. Data

We extract from Bloomberg market data from January 1st 2000 to June 31st 2018. We collect daily stock prices, return indexes, market values, number of shares outstanding, trading volumes, dividends, and book-to-market ratios. All values are in euros. Fama and French factors are obtained from the Ken French website. Our sample is composed of 6545 firms listed on 15 European stock markets: Austria, Belgium, Finland, France, Germany, Greece, Italy, Latvia, Lithuania, Netherlands, Portugal, Spain, Sweden, Switzerland, and the United Kingdom.

Table 1 reports the average monthly firm returns. These firm returns are used to calculate the excess returns. Its last column shows considerable variation among countries in terms of market capitalization. In December 2018, the biggest stock market in Europe was the United Kingdom London Stock Exchange with 2.7 trillion euros of market capitalization. The smallest market is the Riga Stock Exchange with market capitalization of 1 billion euros.

**Table 1: Summary statistics**

| Country | Firms Number | Return% | SD% | MAX% | MIN% | Cap |
|---|---|---|---|---|---|---|
| Austria | 83 | 1.06 | 12.30 | 15.17 | -12.57 | 135 717 |
| Belgium | 347 | 1.12 | 16.96 | 14.19 | -12.60 | 394 408 |
| Finland | 151 | 0.79 | 10.55 | 17.36 | -14.68 | 142 961 |
| France | 1 188 | 1.56 | 8.72 | 19.59 | -15.60 | 2 086 940 |
| Germany | 611 | 1.30 | 8.07 | 18.85 | -18.18 | 2 038 038 |
| Greece | 189 | 1.49 | 13.30 | 29.31 | -25.39 | 45590 |
| Italy | 521 | 0.40 | 8.43 | 17.47 | -16.21 | 529110 |
| Latvia | 27 | 3.44 | 7.30 | 32.87 | -21 | 1004 |
| Lithuania | 34 | 1.54 | 5.79 | 24.24 | -17.20 | 3571 |
| Netherlands | 147 | 1.08 | 14.13 | 17.56 | -15.78 | 991086 |
| Portugal | 59 | 1.85 | 8.46 | 18.80 | -17.28 | 68099 |
| Spain | 257 | 1.39 | 7.58 | 15.80 | -14.30 | 800754 |
| Sweden | 886 | 1.31 | 19.94 | 20 | -17.80 | 504978 |
| Switzerland | 543 | 0.86 | 9.17 | 13.44 | -10.91 | 1519367 |
| UK | 1 502 | 0.88 | 14.17 | 1.356 | -1.44 | 2720240 |

Note: Table 1 shows summary statistics for the firms we are including in our sample. We report the number of firms per country, as well as the cross-sectional average, standard deviation, the maximum and the minimum of firms returns per country. All values of returns are in percentage. The last column (Cap) presents the market capitalization for each stock exchange in December 2018. Market capitalization values are in millions of euros.

As for control variables, since there are certain deterrents to holding a fully diversified portfolio (Malkiel and Xu, 2004; Dennis and Strickland, 2004), and idiosyncratic volatility persists in the case of funds (Vidal-Gracia and Vidal, 2014), it is important to study the relation between idiosyncratic volatility and expected returns. firm size is measured by total stock value. In the Bloomberg database, this is the variable current market cap. For each month, we average the daily market capitalization. The book-to-market ratio is the inverse of the market-to-book ratio (price to book ratio in Bloomberg). To control for liquidity, we use stock turnover and the coefficient of variation of stock turnover (Chordia, Subrahmanyam and Anshuman, 2001). The monthly turnover, TURN, is the number of stocks traded, divided by the number of shares outstanding. The other measure for liquidity is the coefficient of the variation in turnover in the previous 10 months. To control for the momentum effect, we introduce a measure for past returns. Past returns (PR) (-2,-7), are the compounded past returns for each stock from month t-2 to month t-7 where t is the current month. We exclude the month t-1 returns to avoid a bid-ask bounce for the most frequently traded. Table 2 presents the control variable summary statistics for each country.

**Table 2: Control variables summary statistics**

| | **Log TURN** | | | **Log CVTURN** | | | **Log B/M** | | | **SIZE** | | | **PR[-2,-7]** | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **MEAN** | **SD** | **MEDIAN** | **MEAN** | **SD** | **MEDIAN** | **MEAN** | **SD** | **MEDIAN** | **MEAN** | **SD** | **MEDIAN** | **MEAN** | **SD** | **MEDIAN** |
| **Austria** | 5.705 | 0.979 | 5.738 | 0.689 | 0.417 | 0.786 | -4.892 | 1.138 | -4.938 | 5.494 | 0.574 | 5.572 | 0.003 | 0.028 | 0.001 |
| **Belgium** | 6.044 | 0.754 | 6.028 | 0.784 | 0.39 | 0.812 | -0.274 | 0.458 | -0.243 | 5.119 | 0.607 | 5.156 | 0.001 | 0.031 | 0 |
| **Denmark** | 6.866 | 0.899 | 6.838 | 0.599 | 0.431 | 0.63 | -5.856 | 1.086 | -5.931 | 4.934 | 0.7 | 4.98 | 0.002 | 0.039 | 0 |
| **Finland** | 6.795 | 0.927 | 6.77 | 0.591 | 0.431 | 0.608 | -0.546 | 0.521 | -0.517 | 5.182 | 0.612 | 5.219 | 0.001 | 0.041 | 0.001 |
| **France** | 6.012 | 0.997 | 6.098 | 0.638 | 0.407 | 0.619 | -0.439 | 0.516 | -0.421 | 4.803 | 0.67 | 4.834 | 0.001 | 0.039 | 0 |
| **Germany** | 5.733 | 1.051 | 5.748 | 0.734 | 0.386 | 0.724 | -0.416 | 0.608 | -0.399 | 4.583 | 0.772 | 4.6 | -0.001 | 0.036 | 0 |
| **Greece** | 6.067 | 1.591 | 6.147 | 0.375 | 0.433 | 0.432 | -0.122 | 0.722 | -0.138 | 3.678 | 0.994 | 3.732 | -0.001 | 0.069 | -0.001 |
| **Italy** | 7.373 | 0.97 | 7.289 | 0.643 | 0.391 | 0.651 | -0.345 | 0.64 | -0.291 | 5.767 | 0.619 | 5.736 | -0.003 | 0.044 | -0.003 |
| **Latvia** | 5.611 | 1.44 | 5.587 | 0.235 | 0.475 | 0.28 | 0.524 | 0.558 | 0.455 | 1.085 | 1.033 | 1.357 | 0.003 | 0.029 | 0 |
| **Lithuania** | 5.118 | 1.416 | 5.197 | 0.31 | 0.465 | 0.352 | -0.188 | 0.605 | -0.261 | 2.976 | 0.85 | 3.098 | 0.003 | 0.034 | 0 |
| **Netherlands** | 6.965 | 0.847 | 6.981 | 0.819 | 0.393 | 0.826 | -0.661 | 0.531 | -0.635 | 5.952 | 0.648 | 5.994 | 0.001 | 0.041 | 0.001 |
| **Portugal** | 5.939 | 1.183 | 6.001 | 0.476 | 0.426 | 0.488 | -0.213 | 0.67 | -0.193 | 4.454 | 0.669 | 4.52 | -0.001 | 0.034 | 0 |
| **Slovenia** | 4.93 | 1.558 | 4.992 | 0.351 | 0.427 | 0.371 | -3.914 | 1.574 | -3.867 | 3.292 | 0.731 | 3.42 | 0.001 | 0.022 | 0 |
| **Spain** | 7.231 | 0.986 | 7.184 | 0.669 | 0.423 | 0.678 | -0.473 | 0.587 | -0.477 | 6.066 | 0.619 | 6.101 | 0 | 0.035 | 0 |
| **Sweden** | 7.03 | 0.833 | 7.005 | 0.709 | 0.412 | 0.724 | -0.629 | 0.529 | -0.631 | 7.679 | 0.746 | 7.691 | 0 | 0.047 | 0 |
| **Switzerland** | 6.699 | 0.738 | 6.684 | 0.905 | 0.376 | 0.901 | -0.534 | 0.433 | -0.498 | 1.791 | 0.215 | 1.821 | 0.001 | 0.032 | 0.001 |
| **UK** | 7.246 | 0.908 | 7.231 | 0.645 | 0.4 | 0.651 | -0.695 | 0.597 | -0.675 | 5.194 | 0.698 | 5.201 | 0 | 0.041 | 0 |

Note: Our sample covers 6545 firms listed on 15 European stock exchange. The firm size is measured by total stock value. In the Bloomberg database, this is the variable current market cap. For each month, we calculate the natural logarithm of the average the daily market capitalization. The book-to-market ratio is natural logarithm of the inverse of the market-to-book ratio (price to book ratio in Bloomberg). The monthly turnover, TURN, is the number of stocks traded, divided by the number of shares outstanding. Then, we calculate its natural logarithm. Log CVTURN is the coefficient of variation in turnover in the previous 10 months. Past returns (PR) (-2,-7), are the compounded past returns for each stock from month t-2 to month t-7 where t is the current month. We exclude the month t-1 returns to avoid a bid-ask bounce for the most frequently traded.

We next estimate the correlations among the control factors, and between them and the realized or conditional idiosyncratic volatility, for each country. The correlations matrix is provided in the appendix (Table A.1). The cross-sectional correlations between the idiosyncratic volatility measures and the control variables are very weak for all countries. We find negative, but weak correlations between realized idiosyncratic volatility and expected returns, for almost all the sample except France, Greece, Latvia, Lithuania and Slovenia. Thus, correlations between conditional idiosyncratic volatility and expected returns are positive for the sample. This is consistent with Ang et al. (2006) in the case of realized idiosyncratic volatility, and with Fu (2009) in the case of conditional idiosyncratic volatility. However, the correlations between the idiosyncratic volatility measures and turnover are high relative to the other correlations. We would highlight that the correlation between realized, or conditional, idiosyncratic volatilities and market capitalization is always negative.

#### 1.3.1.2. Behavior of different measures of risk

First, we present the results for the all-shares market index portfolio volatility and the average stock volatility. Panel A of Table 3 reports the summary statistics of the square root of the all-shares market index portfolio variance. Greece has the highest portfolio volatility with an average standard deviation over the period of 4.4%; Germany has the lowest portfolio volatility with an average standard deviation of 1.1% over the period. Regarding the average stock volatility, the United Kingdom is ranked highest and Latvia is ranked lowest over the period of study.

In line with the modern portfolio theory (Markowitz, 1952; Sharpe, 1964; Lintner, 1965), market portfolio volatility is less than average stock volatility and idiosyncratic volatility, in each country. Graphs in figure A.1, figure A.2 and figure A.3, in the appendix, show that movements of volatility measures are synchronized and countercyclical, especially during recessions and crisis. This suggests the existence of a common component driving idiosyncratic volatility and moving in harmony with market portfolio volatility. In addition, in line with CLMX (2001) and Malkiel and Xu (2003), the aggregate idiosyncratic volatility is the main component of average stock volatility. This true regardless for the three proxies of idiosyncratic volatility. This suggests that idiosyncratic volatility is the main driver of stock volatility and could have an impact on the market portfolio volatility.

**Table 3: Risk measures summary statistics**

| | Panel A: Market Portfolio Volatility | | | Panel B: Average Stock Volatility | | | Panel C: RIV | | | Panel D: CIV | | | Panel E: PCIV | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **Mean%** | **SD%** | **Median%** | **Mean%** | **SD%** | **Median%** | **Mean%** | **SD%** | **Median%** | **Mean%** | **SD%** | **Median%** | **Mean%** | **SD%** | **Median%** |
| Austria | 1.6 | 0.6 | 1.4 | 4.8 | 0.7 | 4.7 | 4.54 | 0.6 | 4.45 | 4.56 | 0.62 | 4.49 | 4.13 | 2.09 | 4.48 |
| Belgium | 1.5 | 0.7 | 1.3 | 5.6 | 0.8 | 5.5 | 5.3 | 0.72 | 5.18 | 5.31 | 0.72 | 5.19 | 4.96 | 2.13 | 5 |
| Finland | 2.6 | 1.1 | 2.3 | 7.8 | 1.1 | 7.6 | 7.28 | 0.92 | 7.16 | 7.28 | 0.92 | 7.17 | 6.74 | 2.19 | 6.55 |
| France | 1.7 | 0.8 | 1.5 | 6.5 | 0.9 | 6.3 | 6.18 | 3.13 | 5.99 | 6.2 | 3.12 | 6.22 | 5.88 | 2.88 | 5.92 |
| Germany | 1.1 | 0.6 | 1 | 6.1 | 1.9 | 6.2 | 6 | 5.28 | 6.1 | 8.53 | 1.07 | 8.42 | 5.72 | 5 | 5.81 |
| Greece | 4.4 | 2.3 | 3.9 | 11.2 | 1.6 | 11.1 | 10.85 | 1.67 | 10.83 | 10.88 | 1.7 | 10.85 | 9.36 | 4.22 | 9.13 |
| Italy | 3.3 | 1.3 | 3 | 7.5 | 1.3 | 7.4 | 6.87 | 0.97 | 6.8 | 6.89 | 0.98 | 6.83 | 6.3 | 1.94 | 6.21 |
| Latvia | 1.5 | 0.5 | 1.5 | 4.7 | 1.1 | 4.7 | 4.63 | 1.1 | 4.56 | 4.71 | 1.07 | 4.62 | 4.12 | 2.55 | 4.23 |
| Lithuania | 1.9 | 0.9 | 1.6 | 5.5 | 1.5 | 5.3 | 5.41 | 1.39 | 5.23 | 5.44 | 1.39 | 5.25 | 4.68 | 2.14 | 4.76 |
| Netherlands | 2.7 | 1.2 | 2.4 | 7.4 | 1.3 | 7.1 | 6.73 | 1.04 | 6.53 | 6.73 | 1.04 | 6.53 | 6.21 | 2.47 | 5.9 |
| Portugal | 2.1 | 0.8 | 2 | 6 | 0.9 | 6.1 | 5.7 | 0.7 | 5.8 | 5.72 | 0.73 | 5.78 | 5.14 | 2.83 | 5.29 |
| Spain | 2.5 | 1 | 2.4 | 5.9 | 1 | 5.9 | 5.36 | 0.71 | 5.31 | 5.44 | 0.72 | 5.4 | 4.83 | 2.62 | 5.04 |
| Sweden | 2.9 | 1.3 | 2.6 | 8.5 | 1.3 | 8.2 | 8.05 | 1 | 7.76 | 8.06 | 0.99 | 7.76 | 7.49 | 2.9 | 7.22 |
| Switzerland | 2 | 0.7 | 1.8 | 6.1 | 0.9 | 5.9 | 5.73 | 2.22 | 5.62 | 5.05 | 0.39 | 5.62 | 5.28 | 2.01 | 5.22 |
| UK | 2.6 | 0.9 | 2.4 | 6.8 | 0.9 | 6.6 | 6.41 | 2.59 | 6.32 | 6.41 | 0.57 | 1.38 | 5.68 | 2.53 | 5.62 |

Note: This table shows summary statistics for 15 European countries. We report the cross-sectional mean, standard deviation and median (in percentage) for the market portfolio volatility (Panel A), the average stock volatility (Panel B), the realized idiosyncratic volatility (Panel C), the conditional idiosyncratic volatility (Panel D) and the principal component idiosyncratic volatility (Panel E). The average stock volatility is the square root of the arithmetic mean of the stock variance defined in section 2.2.1 multiplied by the square root of the number of trading days in the month. The realized idiosyncratic volatility is standard deviation of residuals of a market model in which the common risk factors are Fama and French (2016) five factors and the momentum factor (Carhart, 1997). To compute for monthly realized idiosyncratic volatility, we multiply the standard deviation of idiosyncratic returns over the month multiplied by the number of trading days in a month. The principal component idiosyncratic volatility (PCIV) of each firm is the monthly standard deviation of the residual estimated using an asset pricing model in which common risk factors are defined as the first three principal components in the sample stocks excess returns. The risk-free rate used to compute excess returns is the US one-month T-bill rate.

In panels C, D and E of table 3, we report respectively summary statistics for realized idiosyncratic volatility (RIV), the conditional idiosyncratic volatility (CIV) and the principal component idiosyncratic volatility (PCIV). First, we compute statistics for every firm series, and then average them at country level to obtain the average for each country. In general, each country's CIV is slightly higher than RIV, and PCIV always less than both. . The country rankings based on market portfolio volatility are close to their rankings based on idiosyncratic volatility. On average over the whole period, Austria has the lowest RIV (4.54%), and Greece has the highest RIV (10.85%). The same observation is found in the case of CIV, while Greece exhibits the highest idiosyncratic volatility (10.88%); Austria is characterized by low values of idiosyncratic volatility (4.56%). Greece also has the highest PCIV (10.88), and Latvia has PCIV (4.12). AIV, estimated on the basis of RIV, CIV and PCIV, are higher than the market portfolio volatility values for all countries which demonstrates the benefits derived from diversification.

Figure A.1 depicts the RIV behavior, while figures A.2 and A.3 focus respectively on the CIV and the PCIV. We add market portfolio volatility and average stock volatility to the idiosyncratic volatility measures in the graphs. We observe four peaks which occur for all the volatility measures we use. The first occurs in the early 2000s, and refers to the dot com bubble period and the telecoms crash. Also, in 2001, European countries suffered inflation due to imbalances following introduction of the Euro in 1999. The second peak corresponds to the emergence in October 2008 of the global financial crisis which pushed the developed economies into recession. The third peak refers to the August 2010 sovereign debt crisis. Following this, nearly all the countries in the sample experienced volatility increases. The fourth peak occurred in 2016 following the results of the United Kingdom referendum resulting into its withdrawal from the European Union.

By inspecting the graphs of figures A.1, A.2 and A.3, three stylized facts drawn our attention because of their generality as they are found across all countries. First, idiosyncratic volatility, whether RIV or CIV or PCIV, accounts for around 90% of stock total volatility. Second, it exists a substantial co-movement between each market's AIV and their market portfolio volatility. This points to the importance of re-assessing the correlation between AIV and market portfolio volatility in order to understand how idiosyncratic volatility affects market portfolio volatility at national level. Third, the existence of a synchronous movement of average cross-sectional idiosyncratic volatility across European countries. Estimates and tests in the next subsection are based on PCIV which we believe captures the main components accounting for the common variance among stocks.

### 1.3.2. Common component in the idiosyncratic risk

This subsection focuses on the common component of the idiosyncratic volatility. We examine the relationship between the country' AIV and its market portfolio volatility. Then, we estimate correlations between countries' AIVs allowing us to identify three groups of countries. Next, we test the presence of European common component of the idiosyncratic risk and the existence of a common component within each group. These principal components are used to investigate idiosyncratic volatility spillovers between AIVs. Finally, we test the significance of the effect of the European common factor of the AIVs on the national markets' portfolio volatilities.

#### 1.3.2.1. Dynamic correlation structure

The observed co-movements of idiosyncratic volatility and market portfolio volatility allows computation of the correlation between these two measures to understand the interactions between these risk measures.

First, we compute the correlation between idiosyncratic volatility and market portfolio volatility over the whole period analyzed. They are very weak and close to zero for all countries. However, we can see that the correlation between each country's idiosyncratic volatility and market volatility is not constant and is changing over time. We prefer to use a rolling correlation to investigate the relationship between idiosyncratic volatility and market volatility.

We choose a rolling correlation with a 12-month observation window. The dynamic correlations between idiosyncratic volatility and market volatility[8] are not constant. Figure A.4 provides the correlations for all the countries considered and shows that they are positive during recessions, and reach extremely high levels (over 85%). This is consistent with the results from prior studies. In periods of economic expansion (or at least periods of no economic distress), we expect the correlation between idiosyncratic volatility and market volatility to decrease to very low levels or even to disappear. We find that the correlations not only decrease to zero but also become significantly negative (-0.6). This explains why we observe a weak or no correlation between idiosyncratic volatility and market volatility over the sample period.

The observed negative rolling correlations are due to the market portfolio trend turning positive prior to a recession and before idiosyncratic volatility turns positive. Since recession is a systematic event rather than firm specific, it is reasonable to expect market

[8] To check the robustness of our results, we use an alternative measure of systematic risk, the volatility index or VIX, and compute the dynamic correlations between cross-sectional average idiosyncratic volatility for France, Germany and the United Kingdom. This results in stronger correlations than in the case of the stock market portfolio. However, similar to stock market volatility, the correlations between idiosyncratic volatility and the VIX have strong negative coefficients. This confirms the existence of a substantial dynamic correlation between the aggregate idiosyncratic risk and systematic risk.

portfolio volatility to rise faster before a recession compared to average cross-section idiosyncratic volatility. This holds for all the countries in our sample. Before recessions, the correlations become negative; after the recession becomes established and recognized officially by all the agents, the correlations become highly positive.

We examine the distribution of the dynamic correlations to confirm the presence of a non-null correlation between idiosyncratic volatility and market volatility, whether negative or positive. To scrutinize those correlations, figure A.5 reports the distribution of the correlations between individual idiosyncratic volatility and market portfolio volatility. We observe numerous moderate correlations (positive and negative) over the whole period although the occurrence of a non-null correlation is more probable than a weak or no correlation.

#### 1.3.2.2. Common component in aggregate idiosyncratic volatility

Another stylized fact, that is confirmed, is the synchronous movement of average cross-sectional idiosyncratic volatilities across European countries. The correlations between idiosyncratic volatilities across Europe are very high. This observation holds for the three estimation methods – RIV, CIV and PCIV. We observe very persistent co-movements among some groups of countries. Out of the 15 countries in the sample, 7 have correlations above 60%. However, not all correlations between countries are strong. Table 4 reports the correlations between countries' AIVs estimated using the three-factor principal component model.

By clustering the correlations hierarchically, we can identify three groups of countries which show strong correlations. The first group includes France, Germany, Sweden, Switzerland, Belgium and the Netherlands which are among the biggest economies in the sample. The second group includes Italy, Portugal, Spain and the United Kingdom. It contains mainly countries of sovereign debt crisis. The third group includes Austria, Greece, Latvia and Lithuania. Figure A.6 depicts this clustering.

To investigate the existence of common component among countries' AIVs, we perform principal component analysis for all AIVs. We repeat the analysis to extract principal components for groups 1, 2 and 3 to identify the interactions between the first principal component in each group and possible spill-over effects. Table 5 reports the results of the principal component analysis. For all countries, we find that the first three principal components explain 80% of the variance. While the first principal component of the first group explains 84% of the total variance among the countries within that group, the proportion of the variance is relatively smaller for the second and third groups (73% and 62% respectively). These results explain and confirm the existence of substantial co-movement between European countries' aggregate idiosyncratic volatilities that we observe in figure A.3.

**Table 4: AIV correlations among European Countries**

| Correlations | Aust | Bel | Fin | Fra | Ger | Grc | Itl | Lat | Lit | Neth | Por | Sp | Swe | Swit | UK |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Austria | 1 | | | | | | | | | | | | | | |
| Belgium | 0.337 | 1 | | | | | | | | | | | | | |
| Finland | 0.37 | 0.824 | 1 | | | | | | | | | | | | |
| France | 0.176 | 0.876 | 0.74 | 1 | | | | | | | | | | | |
| Germany | 0.014 | 0.741 | 0.555 | 0.881 | 1 | | | | | | | | | | |
| Greece | 0.371 | 0.122 | 0.078 | -0.147 | -0.177 | 1 | | | | | | | | | |
| Italy | 0.294 | 0.479 | 0.55 | 0.249 | -0.047 | 0.432 | 1 | | | | | | | | |
| Latvia | 0.341 | 0.008 | -0.122 | -0.111 | -0.03 | 0.557 | 0.04 | 1 | | | | | | | |
| Lithuania | 0.526 | 0.272 | 0.144 | 0.143 | 0.192 | 0.474 | 0.058 | 0.689 | 1 | | | | | | |
| Netherlands | 0.229 | 0.91 | 0.856 | 0.864 | 0.733 | 0.088 | 0.51 | -0.053 | 0.165 | 1 | | | | | |
| Portugal | 0.244 | 0.388 | 0.496 | 0.221 | -0.074 | 0.221 | 0.735 | -0.148 | -0.105 | 0.403 | 1 | | | | |
| Spain | 0.489 | 0.584 | 0.624 | 0.373 | 0.118 | 0.305 | 0.697 | -0.046 | 0.068 | 0.526 | 0.604 | 1 | | | |
| Sweden | 0.165 | 0.858 | 0.851 | 0.877 | 0.732 | -0.096 | 0.417 | -0.218 | 0.054 | 0.885 | 0.351 | 0.511 | 1 | | |
| Switzerland | 0.32 | 0.894 | 0.795 | 0.859 | 0.712 | 0.103 | 0.494 | 0.077 | 0.344 | 0.891 | 0.356 | 0.496 | 0.863 | 1 | |
| UK | 0.626 | 0.616 | 0.625 | 0.414 | 0.145 | 0.385 | 0.664 | 0.24 | 0.446 | 0.559 | 0.517 | 0.659 | 0.48 | 0.633 | 1 |

Note: This table shows times series averages of annually Pearson correlations coefficients of 15 European countries' aggregate idiosyncratic volatility. The aggregate idiosyncratic volatility (AIV) is defined as the cross-sectional average of the principal component idiosyncratic volatility (PCIV) of firms listed on the national stock market exchange in each country. The PCIV of each firm is the monthly standard deviation of the residual estimated using an asset pricing model in which common risk factors are defined as the first three principal components in the sample stocks excess returns. The risk-free rate used to compute excess returns is the US one-month T-bill rate.

### Table 5: PCA results for European countries' AIV

| Panel A: The sample | | | |
|---|---|---|---|
| **All Countries** | **PC1** | **PC2** | **PC3** |
| Standard Deviation | 2.716 | 1.703 | 1.431 |
| Proportion of Variance | 0.492 | 0.193 | 0.136 |
| Cumulative Proportion | 0.492 | 0.685 | 0.822 |
| **Panel B: Group 1** | | | |
| **Group1** | **PC1** | **PC2** | **PC3** |
| Standard Deviation | 2.435 | 0.719 | 0.432 |
| Proportion of Variance | 0.847 | 0.074 | 0.027 |
| Cumulative Proportion | 0.847 | 0.921 | 0.947 |
| **Panel C: Group 2** | | | |
| **Group2** | **PC1** | **PC2** | **PC3** |
| Standard Deviation | 1.715 | 0.709 | 0.571 |
| Proportion of Variance | 0.736 | 0.126 | 0.082 |
| Cumulative Proportion | 0.736 | 0.861 | 0.943 |
| **Panel D: Group 3** | | | |
| **Group3** | **PC1** | **PC2** | **PC3** |
| Standard Deviation | 1.58 | 0.84 | 0.735 |
| Proportion of Variance | 0.624 | 0.177 | 0.135 |
| Cumulative Proportion | 0.624 | 0.8 | 0.935 |

Note: In this table, we report the principal component analysis (PCA) results for aggregate idiosyncratic volatilities (AIV). In each panel we present the first three principal components. Panel A presents results when all AIVs are included. The European common idiosyncratic volatility (ECIV) is the first component in panel A. The results of PCA of group 1, group 2 and group3 are presented in Panels B, C and D respectively. The composition of groups 1, 2and 3 is based on Spearman correlations between the AIVs. The first group includes France, Germany, Sweden, Switzerland, Belgium and the Netherlands which are among the biggest economies in the sample. The second group includes Italy, Portugal, Spain and the United Kingdom. It contains mainly countries of sovereign debt crisis. The third group includes Austria, Greece, Latvia and Lithuania.

#### 1.3.2.3. Idiosyncratic volatility spillovers

Having confirmed the existence of significant synchronous movements between the European idiosyncratic volatilities, we explore possible idiosyncratic volatility spillovers among these groups. In other words, we are interested in possible interdependence among the principal components and the volatility of the three groups. We estimate a vector autoregression (VAR) model for the first principal component of each group. In the first model, we regress the first principal component of the group of stable economies, the first group, on its lagged values and the lagged values of the first principal component of the second group, that includes countries suffering from debt problems. In the second model, we use the common idiosyncratic volatility of the second group, proxied by the first principal component of the second group's idiosyncratic volatility, as our dependent variables. Independent variables are lagged values of this latter and the lagged values of the common idiosyncratic volatility of the first group. Concerning the third and the fourth models, we replicate the same steps using the common idiosyncratic volatilities of the first and the third groups. Table 6 presents models' results. Before fitting the model, we test series stationarity. All the three first components of the different groups are non-stationary. Therefore, we include the series of each group principal component in first difference form. In the first model the dependent variable is the first principal component of group 1, and the lagged values of the first component of group 2 has a significant effect at the 3rd, 6th and 9th lags. Note that the coefficient of the 6th lag of group 2 is negative.

In the second model, the dependent variable is the first principal component of the second group, we find the coefficient of 8th lag of the first group principal component is statistically significant and negative. To test for causality, we report the p-values of the Granger causality test for each model. The results show a causality relation between the first principal component of the first group and the first principal component of the second group. It confirms the existence of spillover effects between the AIVs of the group 1 and group2.

In model 3, the first component of the third group has negative significant coefficients at the 4th and the 5th lags. However, the Granger causality test shows the absence of causality. The first group's principal component has negative significant coefficients at the 1st, 4th and 8th lags. Since the Granger causality test p-value is less than 1%, we can say that a causality relation exists.

**Table 6: Spillover Effects (VAR models' results)**

| **Panel A - Model 1 : PC1 ~PC1 +PC2** | | | | |
|---|---|---|---|---|
| **Independent Variable** | **estimate** | **std.error** | **statistic** | **p.value** |
| PC grp1 lag1 | -0.706 | 0.134 | -5.284 | 0 |
| PC grp 2 lag 3 | 0.27 | 0.16 | 1.687 | 0.093 |
| PC grp 1 lag 4 | -0.334 | 0.159 | -2.096 | 0.037 |
| PC grp 2 lag 6 | -0.288 | 0.162 | -1.777 | 0.077 |
| PC grp1 lag 8 | -0.344 | 0.154 | -2.238 | 0.026 |
| PC grp 2 lag 9 | 0.434 | 0.153 | 2.834 | 0.005 |
| PC grp2 lag 10 | 0.39 | 0.131 | 2.984 | 0.003 |
| Granger Causality pvalue | | | | 0.0043 |

| **Panel C - Model 3 : PC1 ~PC1 +PC3** | | | | |
|---|---|---|---|---|
| **Independent Variable** | **estimate** | **std.error** | **statistic** | **p.value** |
| PC grp1 lag 1 | -0.527 | 0.094 | -5.596 | 0 |
| PC grp1 lag 2 | -0.203 | 0.103 | -1.978 | 0.049 |
| PC grp3 lag 4 | -0.267 | 0.15 | -1.782 | 0.076 |
| PC grp3 lag 5 | -0.286 | 0.151 | -1.902 | 0.059 |
| PC grp1 lag 8 | -0.301 | 0.094 | -3.219 | 0.002 |
| Granger Causality pvalue | | | | 0.3617 |

| Panel B - Model 2: PC2 ~PC1 +PC2 | | | | |
|---|---|---|---|---|
| **Independent Variable** | **estimate** | **std.error** | **statistic** | **p.value** |
| PC grp2 lag 1 | -0.536 | 0.118 | -4.529 | 0 |
| PC grp2 lag 2 | -0.316 | 0.138 | -2.282 | 0.024 |
| PC grp1 lag 8 | -0.388 | 0.139 | -2.795 | 0.006 |
| PC grp2 lag 8 | 0.244 | 0.143 | 1.704 | 0.09 |
| PC grp2 lag 9 | 0.334 | 0.138 | 2.414 | 0.017 |
| PC grp2 lag 10 | 0.23 | 0.118 | 1.949 | 0.053 |
| Granger Causality pvalue | | | | 0.0022 |

| Panel D - Model 3 : PC3 ~PC1 +PC3 | | | | |
|---|---|---|---|---|
| **Independent Variable** | **Estimate** | **std.error** | **statistic** | **p.value** |
| PC grp1 lag 1 | -0.141 | 0.057 | -2.456 | 0.015 |
| PC grp3 lag 1 | -0.421 | 0.083 | -5.06 | 0 |
| PC grp3 lag 2 | -0.269 | 0.09 | -3.006 | 0.003 |
| PC grp1 lag 4 | -0.113 | 0.063 | -1.775 | 0.077 |
| PC grp3 lag 4 | -0.205 | 0.091 | -2.246 | 0.026 |
| PC grp3 lag 5 | -0.193 | 0.092 | -2.108 | 0.036 |
| PC grp1 lag 8 | -0.152 | 0.057 | -2.668 | 0.008 |
| Granger Causality pvalue | | | | 0.0054 |

Note: In table , we report the results of VAR models estimated in subsection 3.2.3 to test for spillover effects between the first principal components of the aggregate idiosyncratic volatilities within each grup of countries which is composed on the basis of spearman correlations. In addition, we present Granger causality test p-values for every VAR model estimated. In model 1, the first principal component of the AIVs of group 1 is regressed on its lagged values and on the lagged values of the first principal component of AIVs of group 2. In model 2, the dependent variable is the first principal component of AIVs of group 2 and the independent variables are its lagged values and the lagged values of the first principal component of AIVs of group 1. Estimation of VAR models for first principal components of group 1 and group 3 have been done same as model 1 and 2.

Therefore, we prove the existence of spillover effect. The first two groups have substantial interdependence and  a causality relation between their common idiosyncratic volatilities. Whereas the effect of the second group of countries on the idiosyncratic volatility of the first group is positive and stronger, the impact of the idiosyncratic volatility of the first group on the second group's idiosyncratic volatility is negative. These results support the existence of common components of idiosyncratic volatility in clustered of countries, and show that existence of considerable interference and contagion effect between idiosyncratic volatilities of these clusters.

#### 1.3.2.4. Predicting market portfolio volatility

After providing evidence of a common component in countries' AIVs, we need to examine the capacity of the ECIV to predict each country's market portfolio volatility. We focus on the effect of the first principal component of countries' AIV on the market volatility of each country.

The main tools are the VAR model and the Granger causality test. The results are reported in the table A.1 in the appendix. For most of our sample countries the principal component of the countries' AIV has a significant effect on national stock market volatility. However, the national market volatility has a significant effect on predicting

ECIV in the cases of Belgium, Finland, France, Germany, and Italy. We observe that the second and the third lags of the ECIV affect 12 out of the 15 stock market volatilities. These results confirm the effect of ECIV on each country's market portfolio volatilities.

We can also forecast domestic market volatility using the fitted VAR model for each country, for the last four months in our time period. the green line in figure A.6 presents real market portfolio volatility and the forecast values of market portfolio volatility using the convenient VAR setting for each country. The yellow and red lines are respectively the upper and lower bounds of the confidence interval. The graphs in figure A.7 show that in the majority of cases, the model forecasts are close to the realized market volatility values. These results show that it is useful for portfolio managers to include the European common component in their risk assessment process, if they are adopting a passive portfolio strategy, especially indexing the idiosyncratic risk premium and its determinants.

## 1.3.3. Idiosyncratic risk premium and its determinants

Having proven that the idiosyncratic risk has a principal component that affect national markets' portfolio volatilities, we proceed to test the pricing of the idiosyncratic risk in the cross-section of returns. In this last subsection, we focus on two proxies for the idiosyncratic volatility that are widely used, the realized idiosyncratic volatility (Ang. et al., 2006; 2009) and the conditional idiosyncratic volatility (Fu, 2009). After using Fama and MacBeth (1973) cross-sectional regressions to test the significance of the relation between the idiosyncratic risk expected returns, we estimate an annual premium for the idiosyncratic risk. Then, we test the relevance of under-diversification proxies in explaining the idiosyncratic risk premium.

### 1.3.3.1. Pricing of the idiosyncratic risk

The cross-section regressions are the main tool we use to determine the sign and the magnitude of the relation between idiosyncratic risk and expected returns. To control for autocorrelation, we perform cross-section regression, following the Fama-MacBeth approach. We regress the monthly excess returns on the five variables discussed in Section 3.1.1: beta, firm size, book-to-market ratio, stock turnover, coefficient of variation in share turnover, and past returns. We include proxies for idiosyncratic volatility. We first add lagged realized idiosyncratic volatility, then we add lagged conditional idiosyncratic volatility derived from the EGARCH (3,1) model. Finally, we test the idiosyncratic volatility coefficient for each type of idiosyncratic volatility to check whether idiosyncratic risk is negatively or positively related to the expected return.

Multiple idiosyncratic risk studies adopt a portfolio approach to study the relation between idiosyncratic risk and the expected returns (Ang et al., 2006, 2009; Stambaugh et al., 2015; Malagon et al., 2018). These works observe a variation in the returns in addition to a variation in idiosyncratic volatility. The problem with this type of approach is that it assumes that the idiosyncratic risk is totally wiped by diversification. Consequently, the estimated idiosyncratic volatility will be less than the average of the stock idiosyncratic volatilities. Fu (2009) criticized portfolio-based studies for this reason. We use Fu's approach and estimate cross-section regressions where monthly expected returns are regressed on the idiosyncratic risk in line with Fama and French (1992). We then average the coefficient estimates from these monthly regressions and construct $t$-test statistics following Fama and MacBeth (1973). The monthly cross-section regressions are run as follows:

$$R_{i\omega t} = \gamma_{0\omega t} + \sum_{k=1}^{K} \gamma_{k\omega t} X_{ki\omega t} + \eta_{i\omega t} \; i = 1,2,\ldots N, \omega = 1,2,\ldots M, t = 1,2,\ldots T$$

where $R_{i\omega t}$ is the return from stock i in country $\omega$ during the month; $\gamma_{k\omega t}$ are the coefficients of the explanatory variables; $X_{ki\omega t}$ are the explanatory variables for the cross-section expected returns: Beta, firm value, book-to-market ratio, past returns, stock turnover, coefficient of variation of stock turnover; we also add either conditional idiosyncratic volatility or lagged realized idiosyncratic volatility. $\eta_{i\omega t}$ is the regression residual ; N is the total number of stocks ; M is the total number of countries in the sample ; T is the maximum number of months that defer from stock to stock. We control for potential bias due to cross-section correlations among residuals. Fama and MacBeth (1973) test for statistical significance by averaging the coefficient estimates ( $\gamma_{k\omega t}$) from the monthly regressions. The Fama and MacBeth coefficient of the explanatory variables and its variance are as follows:

$$\hat{\gamma}_{k\omega} = \frac{1}{T} \sum_{t=1}^{T} \hat{\gamma}_{k\omega t} \quad (7)$$

$$Var\ (\hat{\gamma}_{k\omega}) = \frac{\sum_{t=1}^{T} \quad (\hat{\gamma}_{k\omega t} - \hat{\gamma}_{k\omega})}{T(T-1)} \tag{8}$$

and the t-statistic of the explanatory variable is:

$$t \ = \ \frac{\hat{\gamma}_{k\omega}}{\sqrt{\frac{\sqrt{Var\ (\hat{\gamma}_{k\omega})}}{T}}}$$

We perform this regression at country level. We test the relation between idiosyncratic risk and expected returns, at the level of all fifteen European countries. Although we initially include beta in our estimations, we remove it because we find a flat relation between beta and the returns.

Table 7 reports the cross-section regression results for lagged realized idiosyncratic volatility and lagged expected idiosyncratic volatility. Panel A shows that, for 9 of the 15 countries, the realized idiosyncratic volatility coefficients is negative – which is consistent with Ang et al.'s (2006) findings. However, the negative coefficients are significant only for Italy and Greece. The positive relation between cross-section expected returns and realized idiosyncratic volatility at a 1% and 5% significance levels, respectively, for the Sweden and UK cases is quite striking.

Panel B shows that almost all coefficients of conditional idiosyncratic volatility are positive with the exceptions of Lithuania and Switzerland which have negative, but not significant coefficients. Consistent with Fu's (2009) and Brockman et al. (2009, 2020) findings, 9 out of the 15 countries have the expected positive and statistically significant idiosyncratic volatility coefficients. Most of coefficients are statistically significant at the 1% level, but for the UK they are significant at the 5% level. The highest coefficient is 3.98 (Greece) and the lowest coefficient is -0.14 (Lithuania).

At the sample level, the slope of the average conditional idiosyncratic volatility coefficient is 0.48 and the expected idiosyncratic volatility standard deviation is 1.04%. Thus, an increase of 1 standard deviation in a stock lead to a monthly increase in the expected returns of 0.48*1.04%=0.51%.[9] These results are consistent with Fu (2009) and Brockman et al. (2009, 2020). Note, also, the highly statistical positive relation between

[9] If we exclude Greece, the increase in the expected returns following an increase of 1 standard deviation is 0.267 * 1% = 0.27%.

past returns and expected returns, which is evidence of a strong momentum effect in European stock markets.

**Table 7: Cross-sectional regressions**

| Country | *Log TURN* | *Log CVTURN* | *PR(-2,-7)* | *Log B/M* | *Log Size* | *RIV* |
|---|---|---|---|---|---|---|
| **Panel A : Fama and MacBeth cross-sectional regressions for Realized Idiosyncratic Volatility** | | | | | | |
| Austria | 0.26* | -0.29 | 0.37*** | 0.21* | -0.09*** | -0.07 |
| Belgium | 0.47*** | -0.45** | 0.38*** | 0.08 | -0.28*** | 0.03 |
| Finland | 0.48*** | -0.24* | 0.34*** | -0.14 | -0.26*** | 0.03 |
| France | 0.41 | -0.41 | 0.41*** | -0.15 | -0.38** | 0.21 |
| Germany | 0.81 | -0.07 | 0.50*** | -0.86 | -0.022** | -0.5 |
| Greece | 0.35*** | -0.38* | 0.4*** | 0.33*** | -0.26*** | -0.142*** |
| Italy | 0.012*** | -0.5*** | 0.34*** | -0.06 | -0.56*** | -0.096*** |
| Latvia | 0.28 | -0.59 | 0.49*** | 0.011 | 0.11 | -0.43 |
| Lithuania | 0.02 | 0.013 | 0.30*** | -0.51 | 0.66 | -0.402 |
| Netherlands | 0.36*** | -0.65*** | 0.36*** | 0.22 | -0.21*** | 0.029 |
| Portugal | 0.58*** | -0.24 | 0.38*** | 0.27 | -0.39 | -0.019 |
| Spain | 0.073 | 0.061 | 0.30*** | -0.12 | -0.047 | -6.661 |
| Sweden | 0.69*** | -0.85*** | 0.36*** | -0.17*** | -0.21*** | 0.125*** |
| Switzerland | 0.62** | -0.36*** | 0.34*** | -0.11 | -0.08* | -0.103 |
| UK | 0.02 | 0.13 | 0.12*** | -0.04 | 0.02 | 0.042* |
| **Panel B : Fama and MacBeth cross-sectional regressions for Conditional Idiosyncratic Volatility** | | | | | | |
| **Country** | ***Log TURN*** | ***Log CVTURN*** | ***PR(-2,-7)*** | ***Log B/M*** | ***Log Size*** | ***CIV*** |
| Austria | 0.02 | -0.32 | 0.369*** | 0.09 | -0.09 | 0.173*** |
| Belgium | 0.36*** | -0.52*** | 0.374*** | 0.15 | -0.24*** | 0.23*** |
| Finland | 0.35*** | -0.13 | 0.33*** | -0.12 | -0.2*** | 0.23*** |
| France | 0.4 | -0.4 | 0.41*** | -0.151 | -0.38*** | 0.212 |
| Germany | 0.35 | -0.064 | 0.51*** | -0.74 | -0.0134 | 0.9*** |
| Greece | 0.19* | -0.39* | 0.4*** | 0.24* | -0.1 | 3.99*** |
| Italy | 0.74*** | -0.34** | 0.34*** | -0.11 | -0.27*** | 0.615*** |
| Latvia | -0.81 | -0.116 | 0.49*** | -0.58 | -0.84 | 0.039 |
| Lithuania | 0.0182 | 0.236 | 0.28*** | -0.44 | 0.93 | -0.15 |
| Netherlands | 0.05 | -0.12 | 0.32*** | 0.03 | -0.07 | 0.141 |
| Portugal | 0.59*** | -0.27 | 0.39*** | 0.34 | -0.36 | 0.077 |
| Spain | 0.36*** | -0.7*** | 0.34*** | -0.19 | -0.15*** | 0.39*** |
| Sweden | 0.59*** | -0.71*** | 0.36*** | -0.12* | -0.08** | 0.399*** |
| Switzerland | -0.05 | -0.44 | 0.33*** | -0.1 | 0.09 | -0.089 |
| UK | 0.01 | 0.1 | 0.11*** | -0.036 | 0.03 | 0.0313* |

Note: In this table, we report Fama and MacBeth cross-sectional regressions' results per country. Our sample covers 6545 firms listed on 15 European stock exchange. The realized idiosyncratic volatility is the monthly standard deviation of residuals of the regression of daily excess returns on European Fama and French five risk factors and Carhart momentum factor. The conditional idiosyncratic volatility is the monthly standard deviation of residuals of an EGARCH (3,1) model. Common risk factors are added to the mean equation. We regress daily excess returns on European Fama and French five risk factors and Carhart momentum factor. The firm size is measured by total stock value. In the Bloomberg database, this is the variable current market cap. For each month, we calculate the natural logarithm of the average the daily market capitalization. The book-to-market ratio is natural logarithm of the inverse of the market-to-book ratio (price to book ratio in Bloomberg). The monthly turnover, TURN, is the number of stocks traded, divided by the number of shares outstanding. Then, we calculate its natural logarithm. Log CVTURN is the coefficient of variation in turnover in the previous 10 months. Past returns (PR) (-2,-7), are the compounded past returns for each stock from month t-2 to month t-7 where t is the current month. We exclude the month t-1 returns to avoid a bid-ask bounce for the most frequently traded.

#### 1.3.3.2. Under-diversification proxies as determinants of idiosyncratic risk

Since we have evidence showing that idiosyncratic volatility is priced, we investigate the idiosyncratic risk premium. We adopt a trading strategy which involves going long on the portfolio that includes stocks with the highest idiosyncratic volatility and going short on the portfolio that contains stocks with low idiosyncratic volatility.

For each country, we construct 10 portfolios, sorted according to their idiosyncratic volatility measures (realized or conditional).[10] The portfolios are rebalanced at the beginning of each month. Table 8 presents the portfolio returns and the returns from going long on the 10th portfolio and short on the 1st portfolio. While in panel A portfolios are sorted on the basis of the realized idiosyncratic volatility, portfolios are sorted according to the conditional idiosyncratic volatility in panel B. For each country, we observe increased returns associated with an increase in the level of idiosyncratic volatility. Also, the returns in column "10-1", are positive and statistically significant for all the countries in the sample regardless of whether we use the realized or the conditional idiosyncratic volatility. Note, also, that the portfolios sorted on realized idiosyncratic volatility generate higher returns than those sorted on conditional idiosyncratic volatility, which means that these portfolios are not identical. We would highlight that the countries where there is a strong relation between firm idiosyncratic volatility and cross-section average idiosyncratic volatility, tend to show a lower idiosyncratic volatility premium.

We need to test for factors affecting the idiosyncratic volatility premium. The hypothesis we test in this subsection is that factors reflecting the level of diversification in the market have a substantial influence on the idiosyncratic volatility premium. The factors are grouped into two categories: information costs and investor characteristics.

We use panel data analysis to test the relation between under diversification proxies and the idiosyncratic risk premium. We estimate the following panel data regression:

$$IdioPr_{i\tau} = \alpha + \beta_{SMB}SMB_{\tau} + \beta_{HML}HML_{\tau} + \beta_{MOM}MOM_{\tau} + \beta_{AIV}AIV_{\omega,\tau} + \beta_{AFE}AFE_{\omega,\tau} + \beta_{Inst\_Own}Inst\_own_{\omega,\tau} + \beta_{TURN}TURN_{\omega,\tau} + \beta_{FDI}FDI_{\omega,\tau} + \beta_{GDPk}GDPk_{\omega,\tau} + \varepsilon_{i,t}$$

[10] For the case of realized idiosyncratic volatility, we sort portfolios based on lagged idiosyncratic volatility.

Where $\alpha$ is the intercept; $SMB$, $HML$and $MOM$ are those used in equation 3; $AIV$is the aggregate idiosyncratic volatility of country $\omega$, it is either Avgvol or CAvgvol for realized or conditional idiosyncratic volatility respectively; $AFE$ is earnings absolute forecast error; $Inst\_Own$ is the variation of the portion of capital held by institutional investors ; $TURN$ is computed as the cross-sectional average of the stock turnover for all the firms listed on the market ; $FDI$ is the amount of foreign direct investment ; $GDPk$ is the GDP per capita represents the wealth of the investors in the market.

**Table 8: The Idiosyncratic volatility premium**

| **Panel A : Realized Idiosyncratic Volatility** | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| **Country** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **10(-)1** |
| Austria | 0.090% | 0.035% | 0.431% | 0.353% | 0.557% | 0.928% | 1.485% | 1.963% | 2.748% | 2.105% | 2.022%*** |
| Belgium | 0.351% | 0.854% | 0.546% | 1.031% | 0.702% | 0.724% | 0.556% | 1.050% | 2.012% | 2.445% | 2.093%*** |
| Denmark | -0.077% | 0.392% | 0.329% | 0.950% | 0.715% | 0.804% | 1.229% | 1.494% | 1.645% | 2.905% | 3.012%*** |
| Finland | 0.218% | 0.378% | 0.537% | 0.748% | 0.386% | 0.547% | 0.849% | 0.935% | 1.007% | 1.156% | 1.082%*** |
| France | 0.036% | -0.117% | 1.093% | 1.039% | 0.906% | 1.290% | 1.641% | 1.880% | 2.074% | 3.217% | 3.145%*** |
| Germany | 0.010% | 0.012% | 0.102% | 0.322% | 0.219% | 0.395% | 0.683% | 1.176% | 1.811% | 3.953% | 3.944%*** |
| Greece | -0.371% | -0.587% | -1.093% | -0.675% | -0.482% | 0.486% | 0.421% | 1.134% | 1.954% | 3.002% | 3.358%*** |
| Italy | -0.487% | -0.653% | -0.528% | -0.516% | -0.279% | -0.102% | -0.076% | 0.412% | 1.361% | 3.184% | 3.724%*** |
| Latvia | -0.148% | -0.590% | 0.354% | 1.833% | 3.736% | 4.111% | 4.424% | 4.365% | 4.502% | 4.502% | 4.741%*** |
| Lithuania | -0.651% | -0.761% | -0.026% | 0.320% | 0.942% | 1.109% | 2.304% | 2.497% | 3.460% | 4.762% | 5.473%*** |
| Netherlands | 0.153% | 0.489% | 0.506% | 0.832% | 0.698% | 0.754% | 0.675% | 0.608% | 0.765% | 1.158% | 0.909%*** |
| Portugal | 0.115% | -0.131% | 0.493% | 0.352% | 0.342% | 0.662% | 0.076% | 0.655% | 1.184% | 1.184% | 1.042%*** |
| Slovenia | -0.096% | 0.178% | -0.122% | 0.219% | 0.099% | 0.360% | 1.051% | 1.461% | 1.450% | 1.418% | 1.461%*** |
| Spain | 0.014% | 0.551% | 0.629% | 0.426% | 0.373% | 0.485% | 0.639% | 0.922% | 1.262% | 3.135% | 3.122%*** |
| Sweden | 0.476% | 0.703% | 0.704% | 0.903% | 0.786% | 0.987% | 0.875% | 1.102% | 0.743% | 1.967% | 1.574%*** |
| Switzerland | 0.316% | 0.207% | 0.276% | 0.300% | 0.357% | 0.705% | 0.829% | 0.970% | 1.103% | 1.067% | 0.813%*** |
| United Kingdom | -0.227% | -0.303% | -0.072% | 0.297% | 0.579% | 0.807% | 0.977% | 1.338% | 1.795% | 3.167% | 3.370%*** |
| **Panel B : Conditional Idiosyncratic Volatility** | | | | | | | | | | | |
| **Country** | **1** | **2** | **3** | **4** | **5** | **6** | **7** | **8** | **9** | **10** | **10(-)1** |
| Austria | 0.061% | 0.042% | 0.095% | 0.310% | 0.223% | 0.687% | 0.855% | 0.960% | 0.613% | 0.888% | 0.815%*** |
| Belgium | 0.235% | 0.842% | 0.691% | 0.920% | 0.840% | 0.562% | 0.644% | 0.655% | 0.748% | 1.407% | 1.172%*** |
| Denmark | -0.027% | 0.335% | 0.485% | 0.762% | 0.834% | 0.769% | 0.991% | 1.069% | 0.838% | 1.296% | 1.315%*** |
| Finland | 0.135% | 0.351% | 0.422% | 0.751% | 0.643% | 0.236% | 0.449% | 0.808% | 0.591% | 0.751% | 0.622%*** |
| France | 0.014% | -0.176% | 0.260% | 0.960% | 0.929% | 0.741% | 0.979% | 1.318% | 1.060% | 1.273% | 1.200%*** |
| Germany | 0.133% | 0.320% | 0.481% | 0.437% | 0.842% | 0.600% | 0.818% | 1.046% | 0.747% | 3.347% | 3.198%*** |
| Greece | -0.342% | -0.603% | -1.000% | -1.075% | -0.754% | -0.813% | 0.033% | -0.060% | -0.522% | 0.780% | 1.087%*** |
| Italy | -0.505% | -0.524% | -0.714% | -0.490% | -0.519% | -0.266% | -0.232% | -0.485% | -0.371% | 0.571% | 1.105%*** |
| Latvia | -0.117% | -0.131% | -0.335% | -0.553% | -0.628% | 0.320% | 0.245% | 1.213% | 0.561% | 1.886% | 1.981%*** |
| Lithuania | -0.724% | -0.716% | -0.071% | 0.093% | 0.658% | 0.702% | 1.798% | 2.196% | 1.570% | 0.884% | 1.597%*** |
| Netherlands | 0.111% | 0.620% | 0.558% | 0.715% | 0.841% | 0.591% | 0.763% | 0.572% | 0.744% | 0.746% | 0.561%*** |
| Portugal | 0.038% | -0.099% | -0.259% | 0.227% | 0.281% | 0.055% | 0.283% | 0.477% | 0.646% | 0.651% | 0.613%*** |
| Slovenia | -0.082% | -0.114% | -0.009% | 0.209% | 0.028% | -0.162% | 0.171% | 0.325% | 0.058% | 0.304% | 0.372%*** |
| Spain | 0.017% | 0.042% | 0.690% | 0.400% | 0.508% | 0.235% | 0.362% | 0.747% | 0.612% | 0.754% | 0.737%*** |
| Sweden | 0.507% | 0.685% | 0.754% | 0.743% | 0.728% | 1.089% | 0.743% | 0.791% | 0.837% | 0.519% | 0.104%*** |
| Switzerland | 0.583% | 1.298% | 0.960% | 0.832% | 0.881% | 0.841% | 0.718% | 0.623% | 0.839% | 0.710% | 0.102%*** |
| United Kingdom | -0.194% | -0.308% | -0.215% | 0.090% | 0.346% | 0.677% | 0.777% | 0.818% | 0.478% | 0.717% | 0.860%*** |

Note: Table 8 presents the portfolio returns and the returns from going long on the 10th portfolio and short on the 1st portfolio. While in panel A portfolios are sorted on the basis of the realized idiosyncratic volatility, portfolios are sorted according to the conditional idiosyncratic volatility in panel B. The 10th portfolio includes firms with highest idiosyncratic risk. The 1st portfolio contains stocks associated with the lowest idiosyncratic volatility level.

We estimate models 1 and 3 using pooled ordinary least squares, and estimate models 2 and 4 using two random effects, The standard errors are robust to for heteroscedasticity. We follow Petersen (2009) and adjust the standard errors using two-way clustering, by both country (individual effect) and month (time effect).

We add institutional ownership to proxy for investor characteristics. Institutional investors have more financial wealth and more financial knowledge than individual investors. This variable represents the rate of change in the proportion of shares outstanding in institutional investor's total market. It is calculated as the value of the outstanding shares held by institutional investors, divided by the sum of the market capitalization of all the listed firms in the stock market. The turnover variable proxies for investor tolerance. It is computed as the cross-sectional average of the stock turnover for all the firms listed on the market.

An increase in this variable denotes a more risk tolerant investors. GDP per capita represents the wealth of the investors in the market. Foreign direct investment proxy is for the presence of foreign investors in the market. For the information costs category, we compute earnings' absolute forecast error, following Veldkamp and Van Niewerburgh (2008) who propose it as a proxy for access to market information. It is the absolute value of ratio of the difference between realized earnings and forecasted earnings to values forecasted earnings. If there is more publicly available information and its cost is low, this allows more precise estimates of firm earnings.

SMB, HML and MOM are used as control variables. We also include average idiosyncratic volatility as a control variable because of the presence of commonality in the market idiosyncratic volatility, which could have a substantial effect on the idiosyncratic volatility premium. Table 9 reports the results for the four models estimated. Panel A presents the results for models 1 and 2 which include realized idiosyncratic volatility as the dependent variable. Panel B presents the results for models 3 and 4 which include conditional idiosyncratic volatility as the dependent variable.

Models 1 and 2 for realized idiosyncratic volatility, show a significant effect of both investor characteristics and market information costs on the realized idiosyncratic volatility premium. In Model 1 (Model 2), the Absolute Forecast Error (AFE) variable is significantly positive. An increase of 1% in the AFE leads to an increase of 2.56% (2.12%) in the realized idiosyncratic volatility premium. This means that if information is costly or unavailable, the experts cannot precisely predict earnings, which leads to an increase in the idiosyncratic volatility premium. This is confirmed, also, for investor's distinctive characteristics. A change in institutional investor ownership has a negative effect, statistically significant at the 10% level, on the realized idiosyncratic volatility premium.

If the rate of the change in institutional ownership increases by 1%, the idiosyncratic volatility premium decreases by -2.308% (-2.312%). This means that if institutional investors decide to hold more stocks, the realized idiosyncratic volatility premium decreases. The proxy for risk tolerance, market average turnover, also has a strong positive relation with the idiosyncratic volatility premium. The market turnover coefficient is 1.618% (1.543%). suggesting that a 1% increase in turnover increases the idiosyncratic volatility premium by 1.62% (1.54%). The relation between foreign direct investment and idiosyncratic volatility is negative. The slope of foreign direct investment, which is -0.005 (-0.006), is statically significant, but still very weak. An increase of 1% percent in foreign direct investment flows decreases the idiosyncratic volatility premium by -0.005% (-0.006%). While per capita GDP, the wealth proxy, is not statistically significant, the slopes in Models 1 and 2, suggest a negative relation between an increase in wealth and the idiosyncratic volatility premium. This applies also to common idiosyncratic volatility; the coefficients are not statistically significant, but they are negative.

In the case of conditional idiosyncratic volatility, there is some, but weaker, evidence. In Model 3 (Model 4), the earnings' forecast errors are still positive for the conditional idiosyncratic volatility premium. The AFE coefficient is 1.721 (1.625), suggesting that an increase of 1% in the AFE will be accompanied by a 1.72% (1.62%) increase in the conditional idiosyncratic volatility premium. The estimated slope of institutional ownership is -2.975 (-2.851). If the institutional investors increase their holdings by 1%, the idiosyncratic volatility premium decreases -2.98% (-2.85%). However, we do not find a significant effect of either turnover or FDI. The only negative statistically significant effect on the idiosyncratic volatility premium is for per capita GDP (Model 3). The estimated per capita GDP coefficient is -2.53, which means that an increase of 1% in per capita GDP will lead to a decrease of -2.53% in the conditional idiosyncratic volatility premium.

To test for the appropriateness of the random effects, we use the Breusch Pagan Lagrangian multiplier and the Hausman tests. The Breusch Pagan test statistics are 57.065 for the realized idiosyncratic volatility premium and 117.07 for the conditional idiosyncratic volatility premium, both statistically significant at the 1% level. The Hausman test statistics are respectively 3.614 and 5.529 for realized and conditional idiosyncratic volatility premium, and both are statically insignificant. These results indicate that the random effects model is relevant in our case.

**Table 9: Effect of diversification variables on the Idiosyncratic Volatility**

| Panel A: Realized Idiosyncratic volatility Premium | | | Panel B: Conditional Idiosyncratic Volatility Premium | | |
|---|---|---|---|---|---|
| **Model** | **Model 1** | **Model 2** | **Model** | **Model 3** | **Model 4** |
| SMB | 4.634 | 4.646 | SMB | 2.682 | 2.792 |
| | (3.951) | (4.013) | | (1.856) | (3.142) |
| HML | 13.385*** | 13.323*** | HML | 9.686*** | 9.801* |
| | (4.214) | (4.18) | | (3.331) | (5.538) |
| MOM | -4.456* | -4.400* | MOM | -3.701** | -3.696 |
| | (2.302) | (2.313) | | (1.529) | (2.479) |
| Avgvol | -0.489 | -0.407 | CAvgvol | -2.496 | -1.853 |
| | (2.881) | (2.891) | | (2.521) | (2.848) |
| AFE | 2.558*** | 2.117*** | AFE | 1.721* | 1.625* |
| | (0.481) | (0.513) | | (0.9) | (0.877) |
| Inst_Own | -2.308* | -2.312* | Inst_Own | -2.975*** | -2.851*** |
| | (1.325) | (1.32) | | (0.967) | (0.89) |
| Turn | 1.618*** | 1.543*** | Turn | 0.649 | 0.567 |
| | (0.442) | (0.428) | | (0.798) | (0.813) |
| FDI | -0.005*** | -0.006*** | FDI | -0.001 | 0.0004 |
| | (0.001) | (0.001) | | (0.001) | (0.001) |
| GDPk | -0.173 | -0.178 | GDPk | -0.253** | -0.159 |
| | (0.229) | (0.226) | | (0.102) | (0.134) |
| Intercept | -5.196 | -4.914 | Intercept | -1.487 | -0.939 |
| | (3.3) | (3.321) | | (5.365) | (5.288) |
| Adj$R^2$ | 0.362 | 0.248 | Adj$R^2$ | 0.384 | 0.359 |
| Method | Pooled | Random | Method | Pooled | Random |

Note: Table 9 reports panel regressions results. Panel A presents the results for models 1 and 2 which include realized idiosyncratic volatility as the dependent variable. Panel B presents the results for models 3 and 4 which include conditional idiosyncratic volatility as the dependent variable. SMB is the portfolio return small minus big. HML is the difference between the portfolio return including the high book to market ratio firms and the low book to market ratio portfolio returns; MOM is the average return from high momentum portfolios minus the average return of low momentum portfolios. AFE is the absolute value of ratio of the difference between realized earnings and forecasted earnings to values forecasted earnings. Inst_Own change in is the proportion of the market capitalization of all the listed firms held by institutional investors in the stock market. The turnover (TURN) is computed as the cross-sectional average of the stock turnover for all the firms listed on the market. FDI is the amount of foreign direct investment. GDPk is the GDP per capita represents the wealth of the investors in the market. Avgvol is the cross-sectional average of realized idiosyncratic risk. CAvgvol is the cross-sectional average of conditional idiosyncratic risk.

## 1.4. Conclusion

The stock volatility is composed of systemic risk and idiosyncratic risk. Assumptions of the modern portfolio theory state that idiosyncratic volatility can be eliminated by diversification which is in contrast with recent studies proving its presence as a component of portfolio returns and stock volatility while exposing investors to greater risk. Several empirical studies have proven the significance of idiosyncratic volatility (Ang et al, 2006,2009; Fu, 2009; Brockman et al., 2009, 2020; Stambaugh et al., 2015; Herskovic et al., 2016). In this study, we are examining the existence of a principal component of European countries' idiosyncratic volatilities. Based on prior evidence, a new approach is presented in this chapterto study the commonality in idiosyncratic volatilities across major European stock markets. Then, we test the presence of a premium of the idiosyncratic risk. We identify as well the determinants of this premium using proxies for under-diversification.

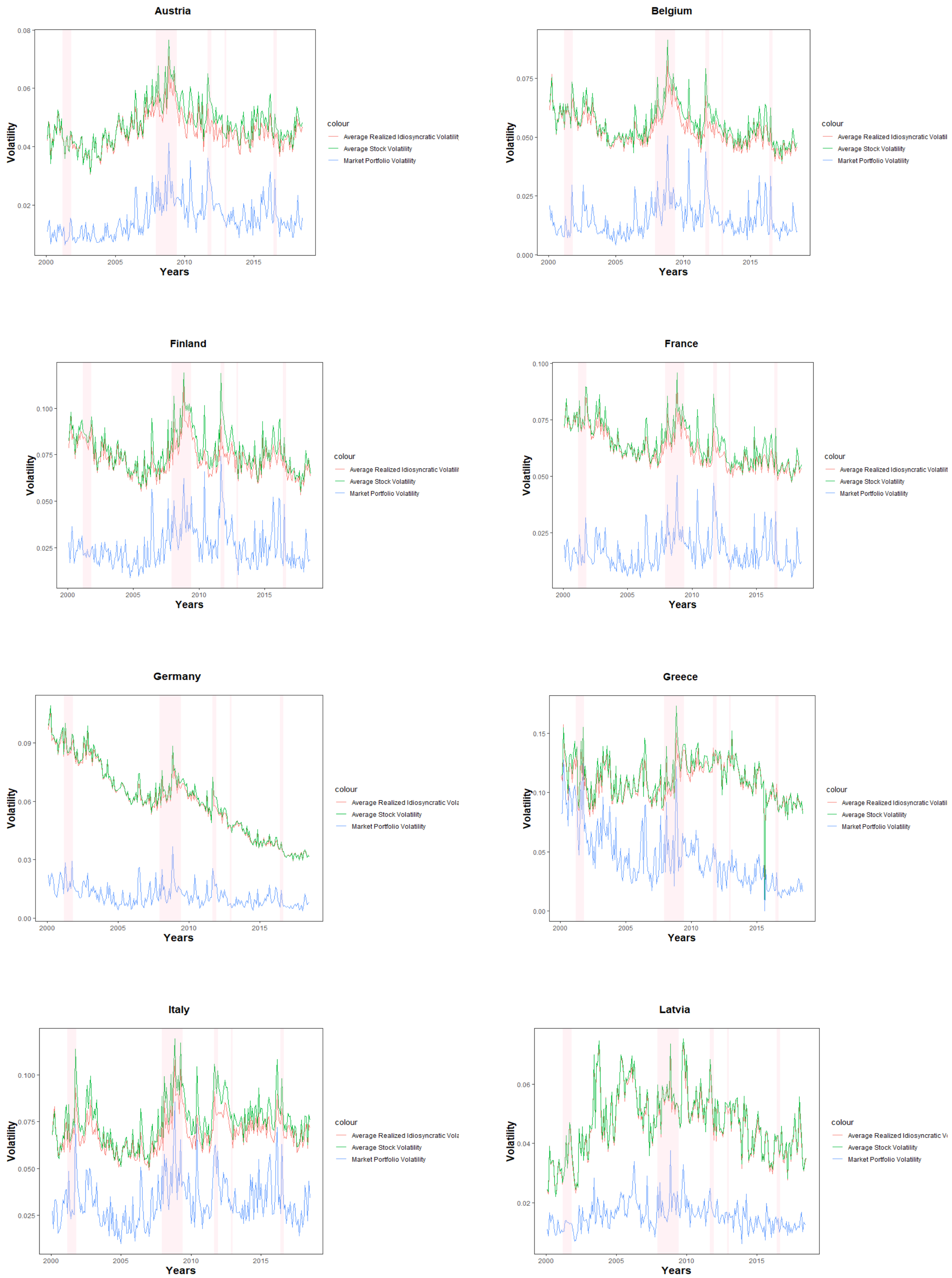
First, we prove that average idiosyncratic volatility accounts for 90% of the stock volatility. Second, we show that there is a substantial correlation between idiosyncratic volatility and market portfolio volatility in a dynamic approach through 12-month rolling correlations. We observe that, before each crisis period, the correlation between aggregate idiosyncratic volatility (AIV) and market volatility turned significantly negative because market volatility reacts more rapidly than idiosyncratic volatility. Third, we identify important commonalities between countries' AIV and spillover effect among the three groups' idiosyncratic volatilities. We show that the common component of the aggregate idiosyncratic volatilities of the second group which includes mainly countries with debt problems has a strong positive effect on the first group of countries. However, the first group's idiosyncratic volatilities have shown a negative impact on the second group aggregate idiosyncratic volatilities. In other words, countries having more stable economies decrease the volatility of the European countries suffering from debt crisis. We discover also that there is an unexpected significant effect of a European common idiosyncratic volatility (ECIV) on countries' stock market volatilities which allows us to predict quite accurate values for each market using a VAR model. These results show that market portfolio volatility is sort of depending on the common component of the idiosyncratic risk. Portfolio managers can use the European common component and the country's aggregate idiosyncratic volatility to predict future values of the market portfolio volatility.

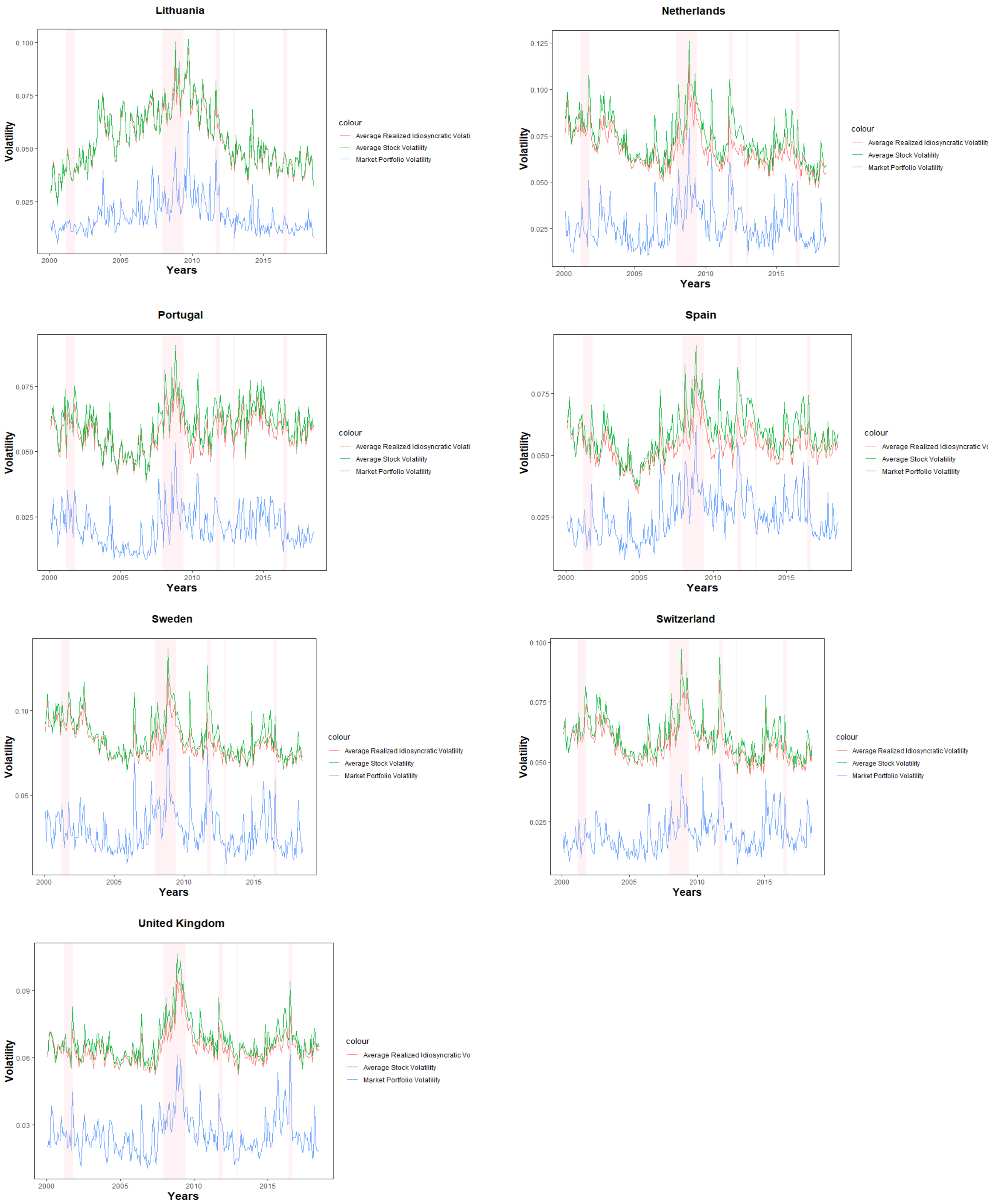
Regarding the idiosyncratic risk premium and its determinants. We find that the relationship between idiosyncratic volatility and expected returns is mostly positive for conditional idiosyncratic volatility and expected returns. However, we find little evidence of significant relationship for realized idiosyncratic volatility. We also prove the existence of an idiosyncratic volatility premium for all countries. It means that even in the case of a highly diversified portfolio, there is likely to be some important idiosyncratic volatility component present and priced. This result is consistent with what we have proven regarding the significant relation between the AIV and market portfolio volatility. The under-diversification proxies show a significant effect on the idiosyncratic risk premium.

After proving that idiosyncratic risk matters, since it contributes in the market portfolio volatility and it is priced in the cross-section of returns. It sounds convenient to explore factors affecting significantly the idiosyncratic volatility. The firm specific information has to have an impact on the volatility of the idiosyncratic component of the stock return (Morck et al., 2000; Durnev et al., 2003; Jin and Myers, 2006). In the next articles, we study the effects of extra-financial disclosure and the quality of accounting information on the idiosyncratic volatility.

# APPENDIX A

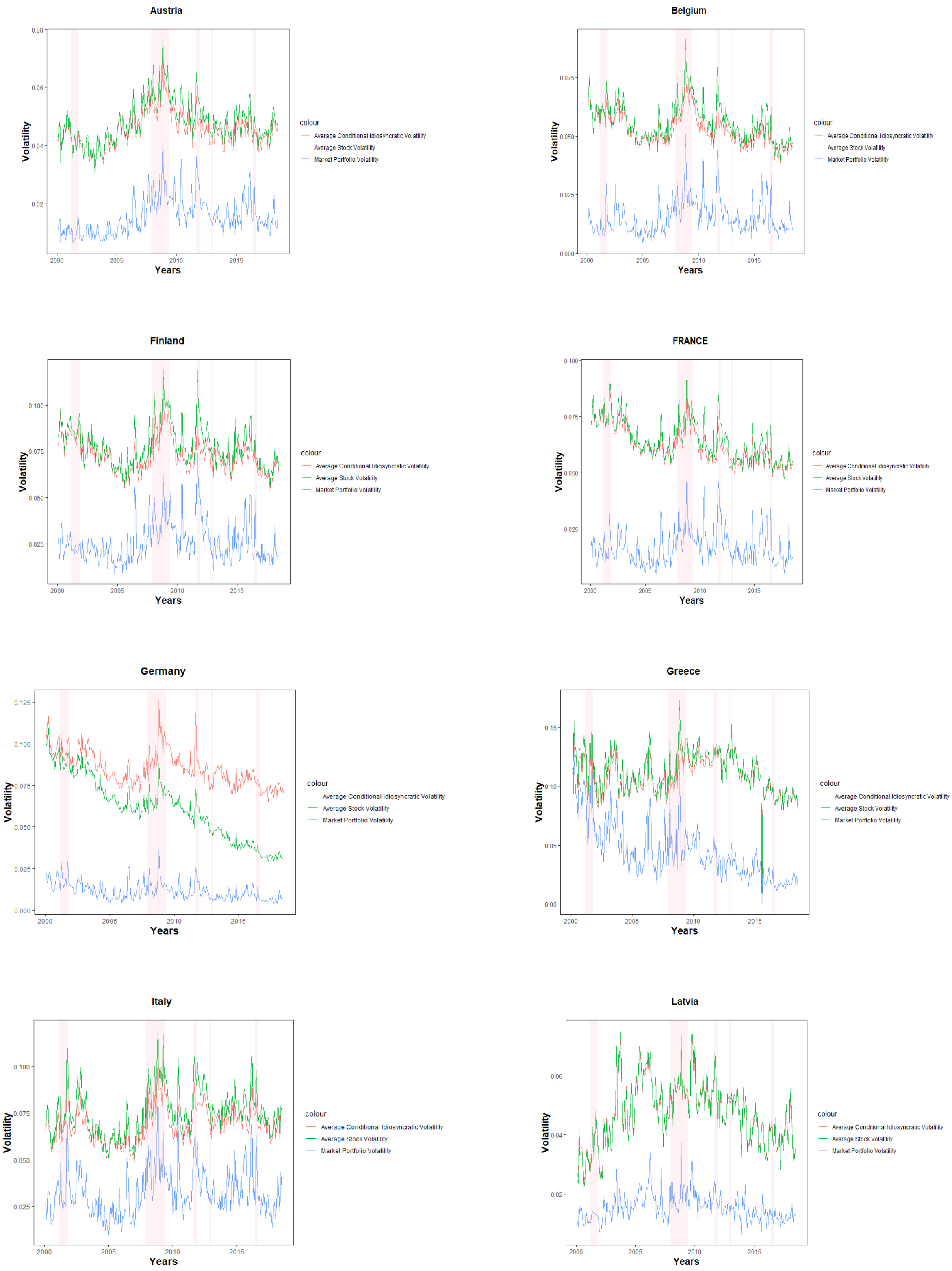
**Figure A.1. Realized Idiosyncratic Volatility**

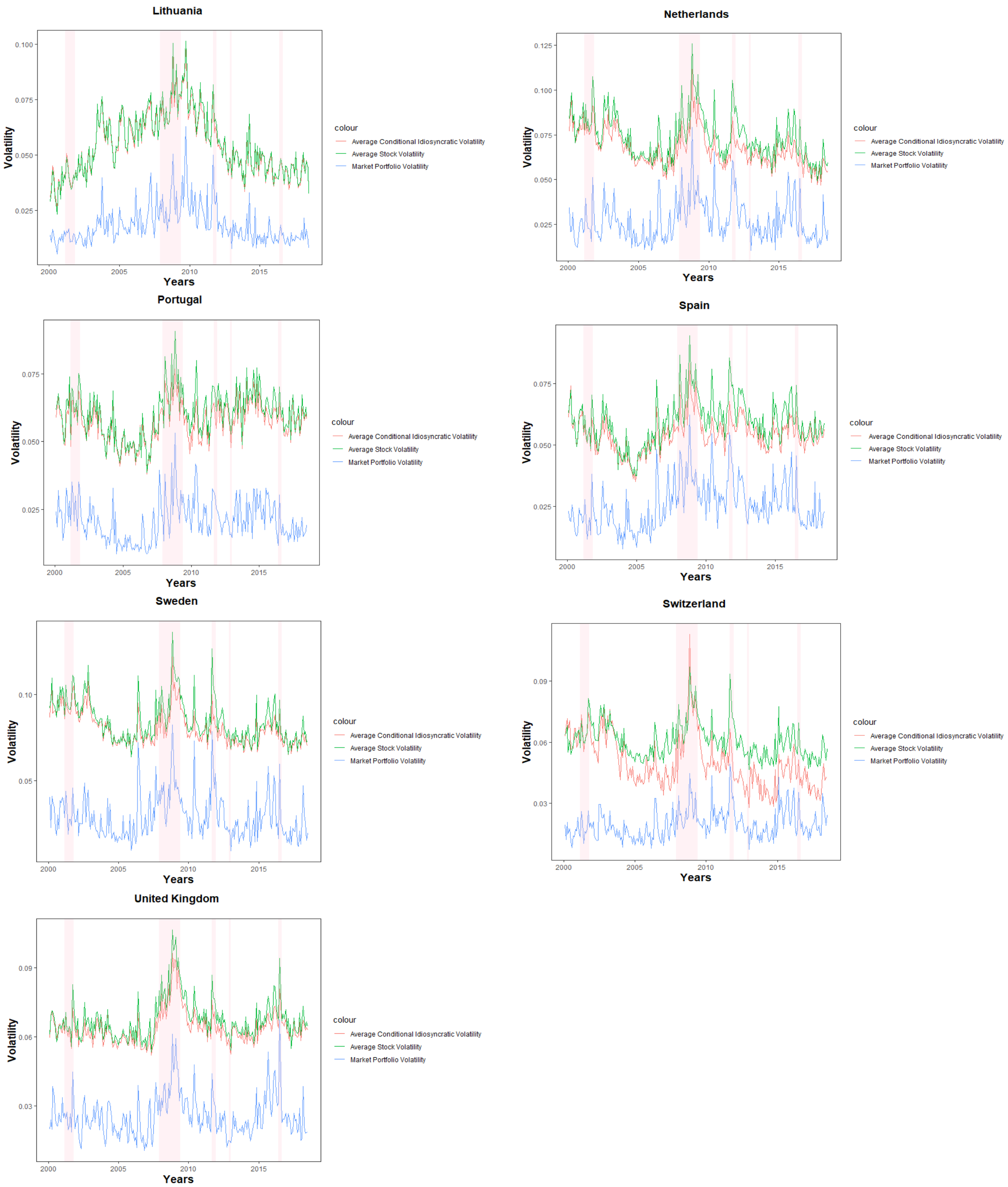





Note: This figure displays the time series of average stock volatility, the market portfolio volatility and the cross-sectional average of the realized idiosyncratic volatility. The sample covers 6545 listed firms on stock exchanges in 15 European countries from January 2000 to June 2018. We extract from Bloomberg market data. We collect daily stock prices, return indices, market values, number of shares outstanding, trading volumes, dividends and book-to-market ratio. All values are in Euros. Fama and French factors are obtained from the Kenneth French Website. The realized idiosyncratic volatility is the monthly standard deviation of residuals of the regression of daily excess returns on European Fama and French five risk factors and Carhart momentum factor. The shaded areas in the graph represents common recessions and crises between the European countries.

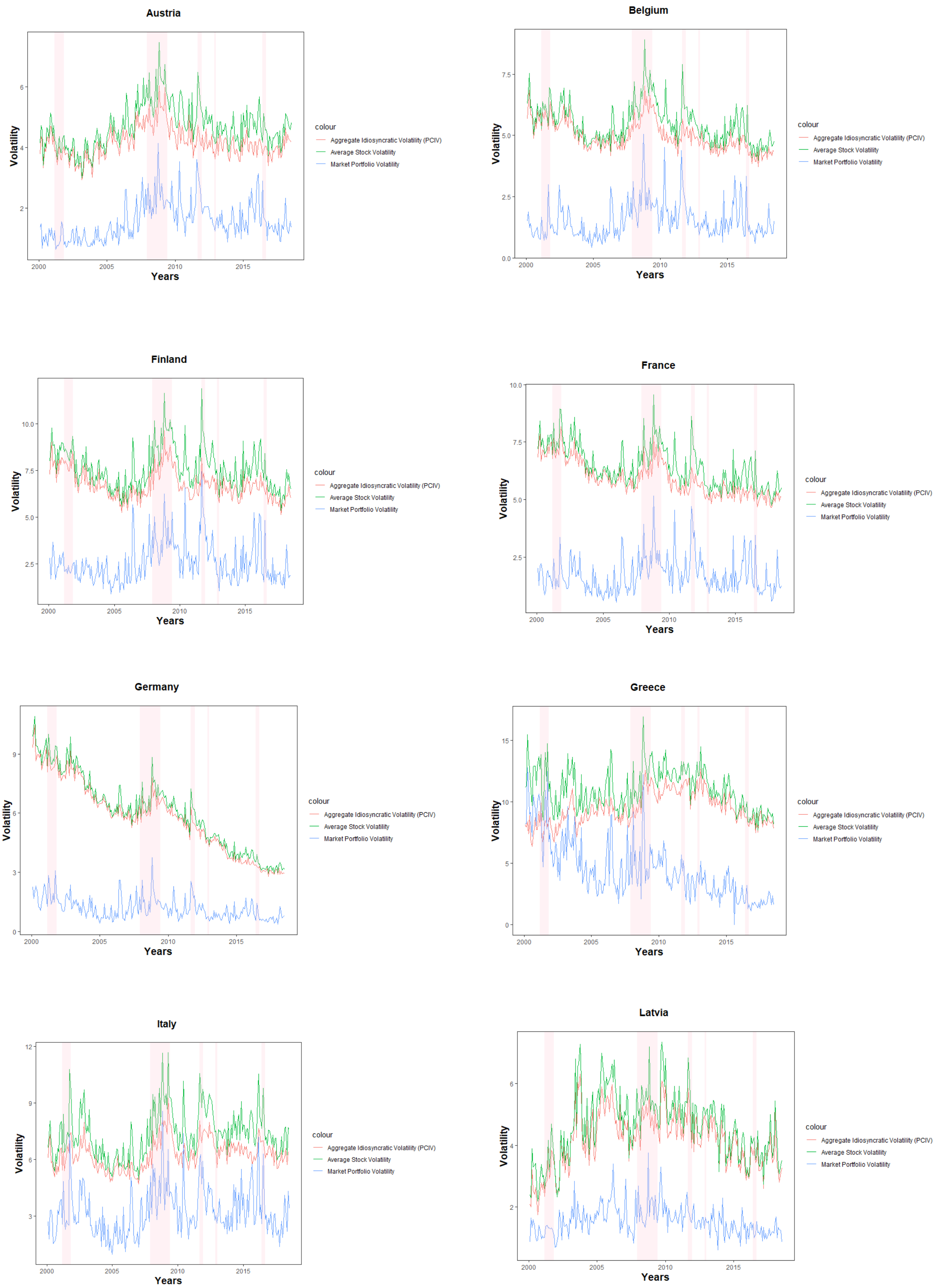
**Figure A.2 : Conditional Idiosyncratic Volatility**





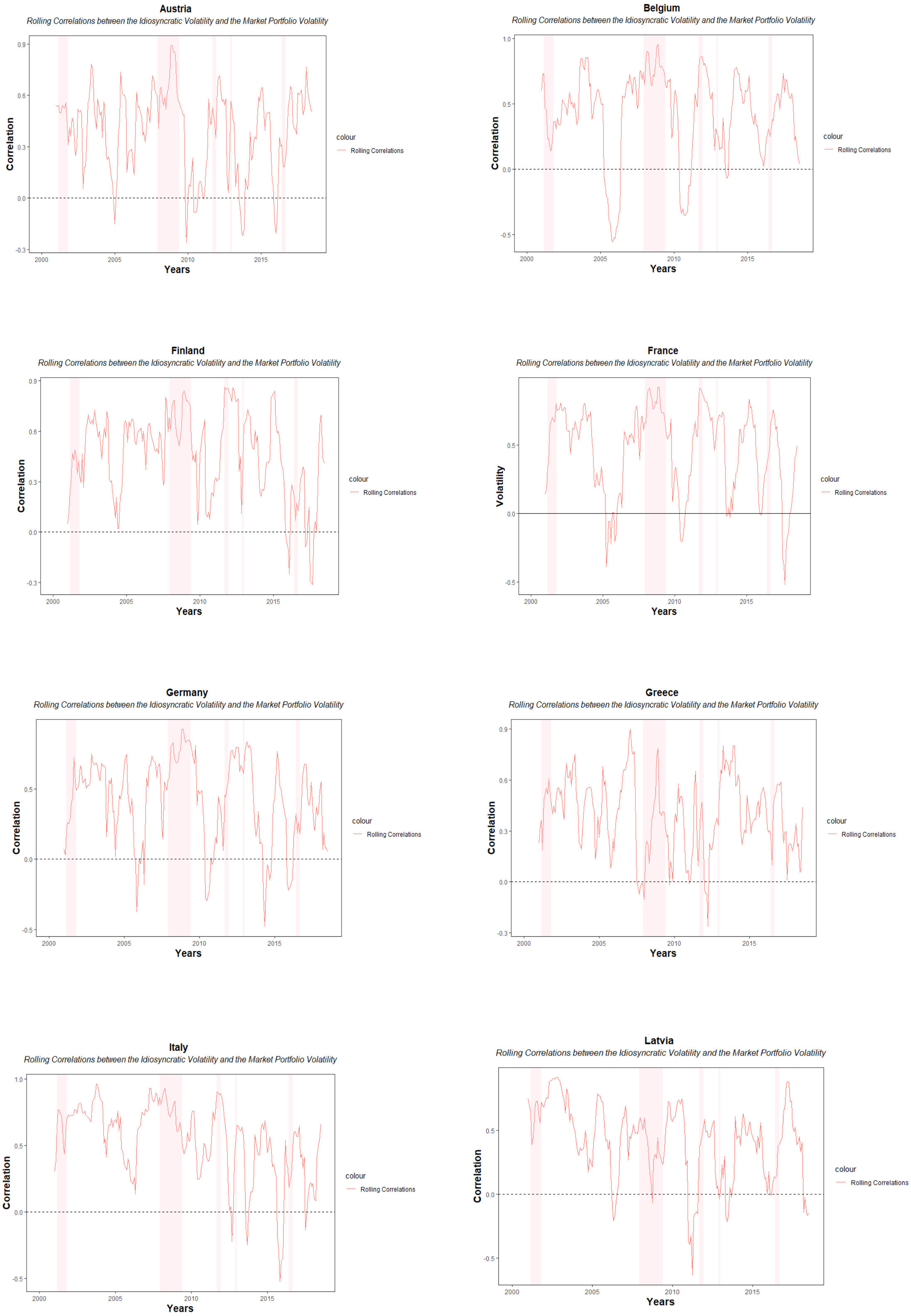

Note: This figure displays the time series of average stock volatility, the market portfolio volatility and the cross-sectional average of the conditional idiosyncratic volatility. The sample covers 6545 listed firms on stock exchanges in 15 European countries from January 2000 to June 2018. We extract from Bloomberg market data. We collect daily stock prices, return indices, market values, number of shares outstanding, trading volumes, dividends and book-to-market ratio. All values are in Euros. Fama and French factors are obtained from the Kenneth French Website. The conditional idiosyncratic volatility is the monthly standard deviation of residuals of an EGARCH (3,1) model. Common risk factors are added to the mean equation. We regress daily excess returns on European Fama and French five risk factors and Carhart momentum factor. The shaded areas in the graph represents common recessions and crises between the European countries.

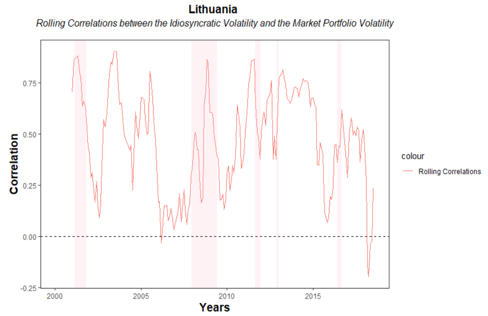
# Figure A.3. Principal Component Idiosyncratic Volatility (PCIV)

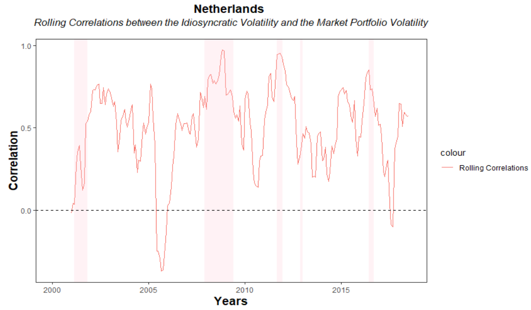


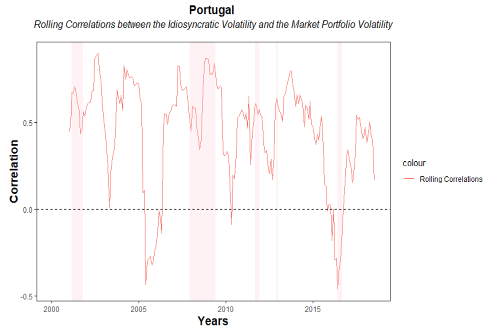

Note: Graphs in figure A.3 displays the time series of average stock volatility, the market portfolio volatility and the aggregate idiosyncratic volatility (AIV) which is the cross-sectional average of principal component idiosyncratic volatility (PCIV). The sample covers 6545 listed firms on stock exchanges in 15 European countries from January 2000 to June 2018. We extract from Bloomberg market data. We collect daily stock prices, return indices, market values, number of shares outstanding, trading volumes, dividends and book-to-market ratio. All values are in Euros. The PCIV is the monthly standard deviation of residuals of the regression of daily excess returns on common risk factors based on principal component analysis. The highlighted areas in the graph represents common recessions and crises between the European countries.

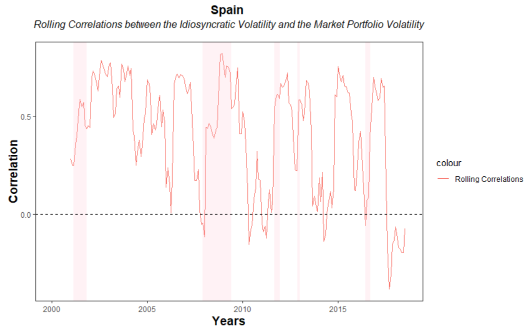
# Figure A.4. Dynamic Correlation

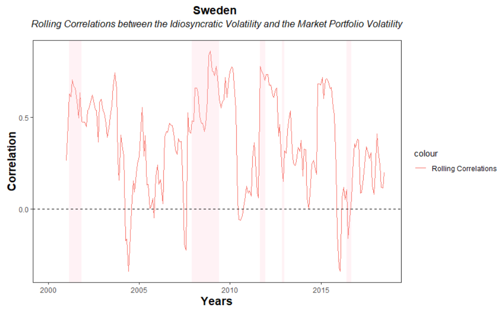


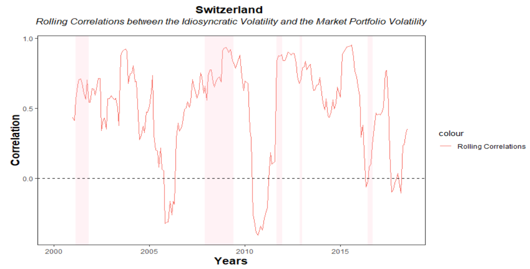


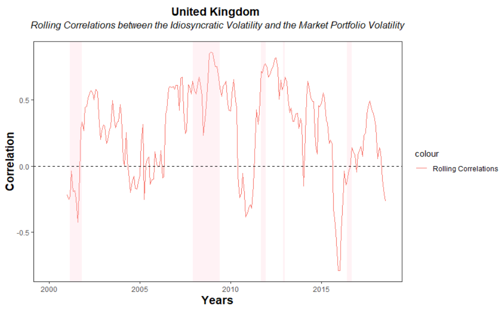



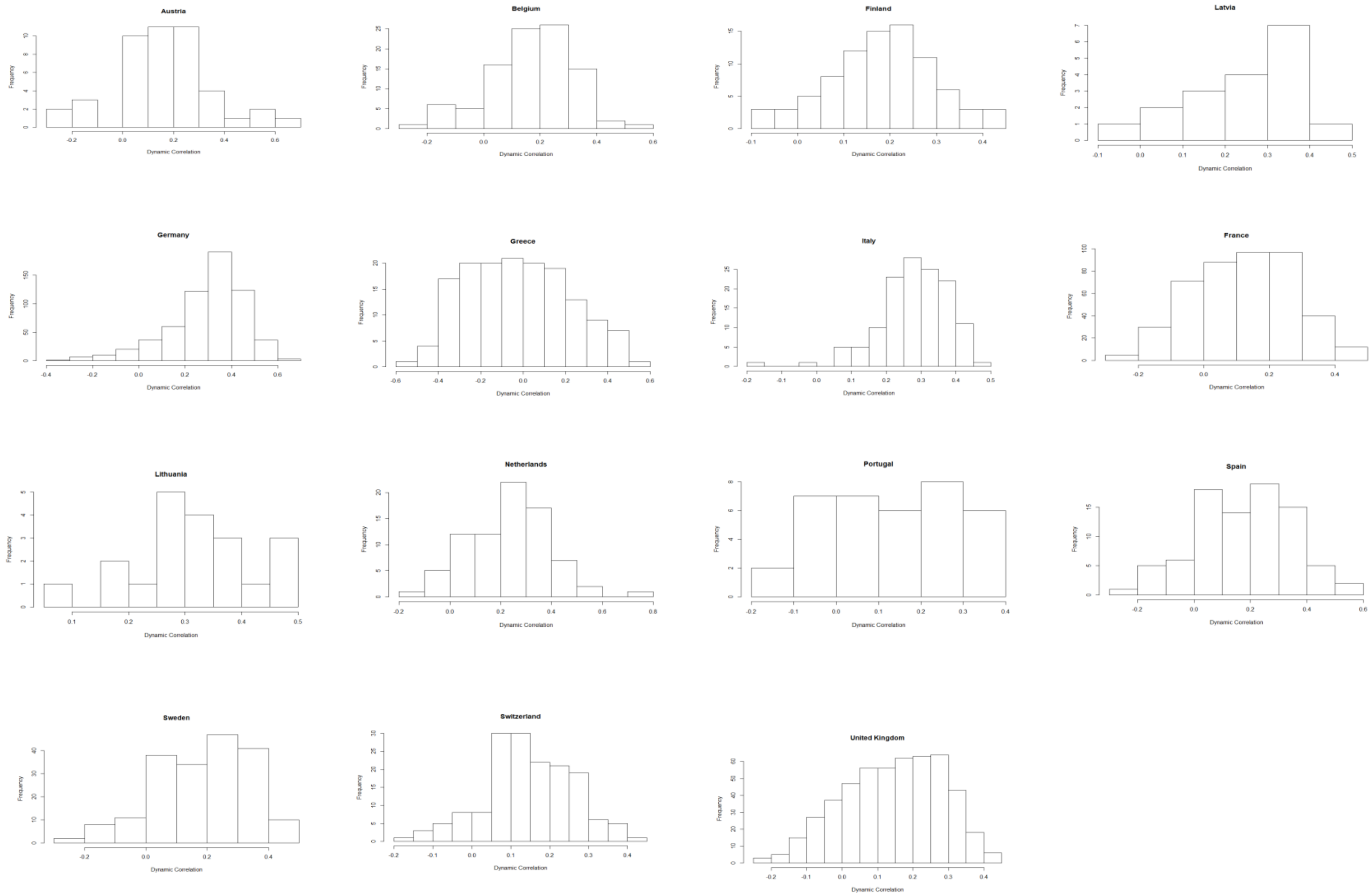



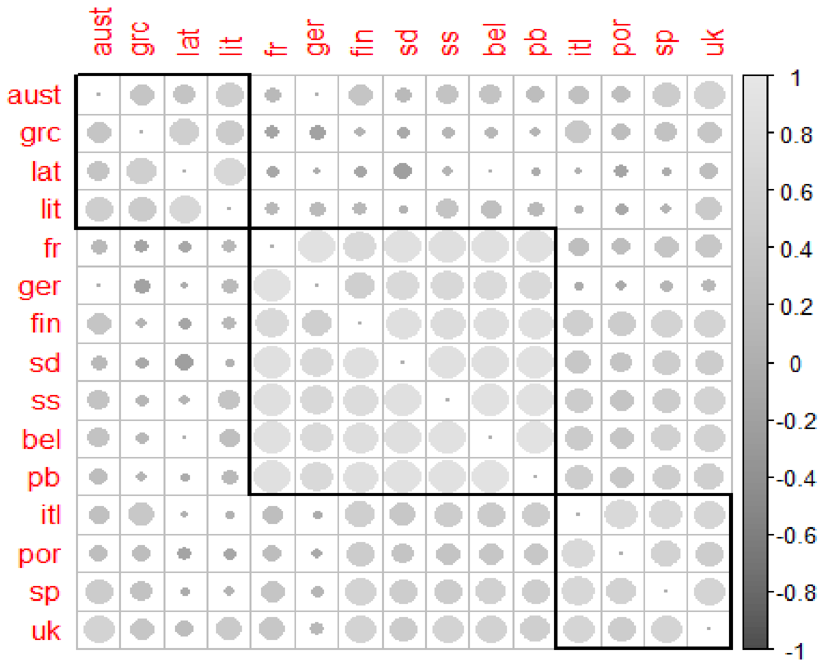

Note: In this figure, we present dynamic correlation between the aggregate idiosyncratic volatility (AIV), which is the cross-sectional average of the principal component idiosyncratic volatilities of firms listed on the market, and the market portfolio volatility. It is a Spearman rolling correlation over 12 months window. Periods of economic recessions and financial crises are highlighted in light red.

## Figure A.5: Distribution of Dynamic Correlation




Note: these graphs show the distribution of the dynamic correlation for each country. We estimate Spearman rolling correlation between the aggregate idiosyncratic volatility (AIV) and the market portfolio volatility over a 12 months window.

**Figure A.6: Clustering AIVs correlations**




Note: In figure A.5, we report the estimated spearman correlations between aggregate idiosyncratic volatilities of 15 European countries. We rely on these correlations to cluster countries into three groups. The first group includes France, Germany, Sweden, Switzerland, Belgium and the Netherlands which are among the biggest economies in the sample. The second group includes Italy, Portugal, Spain and the United Kingdom. It contains mainly countries of sovereign debt crisis. The third group includes Austria, Greece, Latvia and Lithuania.

## Figure A.7: Market portfolio volatility


Note: On the basis of VAR models estimated in section 3.6 and which results are presented in table A.1, we forecast the national market portfolio volatility using the fitted VAR model for each country, for the last four months in our time period. While the green line represents realized market portfolio volatility, the purple line is the forecast values of market portfolio volatility using the convenient VAR setting for each country. The yellow and red lines are respectively the upper and lower bounds of the confidence interval.

# Table A.1: Correlations between AIV and control variables per Country

**Austria**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.051 | 1 | | | | | |
| **log_cvturn** | -0.033 | 0.082 | 1 | | | | |
| **log_bm** | -0.033 | -0.798 | -0.151 | 1 | | | |
| **size** | -0.029 | 0.097 | 0.213 | -0.19 | 1 | | |
| **Past_Ret** | 0.716 | 0.066 | -0.025 | -0.052 | 0.008 | 1 | |
| **Real_vol** | -0.001 | 0.21 | 0.041 | -0.19 | 0.11 | 0.025 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.051 | 1 | | | | | |
| **log_cvturn** | -0.033 | 0.082 | 1 | | | | |
| **log_bm** | -0.033 | -0.798 | -0.151 | 1 | | | |
| **size** | -0.029 | 0.097 | 0.213 | -0.19 | 1 | | |
| **Past_Ret** | 0.716 | 0.066 | -0.025 | -0.052 | 0.008 | 1 | |
| **Cond_vol** | 0.061 | 0.326 | 0.058 | -0.232 | 0.113 | 0.061 | 1 |

**Belgium**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.099 | 1 | | | | | |
| **log_cvturn** | -0.033 | -0.029 | 1 | | | | |
| **log_bm** | -0.032 | -0.022 | -0.075 | 1 | | | |
| **size** | -0.014 | 0.075 | 0.225 | -0.454 | 1 | | |
| **Past_Ret** | 0.74 | 0.09 | -0.026 | -0.072 | 0.034 | 1 | |
| **Real_vol** | -0.026 | 0.01 | -0.065 | 0.096 | -0.158 | -0.017 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.099 | 1 | | | | | |
| **log_cvturn** | -0.033 | -0.029 | 1 | | | | |
| **log_bm** | -0.032 | -0.022 | -0.075 | 1 | | | |
| **size** | -0.014 | 0.075 | 0.225 | -0.454 | 1 | | |
| **Past_Ret** | 0.74 | 0.09 | -0.026 | -0.072 | 0.034 | 1 | |
| **Cond_vol** | 0.029 | 0.167 | -0.049 | 0.109 | -0.158 | -0.003 | 1 |

**Denmark**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.158 | 1 | | | | | |
| **log_cvturn** | -0.013 | 0.016 | 1 | | | | |
| **log_bm** | -0.129 | -0.763 | -0.076 | 1 | | | |
| **size** | 0.002 | 0.104 | 0.219 | -0.217 | 1 | | |
| **Past_Ret** | 0.76 | 0.145 | -0.001 | -0.129 | 0.043 | 1 | |
| **Real_vol** | -0.019 | -0.03 | -0.024 | 0.119 | -0.144 | -0.028 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.158 | 1 | | | | | |
| **log_cvturn** | -0.013 | 0.016 | 1 | | | | |
| **log_bm** | -0.129 | -0.763 | -0.076 | 1 | | | |
| **size** | 0.002 | 0.104 | 0.219 | -0.217 | 1 | | |
| **Past_Ret** | 0.76 | 0.145 | -0.001 | -0.129 | 0.041 | 1 | |
| **Cond_vol** | 0.041 | 0.112 | -0.009 | 0.033 | -0.153 | -0.007 | 1 |

**Finland**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.114 | 1 | | | | | |
| **log_cvturn** | -0.034 | 0.015 | 1 | | | | |
| **log_bm** | -0.037 | -0.105 | -0.103 | 1 | | | |
| **size** | -0.014 | 0.047 | 0.167 | -0.563 | 1 | | |
| **Past_Ret** | 0.765 | 0.094 | -0.035 | -0.081 | 0.037 | 1 | |
| **Real_vol** | -0.034 | 0.013 | -0.093 | 0.123 | -0.201 | -0.055 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.114 | 1 | | | | | |
| **log_cvturn** | -0.034 | 0.015 | 1 | | | | |
| **log_bm** | -0.037 | -0.105 | -0.103 | 1 | | | |
| **size** | -0.014 | 0.047 | 0.167 | -0.563 | 1 | | |
| **Past_Ret** | 0.765 | 0.094 | -0.035 | -0.081 | 0.037 | 1 | |
| **Cond_vol** | 0.033 | 0.155 | -0.068 | 0.124 | -0.192 | -0.013 | 1 |

**France**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.094 | 1 | | | | | |
| **log_cvturn** | -0.019 | 0.018 | 1 | | | | |
| **log_bm** | -0.021 | -0.017 | -0.027 | 1 | | | |
| **size** | -0.005 | -0.033 | 0.169 | -0.437 | 1 | | |
| **Past_Ret** | 0.733 | 0.06 | -0.01 | -0.06 | 0.045 | 1 | |
| **Real_vol** | 0.036 | 0.257 | -0.081 | 0.027 | -0.184 | -0.002 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.094 | 1 | | | | | |
| **log_cvturn** | -0.019 | 0.018 | 1 | | | | |
| **log_bm** | -0.021 | -0.017 | -0.027 | 1 | | | |
| **size** | -0.005 | -0.033 | 0.169 | -0.437 | 1 | | |
| **Past_Ret** | 0.733 | 0.06 | -0.01 | -0.06 | 0.045 | 1 | |
| **Cond_vol** | 0.038 | 0.258 | -0.081 | 0.025 | -0.183 | -0.001 | 1 |

**Germany**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.09 | 1 | | | | | |
| **log_cvturn** | -0.019 | 0.012 | 1 | | | | |
| **log_bm** | -0.027 | -0.022 | -0.076 | 1 | | | |
| **size** | -0.014 | 0.027 | 0.224 | -0.461 | 1 | | |
| **Past_Ret** | 0.7 | 0.039 | -0.002 | -0.075 | 0.041 | 1 | |
| **Real_vol** | -0.012 | 0.091 | -0.121 | 0.125 | -0.252 | -0.055 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.09 | 1 | | | | | |
| **log_cvturn** | -0.019 | 0.012 | 1 | | | | |
| **log_bm** | -0.027 | -0.022 | -0.076 | 1 | | | |
| **size** | -0.014 | 0.027 | 0.224 | -0.461 | 1 | | |
| **Past_Ret** | 0.7 | 0.039 | -0.002 | -0.075 | 0.041 | 1 | |
| **Cond_vol** | 0.026 | 0.227 | -0.099 | 0.125 | -0.249 | -0.075 | 1 |

# Table A.1: Correlations between AIV and control variables per Country (Continued)

**Greece**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.071 | 1 | | | | | |
| log_cvturn | -0.011 | 0.141 | 1 | | | | |
| log_bm | 0.026 | -0.291 | -0.111 | 1 | | | |
| size | -0.02 | 0.428 | 0.174 | -0.521 | 1 | | |
| Past_Ret | 0.786 | 0.039 | -0.016 | 0.022 | -0.018 | 1 | |
| Real_vol | 0.054 | 0.068 | 0.028 | 0.057 | -0.175 | 0.084 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.071 | 1 | | | | | |
| log_cvturn | -0.011 | 0.141 | 1 | | | | |
| log_bm | 0.026 | -0.291 | -0.111 | 1 | | | |
| size | -0.02 | 0.428 | 0.174 | -0.521 | 1 | | |
| Past_Ret | 0.786 | 0.039 | -0.016 | 0.022 | -0.018 | 1 | |
| Cond_vol | 0.077 | 0.164 | 0.039 | 0.088 | -0.2 | 0.056 | 1 |

**Italy**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.196 | 1 | | | | | |
| log_cvturn | -0.003 | -0.078 | 1 | | | | |
| log_bm | -0.026 | -0.149 | 0.035 | 1 | | | |
| size | 0.007 | 0.132 | 0.106 | -0.519 | 1 | | |
| Past_Ret | 0.789 | 0.123 | 0.03 | -0.035 | 0.05 | 1 | |
| Real_vol | -0.021 | 0.086 | -0.09 | 0.145 | -0.187 | -0.039 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.196 | 1 | | | | | |
| log_cvturn | -0.003 | -0.078 | 1 | | | | |
| log_bm | -0.026 | -0.149 | 0.035 | 1 | | | |
| size | 0.007 | 0.132 | 0.106 | -0.519 | 1 | | |
| Past_Ret | 0.789 | 0.123 | 0.03 | -0.035 | 0.05 | 1 | |
| Cond_vol | 0.072 | 0.27 | -0.051 | 0.168 | -0.198 | -0.037 | 1 |

**Latvia**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.124 | 1 | | | | | |
| log_cvturn | -0.037 | -0.057 | 1 | | | | |
| log_bm | -0.058 | -0.091 | 0.143 | 1 | | | |
| size | -0.033 | -0.186 | 0.107 | -0.272 | 1 | | |
| Past_Ret | 0.678 | 0.142 | -0.068 | -0.095 | -0.027 | 1 | |
| Real_vol | 0.042 | 0.085 | 0.024 | 0.144 | -0.143 | 0.099 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.124 | 1 | | | | | |
| log_cvturn | -0.037 | -0.057 | 1 | | | | |
| log_bm | -0.058 | -0.091 | 0.143 | 1 | | | |
| size | -0.033 | -0.186 | 0.107 | -0.272 | 1 | | |
| Past_Ret | 0.678 | 0.142 | -0.068 | -0.095 | -0.027 | 1 | |
| Cond_vol | 0.137 | 0.186 | 0.049 | 0.183 | -0.161 | 0.188 | 1 |

**Lithuania**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.19 | 1 | | | | | |
| log_cvturn | 0.013 | 0.097 | 1 | | | | |
| log_bm | -0.064 | -0.003 | -0.033 | 1 | | | |
| size | -0.061 | 0.018 | 0.099 | -0.269 | 1 | | |
| Past_Ret | 0.708 | 0.173 | 0.028 | -0.079 | -0.002 | 1 | |
| Real_vol | 0.023 | 0.244 | 0.01 | 0.255 | -0.15 | 0.036 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.185 | 1 | | | | | |
| log_cvturn | 0.017 | 0.097 | 1 | | | | |
| log_bm | -0.059 | -0.003 | -0.033 | 1 | | | |
| size | -0.057 | 0.018 | 0.099 | -0.269 | 1 | | |
| Past_Ret | 0.707 | 0.173 | 0.028 | -0.079 | -0.002 | 1 | |
| Cond_vol | 0.14 | 0.33 | -0.002 | 0.264 | -0.183 | 0.136 | 1 |

**Netherlands**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.06 | 1 | | | | | |
| log_cvturn | -0.024 | -0.004 | 1 | | | | |
| log_bm | -0.032 | -0.038 | 0.002 | 1 | | | |
| size | -0.007 | 0.011 | 0.245 | -0.368 | 1 | | |
| Past_Ret | 0.753 | 0.037 | 0.001 | -0.075 | 0.053 | 1 | |
| Real_vol | -0.023 | 0.122 | -0.11 | 0.115 | -0.295 | -0.041 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.06 | 1 | | | | | |
| log_cvturn | -0.024 | -0.004 | 1 | | | | |
| log_bm | -0.032 | -0.038 | 0.002 | 1 | | | |
| size | -0.007 | 0.011 | 0.245 | -0.368 | 1 | | |
| Past_Ret | 0.753 | 0.037 | 0.001 | -0.075 | 0.053 | 1 | |
| Cond_vol | -0.051 | 0.085 | -0.068 | 0.007 | -0.139 | -0.079 | 1 |

**Portugal**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| R | 1 | | | | | | |
| Log_Turn | 0.096 | 1 | | | | | |
| log_cvturn | -0.013 | 0.037 | 1 | | | | |
| log_bm | -0.015 | -0.094 | 0.022 | 1 | | | |
| size | 0.008 | 0.107 | 0.091 | -0.522 | 1 | | |
| Past_Ret | 0.708 | 0.062 | 0.007 | -0.054 | 0.066 | 1 | |
| Real_vol | -0.009 | 0.114 | -0.001 | 0.119 | -0.166 | -0.04 | 1 |
| **Panel B** | **R** | **Log_Turn** | **log_cvturn** | **log_bm** | **size** | **Past_Ret** | **Cond_vol** |
| R | 1 | | | | | | |
| Log_Turn | 0.109 | 1 | | | | | |
| log_cvturn | -0.033 | 0.039 | 1 | | | | |
| log_bm | -0.011 | -0.097 | 0.014 | 1 | | | |
| size | 0.004 | 0.119 | 0.107 | -0.531 | 1 | | |
| Past_Ret | 0.707 | 0.083 | -0.013 | -0.048 | 0.069 | 1 | |
| Cond_vol | 0.062 | 0.244 | 0.027 | 0.126 | -0.159 | 0.012 | 1 |

# Table A.1: Correlations bAIV and control variables per Country (Continued)

**Slovenia**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.192 | 1 | | | | | |
| **log_cvturn** | -0.003 | -0.083 | 1 | | | | |
| **log_bm** | -0.159 | -0.708 | -0.024 | 1 | | | |
| **size** | -0.02 | -0.046 | 0.159 | -0.07 | 1 | | |
| **Past_Ret** | 0.707 | 0.233 | -0.013 | -0.2 | 0.027 | 1 | |
| **Real_vol** | 0.009 | -0.022 | 0.011 | 0.08 | 0.061 | 0.034 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.206 | 1 | | | | | |
| **log_cvturn** | -0.001 | -0.029 | 1 | | | | |
| **log_bm** | -0.161 | -0.733 | -0.043 | 1 | | | |
| **size** | -0.021 | 0.02 | 0.121 | -0.087 | 1 | | |
| **Past_Ret** | 0.707 | 0.241 | -0.006 | -0.196 | 0.029 | 1 | |
| **Cond_vol** | 0.064 | 0.099 | -0.026 | 0.063 | 0.043 | 0.053 | 1 |

**Spain**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.079 | 1 | | | | | |
| **log_cvturn** | -0.033 | 0.074 | 1 | | | | |
| **log_bm** | -0.049 | -0.105 | -0.013 | 1 | | | |
| **size** | 0.001 | 0.12 | 0.123 | -0.435 | 1 | | |
| **Past_Ret** | 0.786 | 0.051 | -0.015 | -0.075 | 0.055 | 1 | |
| **Real_vol** | -0.02 | 0.072 | 0.011 | 0.129 | -0.163 | -0.05 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.079 | 1 | | | | | |
| **log_cvturn** | -0.033 | 0.074 | 1 | | | | |
| **log_bm** | -0.049 | -0.105 | -0.013 | 1 | | | |
| **size** | 0.001 | 0.12 | 0.123 | -0.435 | 1 | | |
| **Past_Ret** | 0.786 | 0.051 | -0.015 | -0.075 | 0.055 | 1 | |
| **Cond_vol** | 0.012 | 0.214 | 0.032 | 0.137 | -0.155 | -0.059 | 1 |

**Switzerland**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.112 | 1 | | | | | |
| **log_cvturn** | -0.009 | -0.015 | 1 | | | | |
| **log_bm** | -0.015 | -0.071 | -0.124 | 1 | | | |
| **size** | 0.021 | -0.027 | 0.088 | -0.028 | 1 | | |
| **Past_Ret** | 0.765 | 0.097 | 0.001 | -0.048 | 0.033 | 1 | |
| **Real_vol** | -0.035 | 0.022 | -0.11 | 0.131 | -0.065 | -0.045 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | -0.063 | 1 | | | | | |
| **log_cvturn** | -0.031 | -0.17 | 1 | | | | |
| **log_bm** | -0.001 | 0.087 | -0.198 | 1 | | | |
| **size** | 0.041 | -0.054 | 0.015 | 0.21 | 1 | | |
| **Past_Ret** | 0.783 | -0.123 | -0.017 | -0.025 | 0.065 | 1 | |
| **Cond_vol** | -0.118 | 0.489 | -0.325 | 0.243 | -0.067 | -0.173 | 1 |

**Sweden**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.112 | 1 | | | | | |
| **log_cvturn** | -0.021 | -0.01 | 1 | | | | |
| **log_bm** | -0.038 | -0.032 | -0.075 | 1 | | | |
| **size** | -0.002 | 0.001 | 0.22 | -0.496 | 1 | | |
| **Past_Ret** | 0.755 | 0.063 | -0.004 | -0.083 | 0.052 | 1 | |
| **Real_vol** | -0.027 | 0.072 | -0.124 | 0.147 | -0.265 | -0.065 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0.112 | 1 | | | | | |
| **log_cvturn** | -0.021 | -0.01 | 1 | | | | |
| **log_bm** | -0.038 | -0.032 | -0.075 | 1 | | | |
| **size** | -0.002 | 0.001 | 0.22 | -0.496 | 1 | | |
| **Past_Ret** | 0.755 | 0.063 | -0.004 | -0.083 | 0.052 | 1 | |
| **Cond_vol** | 0.032 | 0.204 | -0.097 | 0.162 | -0.264 | -0.055 | 1 |

**United Kingdom**

| Panel A | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Real_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0 | 1 | | | | | |
| **log_cvturn** | -0.003 | 0.027 | 1 | | | | |
| **log_bm** | -0.011 | -0.033 | -0.129 | 1 | | | |
| **size** | -0.001 | -0.027 | 0.262 | -0.505 | 1 | | |
| **Past_Ret** | 0.237 | 0.038 | -0.015 | -0.072 | 0.047 | 1 | |
| **Real_vol** | -0.053 | 0.255 | -0.015 | 0.136 | -0.093 | -0.057 | 1 |

| Panel B | R | Log_Turn | log_cvturn | log_bm | size | Past_Ret | Cond_vol |
|---|---|---|---|---|---|---|---|
| **R** | 1 | | | | | | |
| **Log_Turn** | 0 | 1 | | | | | |
| **log_cvturn** | -0.004 | 0.028 | 1 | | | | |
| **log_bm** | -0.011 | -0.034 | -0.129 | 1 | | | |
| **size** | -0.001 | -0.028 | 0.263 | -0.507 | 1 | | |
| **Past_Ret** | 0.235 | 0.038 | -0.016 | -0.072 | 0.048 | 1 | |
| **Cond_vol** | -0.052 | 0.258 | -0.014 | 0.136 | -0.093 | -0.056 | 1 |

Note: This table shows summary statistics for 6545 firms listed on 15 European stock exchange. We report the cross-sectional mean, standard deviation and median (in percentage) for control variables and idiosyncratic volatility measures. The average stock volatility is the square root of the arithmetic mean of the stock variance defined in section 2.2.1 multiplied by the square root of the number of trading days in the month. The realized idiosyncratic volatility is standard deviation of residuals of a market model in which the common risk factors are Fama and French (2016) five factors and the momentum factor (Carhart, 1997). To compute for monthly realized idiosyncratic volatility, we multiply the standard deviation of idiosyncratic returns over the month multiplied by the number of trading days in a month. Conditional idiosyncratic volatility (CIV) is computed using an EGARCH model (3,1). The risk-free rate used to compute excess returns is the US one-month T-bill rate. . The firm size is measured by total stock value. In the Bloomberg database, this is the variable current market cap. For each month, we calculate the natural logarithm of the average the daily market capitalization. The book-to-market ratio is natural logarithm of the inverse of the market-to-book ratio (price to book ratio in Bloomberg). The monthly turnover, TURN, is the number of stocks traded, divided by the number of shares outstanding. Then, we calculate its natural logarithm. Log CVTURN is the coefficient of variation in turnover in the previous 10 months. Past returns (PR) (-2,-7), are the compounded past returns for each stock from month t-2 to month t-7 where t is the current month. We exclude the month t-1 returns to avoid a bid-ask bounce for the most frequently traded.

## Table A.2: VAR models' results

**Panel A: Austria**

**Vol_Ind~ ECIV +Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| PC1.l1 | 0.169 | 0.019 | 8.983 | 0 |
| Vol_Ind.l1 | 0.383 | 0.07 | 5.455 | 0 |
| ECIV.l2 | 0.107 | 0.025 | 4.245 | 0 |
| ECIV.l3 | 0.1 | 0.026 | 3.787 | 0 |
| Vol_Ind.l3 | 0.158 | 0.074 | 2.13 | 0.034 |
| ECIV.l4 | 0.052 | 0.027 | 1.913 | 0.057 |
| Vol_Ind.l4 | 0.126 | 0.075 | 1.684 | 0.094 |
| Vol_Ind.l6 | 0.237 | 0.076 | 3.137 | 0.002 |
| ECIV.l7 | -0.045 | 0.025 | -1.82 | 0.071 |
| Granger Causality | | | | 0.045 |

**ECIV ~ ECIV +Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.595 | 0.07 | -8.5 | 0 |
| ECIV.l2 | -0.212 | 0.093 | -2.27 | 0.024 |
| Vol_Ind.l2 | -0.699 | 0.28 | -2.49 | 0.013 |
| ECIV.l3 | 0.193 | 0.099 | 1.957 | 0.052 |
| Vol_Ind.l4 | 0.475 | 0.278 | 1.707 | 0.089 |
| ECIV.l7 | -0.176 | 0.093 | -1.89 | 0.06 |
| ECIV.l8 | -0.275 | 0.08 | -3.41 | 0.001 |
| Granger Causality | | | | 0.377 |

**Panel B: Belgium**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | 0.245 | 0.026 | 9.26 | 0 |
| Vol_Ind.l1 | 0.41 | 0.071 | 5.799 | 0 |
| ECIV.l2 | 0.16 | 0.035 | 4.619 | 0 |
| ECIV.l3 | 0.122 | 0.037 | 3.298 | 0.001 |
| Vol_Ind.l3 | 0.216 | 0.077 | 2.801 | 0.006 |
| ECIV.l5 | 0.067 | 0.038 | 1.739 | 0.084 |
| Vol_Ind.l7 | 0.133 | 0.08 | 1.664 | 0.098 |
| ECIV.l8 | -0.058 | 0.034 | -1.68 | 0.095 |
| Vol_Ind.l9 | 0.152 | 0.072 | 2.113 | 0.036 |
| Granger Causality | | | | 0.056 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.557 | 0.074 | -7.54 | 0 |
| ECIV.l2 | -0.239 | 0.097 | -2.48 | 0.014 |
| Vol_Ind.l2 | -0.773 | 0.208 | -3.71 | 0 |
| ECIV.l3 | 0.231 | 0.103 | 2.232 | 0.027 |
| ECIV.l8 | -0.173 | 0.096 | -1.82 | 0.071 |
| ECIV.l9 | 0.151 | 0.086 | 1.762 | 0.08 |
| Granger Causality | | | | 0.021 |

**Panel C: Finland**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| Vol_Ind.l1 | 0.41 | 0.08 | 5.12 | 0 |
| ECIV.l2 | 0.11 | 0.06 | 1.71 | 0.09 |
| ECIV.l3 | 0.22 | 0.06 | 3.41 | 0 |
| Granger Causality | | | | 0.03 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.49 | 0.08 | -6.16 | 0 |
| ECIV.l2 | -0.25 | 0.09 | -2.77 | 0.01 |
| Vol_Ind.l2 | 0.26 | 0.13 | 2.03 | 0.04 |
| ECIV.l3 | 0.16 | 0.09 | 1.76 | 0.08 |
| Vol_Ind.l3 | -0.48 | 0.13 | -3.82 | 0 |
| ECIV.l4 | -0.21 | 0.1 | -2.16 | 0.03 |
| ECIV.l8 | -0.16 | 0.08 | -2.01 | 0.05 |
| Granger Causality | | | | 0.1 |

**Panel D: France**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| Vol_Ind.l1 | 0.444 | 0.082 | 5.417 | 0 |
| ECIV.l2 | 0.085 | 0.047 | 1.792 | 0.075 |
| ECIV.l3 | 0.126 | 0.049 | 2.545 | 0.012 |
| ECIV.l6 | -0.084 | 0.047 | -1.78 | 0.077 |
| Vol_Ind.l6 | 0.216 | 0.09 | 2.396 | 0.018 |
| ECIV.l7 | -0.124 | 0.043 | -2.9 | 0.004 |
| Granger Causality | | | | 0.023 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.594 | 0.079 | -7.48 | 0 |
| ECIV.l2 | -0.228 | 0.093 | -2.44 | 0.016 |
| ECIV.l3 | 0.235 | 0.097 | 2.422 | 0.016 |
| Vol_Ind.l3 | -0.614 | 0.168 | -3.65 | 0 |
| Vol_Ind.l6 | 0.33 | 0.178 | 1.858 | 0.065 |
| ECIV.l8 | -0.245 | 0.066 | -3.69 | 0 |
| Granger Causality | | | | 0.075 |

**Panel E: Germany**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| Vol_Ind.l1 | 0.365 | 0.086 | 4.251 | 0 |
| ECIV.l2 | 0.08 | 0.031 | 2.57 | 0.011 |
| ECIV.l3 | 0.133 | 0.033 | 4.05 | 0 |
| ECIV.l4 | 0.062 | 0.034 | 1.814 | 0.071 |
| Vol_Ind.l5 | 0.166 | 0.092 | 1.803 | 0.073 |
| Vol_Ind.l6 | 0.265 | 0.092 | 2.886 | 0.004 |
| ECIV.l7 | -0.06 | 0.032 | -1.9 | 0.059 |
| ECIV.l8 | -0.06 | 0.028 | -2.11 | 0.036 |
| Granger Causality | | | | 0.008 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.516 | 0.086 | -6.03 | 0 |
| ECIV.l2 | -0.197 | 0.096 | -2.06 | 0.041 |
| ECIV.l3 | 0.315 | 0.101 | 3.113 | 0.002 |
| Vol_Ind.l3 | -1.073 | 0.277 | -3.88 | 0 |
| Vol_Ind.l6 | 0.521 | 0.284 | 1.834 | 0.068 |
| ECIV.l8 | -0.279 | 0.088 | -3.17 | 0.002 |
| Granger Causality | | | | 0.011 |

**Panel F: Greece**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| Vol_Ind.l1 | 0.442 | 0.083 | 5.36 | 0 |
| Vol_Ind.l4 | 0.196 | 0.087 | 2.268 | 0.024 |
| Vol_Ind.l6 | 0.197 | 0.086 | 2.28 | 0.024 |
| ECIV.l7 | -0.156 | 0.092 | -1.71 | 0.089 |
| Granger Causality | | | | 0.175 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.611 | 0.08 | -7.66 | 0 |
| ECIV.l2 | -0.236 | 0.092 | -2.56 | 0.011 |
| ECIV.l3 | 0.159 | 0.095 | 1.678 | 0.095 |
| Vol_Ind.l3 | -0.157 | 0.081 | -1.94 | 0.054 |
| ECIV.l4 | -0.166 | 0.095 | -1.75 | 0.082 |
| ECIV.l8 | -0.268 | 0.068 | -3.93 | 0 |
| Granger Causality | | | | 0.621 |

**Panel G: Italy**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| Vol_Ind.l1 | 0.333 | 0.082 | 4.039 | 0 |
| ECIV.l2 | 0.197 | 0.079 | 2.508 | 0.013 |
| ECIV.l3 | 0.257 | 0.083 | 3.097 | 0.002 |
| ECIV.l4 | 0.178 | 0.084 | 2.114 | 0.036 |
| Vol_Ind.l6 | 0.167 | 0.087 | 1.926 | 0.055 |
| ECIV.l7 | -0.173 | 0.067 | -2.59 | 0.01 |
| Vol_Ind.l7 | 0.206 | 0.086 | 2.38 | 0.018 |
| Granger Causality | | | | 0.043 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.625 | 0.08 | -7.82 | 0 |
| ECIV.l2 | -0.241 | 0.097 | -2.49 | 0.014 |
| ECIV.l3 | 0.226 | 0.103 | 2.198 | 0.029 |
| Vol_Ind.l3 | -0.393 | 0.103 | -3.82 | 0 |
| ECIV.l8 | -0.239 | 0.066 | -3.63 | 0 |
| Granger Causality | | | | 0.043 |

**Panel H: Latvia**

**Vol_Ind~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | 0.089 | 0.02 | 4.385 | 0 |
| Vol_Ind.l1 | 0.236 | 0.071 | 3.313 | 0.001 |
| ECIV.l2 | 0.071 | 0.024 | 2.955 | 0.004 |
| Vol_Ind.l2 | 0.195 | 0.072 | 2.696 | 0.008 |
| ECIV.l3 | 0.046 | 0.025 | 1.855 | 0.065 |
| ECIV.l8 | 0.045 | 0.024 | 1.854 | 0.065 |
| Vol_Ind.l9 | 0.15 | 0.073 | 2.07 | 0.04 |
| Vol_Ind.l10 | 0.178 | 0.071 | 2.519 | 0.013 |
| Granger Causality | | | | 0.005 |

**ECIV~ECIV+Vol_Ind**

| Independent Variables | Estimate | Std Error | t.value | p.value |
|---|---|---|---|---|
| ECIV.l1 | -0.594 | 0.072 | -8.19 | 0 |
| ECIV.l2 | -0.181 | 0.086 | -2.1 | 0.037 |
| Vol_Ind.l3 | -0.448 | 0.263 | -1.71 | 0.09 |
| Vol_Ind.l4 | 0.441 | 0.266 | 1.659 | 0.099 |
| ECIV.l7 | -0.174 | 0.087 | -2 | 0.047 |
| ECIV.l9 | 0.222 | 0.083 | 2.674 | 0.008 |
| ECIV.l10 | 0.198 | 0.073 | 2.717 | 0.007 |
| Vol_Ind.l10 | 0.602 | 0.253 | 2.382 | 0.018 |
| Granger Causality | | | | 0.152 |

| Panel M: Sweden | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ECIV+Vol_Ind | | | | | ECIV~ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| Vol_Ind.l1 | 0.407 | 0.082 | 4.947 | 0 | ECIV.l1 | -0.6 | 0.08 | -7.5 | 0 |
| ECIV.l2 | 0.159 | 0.079 | 2.009 | 0.046 | ECIV.l2 | -0.236 | 0.095 | -2.48 | 0.014 |
| ECIV.l3 | 0.263 | 0.083 | 3.178 | 0.002 | ECIV.l3 | 0.196 | 0.099 | 1.97 | 0.05 |
| Vol_Ind.l4 | 0.156 | 0.088 | 1.772 | 0.078 | Vol_Ind.l3 | -0.345 | 0.102 | -3.37 | 0.001 |
| ECIV.l6 | -0.145 | 0.079 | -1.83 | 0.069 | ECIV.l4 | -0.199 | 0.101 | -1.97 | 0.05 |
| Vol_Ind.l6 | 0.167 | 0.089 | 1.875 | 0.062 | ECIV.l8 | -0.236 | 0.067 | -3.5 | 0.001 |
| ECIV.l7 | -0.219 | 0.071 | -3.08 | 0.002 | Granger Causality | | | | 0.22 |
| ECIV.l8 | -0.093 | 0.056 | -1.66 | 0.099 | | | | | |
| Granger Causality | | | | 0.005 | | | | | |

| Panel N: Switzerland | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ ECIV+Vol_Ind | | | | | ECIV~ ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| ECIV.l1 | 0.06 | 0.035 | 1.724 | 0.086 | ECIV.l1 | -0.562 | 0.079 | -7.07 | 0 |
| Vol_Ind.l1 | 0.335 | 0.081 | 4.14 | 0 | ECIV.l2 | -0.211 | 0.095 | -2.22 | 0.028 |
| ECIV.l2 | 0.077 | 0.042 | 1.856 | 0.065 | ECIV.l3 | 0.214 | 0.098 | 2.175 | 0.031 |
| ECIV.l3 | 0.161 | 0.043 | 3.723 | 0 | Vol_Ind.l3 | -0.484 | 0.189 | -2.56 | 0.011 |
| ECIV.l5 | 0.074 | 0.045 | 1.656 | 0.099 | ECIV.l7 | -0.151 | 0.088 | -1.71 | 0.088 |
| ECIV.l6 | -0.077 | 0.042 | -1.82 | 0.071 | ECIV.l8 | -0.248 | 0.068 | -3.62 | 0 |
| Vol_Ind.l6 | 0.233 | 0.086 | 2.698 | 0.008 | Granger Causality | | | | 0.533 |
| ECIV.l7 | -0.14 | 0.039 | -3.62 | 0 | | | | | |
| ECIV.l8 | -0.084 | 0.03 | -2.79 | 0.006 | | | | | |
| Granger Causality | | | | 0 | | | | | |

| Panel O: United Kingdom | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ECIV+Vol_Ind | | | | | ECIV~ ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| Vol_Ind.l1 | 0.472 | 0.078 | 6.046 | 0 | ECIV.l1 | -0.555 | 0.078 | -7.08 | 0 |
| ECIV.l2 | 0.143 | 0.046 | 3.107 | 0.002 | ECIV.l2 | -0.218 | 0.089 | -2.43 | 0.016 |
| ECIV.l3 | 0.194 | 0.048 | 4.02 | 0 | ECIV.l4 | -0.273 | 0.096 | -2.85 | 0.005 |
| ECIV.l9 | 0.075 | 0.044 | 1.714 | 0.088 | ECIV.l8 | -0.216 | 0.091 | -2.37 | 0.019 |
| Vol_Ind.l10 | 0.129 | 0.077 | 1.68 | 0.095 | ECIV.l9 | 0.183 | 0.085 | 2.151 | 0.033 |
| Granger Causality | | | | 0.001 | Granger Causality | | | | 0.521 |

| Panel M: Sweden | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ECIV+Vol_Ind | | | | | ECIV~ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| Vol_Ind.l1 | 0.407 | 0.082 | 4.947 | 0 | ECIV.l1 | -0.6 | 0.08 | -7.5 | 0 |
| ECIV.l2 | 0.159 | 0.079 | 2.009 | 0.046 | ECIV.l2 | -0.236 | 0.095 | -2.48 | 0.014 |
| ECIV.l3 | 0.263 | 0.083 | 3.178 | 0.002 | ECIV.l3 | 0.196 | 0.099 | 1.97 | 0.05 |
| Vol_Ind.l4 | 0.156 | 0.088 | 1.772 | 0.078 | Vol_Ind.l3 | -0.345 | 0.102 | -3.37 | 0.001 |
| ECIV.l6 | -0.145 | 0.079 | -1.83 | 0.069 | ECIV.l4 | -0.199 | 0.101 | -1.97 | 0.05 |
| Vol_Ind.l6 | 0.167 | 0.089 | 1.875 | 0.062 | ECIV.l8 | -0.236 | 0.067 | -3.5 | 0.001 |
| ECIV.l7 | -0.219 | 0.071 | -3.08 | 0.002 | Granger Causality | | | | 0.22 |
| ECIV.l8 | -0.093 | 0.056 | -1.66 | 0.099 | | | | | |
| Granger Causality | | | | 0.005 | | | | | |

| Panel N: Switzerland | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ ECIV+Vol_Ind | | | | | ECIV~ ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| ECIV.l1 | 0.06 | 0.035 | 1.724 | 0.086 | ECIV.l1 | -0.562 | 0.079 | -7.07 | 0 |
| Vol_Ind.l1 | 0.335 | 0.081 | 4.14 | 0 | ECIV.l2 | -0.211 | 0.095 | -2.22 | 0.028 |
| ECIV.l2 | 0.077 | 0.042 | 1.856 | 0.065 | ECIV.l3 | 0.214 | 0.098 | 2.175 | 0.031 |
| ECIV.l3 | 0.161 | 0.043 | 3.723 | 0 | Vol_Ind.l3 | -0.484 | 0.189 | -2.56 | 0.011 |
| ECIV.l5 | 0.074 | 0.045 | 1.656 | 0.099 | ECIV.l7 | -0.151 | 0.088 | -1.71 | 0.088 |
| ECIV.l6 | -0.077 | 0.042 | -1.82 | 0.071 | ECIV.l8 | -0.248 | 0.068 | -3.62 | 0 |
| Vol_Ind.l6 | 0.233 | 0.086 | 2.698 | 0.008 | Granger Causality | | | | 0.533 |
| ECIV.l7 | -0.14 | 0.039 | -3.62 | 0 | | | | | |
| ECIV.l8 | -0.084 | 0.03 | -2.79 | 0.006 | | | | | |
| Granger Causality | | | | 0 | | | | | |

| Panel O: United Kingdom | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Vol_Ind~ECIV+Vol_Ind | | | | | ECIV~ ECIV+Vol_Ind | | | | |
| **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** | **Independent Variables** | **Estimate** | **Std Error** | **t.value** | **p.value** |
| Vol_Ind.l1 | 0.472 | 0.078 | 6.046 | 0 | ECIV.l1 | -0.555 | 0.078 | -7.08 | 0 |
| ECIV.l2 | 0.143 | 0.046 | 3.107 | 0.002 | ECIV.l2 | -0.218 | 0.089 | -2.43 | 0.016 |
| ECIV.l3 | 0.194 | 0.048 | 4.02 | 0 | ECIV.l4 | -0.273 | 0.096 | -2.85 | 0.005 |
| ECIV.l9 | 0.075 | 0.044 | 1.714 | 0.088 | ECIV.l8 | -0.216 | 0.091 | -2.37 | 0.019 |
| Vol_Ind.l10 | 0.129 | 0.077 | 1.68 | 0.095 | ECIV.l9 | 0.183 | 0.085 | 2.151 | 0.033 |
| Granger Causality | | | | 0.001 | Granger Causality | | | | 0.521 |

Note: Table A.2 reports VAR models' estimation per country. These models are estimated to show the substantial effect that the European common Idiosyncratic Volatility (ECIV) on national market portfolio volatility. We present also the p-value of granger causality test performed for each model. In the case of 14 out of 15 markets, lagged values of ECIV have a significant impact on the market portfolio volatility. "Vol_Ind" is the market portfolio volatility and "ECIV" is the European common idiosyncratic volatility. To identify the lag order, we add the letter "l" followed by the lag order; per example "ECIV.l1" means the first lag of the variable European common idiosyncratic volatility.

# Chapitre 2

## Corporate Social Responsibility in Europe: Impact on the Idiosyncratic Volatility[11]

[11] The work in this chapter is based on the article KHALED FAROUK SOLIMAN, A. et E. LE SAOUT, "Corporate Social Responsibility in Europe: Impact on the Idiosyncratic Volatility". *10th International Conference of the Financial Engineering and Banking Society*, Lille, september 2021.

## 2.1. Introduction

Classical financial theories are based on a shareholder perspective. Such a perspective holds that firm's main objective is only limited to maximizing shareholder wealth with no responsibility to act in the benefit of other stakeholders, even if it serves transcendent objectives like society's welfare and environmental cause (Friedman, 1970). However, due to recent legal and societal obligations, companies engage in activities with no direct impact on shareholder wealth, such as modernizing their production process in a way to make it more environmentally friendly, improving the work environment for labor, taking into consideration human rights by avoiding suppliers with history in employee exploitation and child labor and participate in activities serving community development.

Corporate Social responsibility (CSR) is a business model that helps firms and companies to engage more socially and environmentally. Firms adopt that model to be able to operate in a way that helps in enhancing rather than degrading the environment and society. It aids firms to be more socially and environmentally accountable to themselves and their stakeholder. The explanation basis of a firm's investments to engage in Corporate Social Responsibility (CSR) is found in the stakeholder theory (Freeman, 1984). It asserts that companies engage in CSR activities to reduce the risk of occurrence of conflicts with different stakeholders, like for example governmental agencies and environmental and social activists, which would impact negatively its risk profile and its financial performance. In the United States, BlackRock and State Street Global Advisors (SSGA), two of the major firms in the field of asset management, stressed on the importance of extra-financial and sustainability disclosure for the publicly traded companies and recommended the use of the Sustainability Accounting Standards Board (SASB) guidelines. These latter help in setting standards for a firm to meet their investors' demands or needs of financial material sustainability and disclosure. The Governance and Accountability Institute has reported that 90% of the companies listed in the S&P 500 index publish Sustainability reports against less than 20% in 2011.

According to the Association of Financial Markets in Europe (AFME), assets under management (AUM) in European markets invested in environmental, social governance

(ESG) funds have increased to €21,925 Billion in the first quarter of 2021. While the share of equity assets under management invested in the ESG funds is 63%, bond assets under management represent 23% of total investments in ESG funds. The increase in Socially Responsible Investment (SRI) in European markets, and other markets as well, is explained by a growing number of fund managers considering the inclusion of CSR/ESG criteria in their investment decision-making process for multiple reasons (UNEP FI, 2019). First, the increasing asset owners' demand for the integration of CSR/ESG-related factors when engaging asset managers.[12] Second, the European Union directives[13] supporting the non-financial reporting, especially for their Corporate Social Responsibility (CSR) performance, and encouraging European firms to implement more serious CSR policy. The European Union (EU) directives 2014/95/EU and 2013/34/EU urge large European firms to adopt more conservative Corporate Social Responsibility (CSR) norms and disclose more information on their CSR performance. The European Commission defines CSR as: « the responsibility of enterprises for their impacts on society. To fully meet their social responsibility, companies "should have in place a process to integrate social, environmental, ethical, human rights, and consumer concerns into their business operations and core strategy in close collaboration with their stakeholders, to maximize the creation of shared value for their owners/shareholders and civil society at large and identifying, prevent and mitigating possible adverse impacts".

In addition to encouraging firms to improve their CSR performance, the European Commission issued the directive 2016/2341 on the supervision and activities of the Institutions of Occupational Retirement Provision (IORP). It mandates the inclusion of environmental, social, and governance factors in pension funds' governance system when considering investment decisions. The European Union is still aiming to set and enhance

[12] The UNEP Fi 2019 survey find that 69% of asset owners integrate ESG-related factors when they appoint asset managers. They also state that investors become more active regarding ESG questions, as 62% of survey participants take into consideration EGS criteria when monitoring asset managers. In addition, investors are becoming more committed to the environmental cause by supporting initiatives, like the Climate Action 100+, and by calling upon the G20 to support the climate disclosure.

[13] The article 26 of the Accounting Directive 2013/34/EU mandate the disclosure of the environmental and social analysis related to the firm's activity in the management reports. Under The European Union (EU) directive 2014/95/EU, The Non-Financial Reporting Directive (NFRD), large companies, financial and non-financial, have to publish information related environmental and social matters, human right related issues, anti-corruption effort, and diversity on company boards. Firms have to report about the impact of their business on people and the environment and about how sustainability problems affect their activity. This is a "double materiality perspective".

regulations to place sustainability at the heart of the Union's Capital Markets by establishing an Action Plan on Sustainable Finance Growth[14]. As a result of the increasing demands of investors for sustainability analysis and the European Union's intentions to integrate it into regulations, conventional funds adopt ESG analysis in their risk management analysis to avoid and/or contain crisis negative effect (Gangi and Trotta, 2015; Mercedes Alda, 2020).

In 2021, the European Commission is proposing the Corporate Sustainability Reporting Directive to cover more companies, extending the application of non-financial reporting to the non-listed large companies and listed SMEs, and improving the quality and the comparability of disclosed environmental and social information. This proposal responds to demands from investors and stakeholders for improving the quality and the quantity of disclosed sustainability-related information.

Several studies have investigated the determinants of idiosyncratic volatility, which is a component of stock volatility that is not explained by common factors. Modern portfolio theory teaches us that this component is diversifiable and should not be priced (Markowitz, 1952; Sharpe, 1964; Lintner, 1965). However, most recent empirical studies show that the idiosyncratic risk can be priced in the cross-section of stock returns, although there is no consensus on how it should be priced (Ang, Hodrick, Xing and Zhang, 2006,2009; Fu, 2009; Brockman et al., 2009; Brockman et al., 2020; Zhong, 2017). If this variable is well specified it should reflect firm specific information.

There is also no consensus on how firm specific information is incorporated in stock idiosyncratic returns. High relative idiosyncratic volatility is assumed to be related to more informed trading and better information (Morck, Yeung, and Yu, 2000; Durnev, Mork, Yeung, and Zarowin, 2003; Jin and Myers, 2006). Therefore, greater opaqueness would be associated with higher R2. There is a strand of literature that shows that idiosyncratic volatility could be an "occasional frenzy" as described by Roll (1988) and related positively to mispricing (De Long, Shleifer, Summers, and Waldman, 1990; Dontoh,

[14] The Action Plan on Sustainable Finance Growth was released in 2018 by the European Commission with three main outlines:1. Increase capital flows towards sustainable investment to reach inclusive growth, 2. Integrate sustainability into risk management, and 3. Encouraging transparency in financial and economic activity.

Rhadhakrishnan and Ronen, 2004; Pontiff, 2006; Kelly, 2014). In other words, an increase in idiosyncratic volatility is considered due to increased trading noise. Consequently, an increase in idiosyncratic volatility indicates a deviation in the stock price from its fundamental value.

Since the argument about the nature of the relationship between idiosyncratic volatility and firm specific information still holds, this raises questions about the direction of the relationship between firm CSR performance and the idiosyncratic component of stock volatility. The findings are ambiguous. For instance, Luo and Bhattacharya, 2009, Mishra and Modi (2012) and Brooks and Oikonomou (2018) have found a negative relation, on the other hand, Beccheti, Ciciretti, and Hasan (2015) have found a positive relation since they suggest that idiosyncratic volatility reflects better-informed trading based on firm specific information. Several works have investigated the determinants of idiosyncratic volatility and show that it is a component of stock volatility not explained by common factors.

This study focuses on the impact of CSR performance on firm idiosyncratic volatility in nine European countries separately because country attributes have a critical impact on CSR activities. Cai, Pan, and Statman (2016) show that CSR rating variations across different countries are explained by the country's characteristics, such as economic development and political system. They document a positive relationship between the median CSR scores of all companies and the economic development, proxied by the per capita income, and a negative relationship between the median CSR scores in a country and strong civil liberty and political rights. In the same view, Liang and Renneboog (2017) find that the country's legal origins have a strong impact on the firm's CSR rating. CSR scores are higher in civil law countries than in common law countries. They argue also that country's legal origin effect on CSR ratings is more important than other countries[15] or firm attributes[16].

Prior studies have presented the relationship between CSR performance and the stock volatility or idiosyncratic volatility as it has existed since the dawn of investing in stock

[15] Such as regulatory quality, social preferences, political institutions, and culture.

[16] They include financial performance, corporate governance, and ownership structure.

exchanges. It is examined as if it was as strong as the relationship between earnings and stock returns. However, the impact of CSR or sustainability reporting on the stock risk or idiosyncratic volatility is a very recent phenomenon, even though the extra financial reporting dates from at least the eighties. Robertson (1976) observed a shift of power balance between different firms' stakeholders, like investors, customers, and the public. Workers' rights were legalized, and discussions were held to improve the work's condition, going to allow the employees to participate in management. Nevertheless, countries, such as France, had already regulated the information addressed to employees through "*Bilan social.*" In other words, the social pillar of ESG is established in the seventies. The information associated with employees and workers was sort of accessible for investors. Nevertheless, the ecological concerns emerged in the eighties and crystalized in Brundtland Report. Although the establishment of guidelines of the Global Reporting Initiative in 1999 made the breakthrough of the institutionalization of sustainable or environmental social reporting norms, before this year, these norms were norms of behavior (Larrinaga and Bebbington, 2021). In simpler terms, some of the information related to a firm's social and environmental performance were already available for investors. In this paper, we test the impact of CSR performance on idiosyncratic risk. Furthermore, we seek to discover if this information was already exploited by investors or it is included in the investor's decision-making process recently. We test the CSR impact and its significance in each of the nine countries separately for practical reasons, then we test them on the European level by including all firms in our sample in the analysis. This study contributes to the literature on the impact of extra-financial information disclosure on the firm's specific risk.

The paper is organized as follows. Section 2 provides a review of the idiosyncratic volatility and discusses the links between volatility and CSR. Section 3 presents the empirical study. We provide different specifications of our model and data and discuss the influence of global CSR measures and their components on idiosyncratic volatility. Section 4 concludes.

## 2.2. Corporate social responsibility and the idiosyncratic volatility

In this section, we review the main findings in the literature on idiosyncratic volatility and the model used to estimate idiosyncratic volatility and examine the relationship with corporate social and environmental performance.

### 2.2.1. Literature review

The first part of the review refers to idiosyncratic volatility and the information it is supposed to convey. The second part addresses the links between volatility and CSR performance, particularly in studies on socially responsible investment. The last part discusses the relation between and idiosyncratic volatility and its relation to stock returns.

#### 2.2.1.1. Idiosyncratic volatility: a mirror for firm specific information?

The concept of idiosyncratic volatility differs with different theories and perspectives. The informed trading hypothesis argues that any kind of firm information should be reflected in the volatility of the idiosyncratic component in the stock return. The intuition is that in the case of firm specific public information, stock trading based on this information increases. Consequently, the stock price movement should be correlated less with the market return movement. Therefore, this hypothesis predicts a positive relationship between idiosyncratic volatility and public firm specific information. Morck, Yeung, and Yu (2000) argue that the better the information environment, the more the co-movement between stock returns will decrease. In other words, R2 becomes weaker and the weight of the idiosyncratic component in the stock return increases. Similarly, Durnev, Mork, Yeung, and Zarowin,(2003) find that firms with high idiosyncratic volatility, have relatively higher stock price informativeness. Jin and Myers (2006) predict that countries characterized by greater opaqueness display high stock returns correlations which translate into a high $R_2$.

However, idiosyncratic volatility can be related more to noise trading and mispricing. De Long et al. (1990) show that the beliefs of noise traders are unpredictable to the point that it becomes risky for arbitrageurs to bet against them. Kelly (2014) provides evidence that a low $R_2$ is associated with a poorer information environment and greater obstacles to trading. Dontoh et al. (2004) show that noise trading has a negative influence on the relation between stock prices and accounting information. In this view, idiosyncratic volatility should decrease as the information environment improves and firm specific information becomes more accessible. In this view also, the rational consequence is that the stock price will tend towards its fundamental value as idiosyncratic volatility decreases since mispricing also is supposed to decrease.

In the same line, the signaling theory (Spence, 1973) assets it is beneficial for firms to send a signal to differentiate themselves from others. Several studies used the theory to explain how firms can make potential benefits by adopting socially responsible practices (Ramchander et al., 2012; Su et al., 2014; Nguyen et al., 2020). When CSR practices are voluntary, firms tend to signal their characteristics and actions, unobserved by stakeholders other than shareholders, by disclosing information related to its environmental and social effects.

#### 2.2.1.2. The relationship between idiosyncratic volatility and CSR performance

Analysis of the relationship between environmental and social performance (Environmental, Social and Governance, "ESG") criteria and volatility, mainly uses a socially responsible investment lens.

The relationship between CSR and firm specific or global risk can be theoretically explained in the context of two theories. The first theory is the stakeholder theory (Freeman, 1984). According to this theory, a firm should satisfy stakeholders, not only shareholders but also governmental agencies, employees, environmentalists, and more. In this context, CSR is employed to avoid possible conflicts with stakeholders, especially environment activists, workers' unions, and the government. As a result, the firm risk is likely to be reduced. CSR engagement is perceived as the insurance-like protection for the relationship-based intangible assets of a firm (Godfrey, 2005). Several studies (Godfrey, 2005; Luo and Bhattacharya, 2006; Godfrey et al., 2009) argue that CSR commitment can create a positive moral capital among different stakeholders.

Many studies support this risk mitigation effect of the CSR engagement by reporting a negative relationship between the firm's CSR performance and the risk. The notion of risk is at the heart of the argument developed by Kurtz (2002) who describes an ‘information’ effect. Kurtz suggests that those companies best able to control their socio-environmental issues experience fewer social and industrial conflicts and their effects on their reputation.

Companies that do not engage in socially responsible behavior are subject to a higher risk of bankruptcy and withdrawal of capital by investors. Therefore, the selection of securities must allow the generation of added value. Similar to Kurtz (2002), Viviani, Revelli, and Fall (2015) examine the relationship between CSR and financial risk by measuring the value-at-risk. They conclude that companies with better CSR experienced lower downside risks during this period, based on value-at-risk statistics. In terms of risk prediction, they find an original relationship between the ‘human resources’ dimension and the statistical quality of the prediction of stock return risk for short sales. Hoepner et al. (2018) provide more evidence of the negative impact of CSR commitment on the downside risk using lower partial moment and value-at-risk. They emphasize that this impact is driven mainly by the firm's environmental engagement. Similarly, Ilhan et al. (2019) document firms with higher carbon emissions, used as poor ESG rating proxy, exhibit higher tail risk.

Diamond and Verrechia (1991) find a negative association between stock price volatility and improved disclosure and accounting quality. Rajgopal and Venkatachalam (2011) find a negative significant relationship between idiosyncratic volatility and earnings quality decline. They highlight that this is an observed relation, but that it does not support a causal relation. Benabou and Tirole (2010) hint at the potential effect of corporate social performance on the firm’s systematic risk since they could be more resilient to crisis shocks.

Modeling the CSR as a tool for product differentiation, Albuquerque et al. (2018) find that CSR investments decrease firm’s systematic risk and increase shareholders’ wealth. Broadstock et al.'s (2021) results show that high ESG performing stocks in China have exhibited a relative resilience to financial risk[17] during the financial crisis related to the Coronavirus pandemic.[18]Whereas, high ESG performance stocks still don’t benefit from a

[17] They used the stock volatility as a financial risk proxy.

[18] Several studies are interested in the effect that CSR engagement would have on financial performance during the 2008 financial crisis. Lins et al. (2017) and Cornett et al. (2016) show that, non-financial firms

total immunity to financial crisis.

In the context of the relationship between idiosyncratic volatility and CSR performance, Luo and Bhattacharaya (2009) find that Corporate Social Performance (CSP) reduces the idiosyncratic volatility of the stock. In prior works, Boutin-Dufresne and Savaria (2004) and Lee and Faff (2009) find that firms with higher CSR scores exhibit lower firm specific risk. Mishra and Modi (2012) take into account the asymmetric response of idiosyncratic volatility to different CSR proxies and, show that the relationship is negative for positive CSR proxies and positive for negative CSR proxies. They state that the effect of positive CSR on idiosyncratic volatility is not guaranteed. Brooks and Oikonomou (2018) provide evidence of a causal negative relation between CSP and financial risk, whether systematic or idiosyncratic. This relation holds across different markets and asset classes. In a study that covers 67 countries, Chollet and Sandwidi (2018) show that total and idiosyncratic risk can be reduced significantly through firm's social performance.[19] However, no significant relationship is found when the systematic risk is considered.

On the other hand, Friedman (1970) states that CSR is not the best investment for a firm's wealth maximization, and it could be potentially harmful to the firm's financial performance. Consistent with this argument, the agency theory predicts a positive relationship between CSR performance and the firm risk (Jensen and Meckling, 1976; Barnea and Rubin, 2010). In the context of principal-agent problems, investing in environmental and social activities could be perceived as a waste of the firm's scarce resources. Barnea and Rubin (2010) argue that managers would tend to over-invest into CSR to improve their reputation as "good global citizens", whereas any investment should have the firm value maximization as its main objective. Bhandari and Javakhadze (2017) show evidence of capital allocation inefficiencies in the firm performance due to investment in CSR activities. [20]Godfrey et al. (2009) and McCarthy et al. (2017) suggest that managers could use investing in CSR activities to mitigate the negative effects of making bad investment decisions on shareholders' wealth. In the same view, Cespa and

---

and Banks with higher CSR ratings have better financial performance.

[19] They argue that the environmental performance has a negative but statistically insignificant effect.

[20] They also argue that focusing on CSR strategies, at the cost of firm's activity-related investment opportunities, may be harmful to shareholder wealth in the long run.

Cestone [21](2007) show in their developed model that managers may over-invest in CSR activities when their position is threatened. They argue that managers' "good relations" with local communities and politicians[22] may be a way to keep their positions because of the pressure these activists could place on shareholders. Managers' engagement to satisfy stakeholders[23] could be at the expense of the firm wealth and, as a result, the firm's risk would be aggravated and their business performance would be compromised. Beccheti, Ciciretti, and Hasan (2015) argue that improved CSR performance should be linked to higher idiosyncratic volatility.[24]However, Humphrey, Lee, and Shen (2012) don't find any significant effect of ESG rating on firm's specific risk.[25]

> *H1: In the context of the stakeholder theory, the firm can reduce its idiosyncratic volatility through improving their CSR performance. In other words, increasing firm's CSR score would reduce the idiosyncratic risk.*

Firm's shareholders witnessed a shift of power balance in their favor vis-à-vis firm's shareholders from the seventies (Robertson ,1976). Labor conditions and workers' rights were regulated and legalized to the extent of allowing employees to participate in firm's management. Nonetheless, in countries, like France, the information addressed to employees had already been regulated by "Bilan Social" in the late seventies. Thereby, the information related to employees and workers was, to some extent, accessible to investors. Nevertheless, the ecological concerns emerged 1987 by Bruntland "*Our Common Future*" report of the United Nations Commission on Environment and Development. The institutionalization of sustainable or environmental and social reporting norms resulted from the issuance of the guidelines of the Global Reporting Initiative in 1999. However, prior this year, these norms were only norms of behavior (Larrinaga and Bebbington,

[21] We can find the origins of this view in Preston and O'Bannon's (1997) works. Trade off and managerial opportunism hypotheses predict a negative relationship between the CSR investment level and financial performance. The negative effect of CSR on firm's financial performance is the result of managers pursuing their private goals by taking an investment decision in ways that do not add value to shareholders'

wealth and may drain off firm's resources.

[22] Other stakeholders could also be considered as environmental and social activists and more.

[23] With the exclusion of shareholders.

[24] However, they find that the existence of the inverse relationship is conditional to the inclusion of a stakeholder risk proxy. Thus, the CSR commitment is negatively related to stakeholder risk but positively related to idiosyncratic risk.

[25] They indicate that the CSR performance has insignificant impact on firm's costs or benefits.

2021). In other words, some of the information related to a firm's social and environmental performance were already available for investors. If the relationship is mechanical or automatic, the relationship must exist once environmental and social related information are available. We test the effect of firm's CSR performance on the idiosyncratic volatility over two sub-periods. While, the first is before 2008 financial crisis, the second starts after it.

From a portfolio analysis point of view, socially responsible investing strategies for ESG criteria are used to position portfolios. Most studies restrict the risk analysis to portfolio diversification. From a theoretical point of view, socially responsible investment underperforms traditional investment. Indeed, the addition of constraints in the portfolio optimization process and the reduction of the investment universe should lead to a decrease in diversification and a lowering of the efficiency frontier (Le Saout, 2006). However, many empirical studies analyzing the risk-adjusted returns results from the market equivalent to that of the portfolios based on the only criteria of expectation of profitability and risk. Kumar et al. (2016) show that firms listed on the Dow Jones Sustainability index exhibit lower stock volatility than their peers. Consistent with the negative relationship between CSR performance and portfolio volatility, Giese et al. (2019) highlight the fact that ESG based portfolios have reduced risk. Mercedes Alda (2020) find that funds with high CSR ratings, whether Socially Responsible Investment (SRI) funds or conventional funds are associated with better returns. This result shows that including non-financial factors in the fund's risk management strategy does add value to the fund's participants' savings. Joliet and Titova (2018) find that SRI funds and conventional funds include ESG criteria as well as financial information in their investment decision-making process. When comparing financial risk and performance of 194 SRI and conventional funds during the financial crisis, Gangi and Trotta (2015) find that SRI funds contain better the crisis' negative impact on both levels. After 2008 crisis, investors started to include the extra-financial information into their investment decision making process. According UNEP Fi 2019 survey, 69% of their sample asset owners consider CSR factors when they appoint asset managers. Investors' interest into CSR/ESG can also be witnessed in the growing share of equity under management invested in socially responsible investment in Europe reaching 63% level.

*H2: If a relationship between idiosyncratic volatility and the firm's CSR performance exists, it would be a recent phenomenon due to the higher demand of extra-financial information from investors.*

## 2.2.2. Idiosyncratic volatility measure and the panel models

In this subsection, we present the way we estimate the idiosyncratic volatility and the panel model, and its different specifications, we use to test the effect of CSR performance on the idiosyncratic.

### 2.2.2.1. Idiosyncratic volatility estimation

We follow Ang et al. (2006, 2009) and consider idiosyncratic volatility as the standard deviation of the idiosyncratic return using an asset pricing model. While Ang et al. (2006,2009) use Fama and French's (1992) three-factor model, for each year and every firm in each country, we regress the stock excess return on the different daily Fama and French (1992, 2016) risk factors and Carhat's (1997) momentum factor over a 60-day rolling window. Then the idiosyncratic volatility model can be written as:

$$R_{it} - r_t = \alpha_{it} + \beta_{mi}(R_{mt} - r_t) + \beta_{SMBi}SMB_t + \beta_{HMLi}\,HML_t + \beta_{RMWi}\,MOM_t + \beta_{RMWi}\,RMW_t + \beta_{CMAi}\,CMA_t + \varepsilon_{it} \quad (1)$$

where $R_{it}$ is the return of the stock *i* during the month t ; $r_t$is the free risk rate ; $\alpha_{it}$is the intercept ; $\beta_{mi}$ is the value weighted market return ; $\beta_{SMBi}$ is the size factor coefficient ; $SMB_t$ is the return from the portfolio small minus big ; $\beta_{HMLi}$ is the book to market coefficient; $HML_t$ is the difference between the portfolio return including the high book to market ratio firms and the low book to market ratio portfolio return ; $MOM_t$ is the average return from the high momentum portfolios minus the average return from the low momentum portfolios; $RMW_t$ is the average return from the robust operating profitability portfolios minus the average return from the two weak operating profitability portfolios; $CMA_t$is an investment factor, estimated as the difference between the average return from the conservative investment portfolios and the average return from the aggressive investment portfolios; $\varepsilon_{it}$ is the residual. The realized idiosyncratic volatility is considered as the standard deviation of this residual. Since we use daily data, the standard deviation of the estimated residuals is also daily and should be converted into a yearly standard deviation. Thereby, we multiply the daily standard deviation by the square root of the number of trading days in the corresponding year.

#### 2.2.2.2. The panel data analysis

To test the relationship between the idiosyncratic volatility and firm environmental and social performance, we estimate three-panel data specifications using the environmental-social index as the CSR variable in the first specification, the environment variable in the second specification, and the social variable in the last specification.

$$Ivol_{it} = \alpha_{it} + \beta_{CSRi}\, CSR\ variable_{it-1} + \beta_{EPSi}\, EPS_{it-1} + \beta_{MKTCAPi}\, MKTCAP_{it-1} + \beta_{LEVi} LEV_{it-1} + \beta_{MTBi}\, MTB_{it-1} + \beta_{TURNi} TURN_{it-1} + \varepsilon_{it} \quad (2)$$

Where for each firm *i* and during the year *t*, CSR variable is a value-weighted average of Environment and Social components in the first specification, the Environment variable in the second specification, and for the last specification the Social variable; EPS is the earnings per share variable, MKTCAP is the size variable measured as the natural logarithm of the yearly market capitalization; LEV is the natural logarithm of the ratio of the debt value relative to total assets value; MTB is the market to book ratio. In each specification, the standard errors are robust for heteroscedasticity. We follow Petersen (2009) by adjusting the standard errors using two-way clustering, by both countries (the individual effect) and by year (the time effect). To choose the appropriate estimation technique (Pooled, Fixed Effects or Random Effects) for each country, we use Breusch Pagan Lagrangian Multiplier and the Hausman tests for each specification.

## 2.3. Empirical analysis

The purpose of our analysis is to determine the effects of CSR performance on idiosyncratic volatility in Europe. We present the data followed by the different specifications for the panel model and the idiosyncratic volatility estimates. The following sections deal successively with the impact of the CSR scores on the idiosyncratic volatility and the effect of the CSR components on idiosyncratic volatility.

### 2.3.1. Data

Our market data are extracted from Datastream for 2003 to 2018. We collected daily stock prices and return indexes. All values are in dollars. Fama and French factors were obtained from the Ken French website. Our sample includes nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the UK). In addition to hosting the largest market exchanges in Europe, these countries represent over 70% of European GDP. We collected CSR components from the Refinitiv[26] database. The database calculates CSR/ESG scores using a subset of 186 metrics, which are regrouped into 10 components. Components' scores are summed up into three pillars: Environment, Social, and Governance. A higher score reflects better CSR disclosure and performance. In this study, we only focus on Environment and Social pillars. We identify three components for the environment: resources use (Res. Use), emissions (EMS), and environmental innovation (Env. In.). The Social pillar is divided into four components: workforce (WF), human rights (HR), community (COM), and product responsibility (Prdt Resp.). We include a controversial score related to deterioration in global CSR performance. We also apply weights of the global ESG index to calculate the weighted average index for each pillar: "ENV" for the environment pillar and "SOC" for the social pillar. The Environment-Social index (ES) is calculated based on these components computed in the same way as ENV and SOC.

Table 1 presents the number of indicators and the weights; Table 2 presents the summary statistics for the CSR proxies. We observe that Spain has the highest ES and SOC indices and Belgium has the weakest ES, ENV, and SOC indices. The volatility of the indices varies across countries. The UK is characterized by the least volatile ES and SOC indices; the most volatile ES, ENV, and SOC indices are recorded for Spain, Italy, and Germany respectively. In terms of sample composition, the UK has the highest proportion of firms and the Netherlands has the lowest weight in the sample (2.84%). Table A.1 reports correlations between idiosyncratic volatility and each country's ES, ENV, SOC,

[26] Refinitiv was Thomson and Reuters and Blackstone's Consortium property. It contains Asset 4 ESG database which is widely used in CSR/ESG literature. In 2019 it was sold entirely to London Stock Exchange Group (LSEG).

and GOV[27]. All the correlations are weak and are mostly negative.

**Table 1: Weights**

| Pillar | Component | Indicators Number | Weights (%) | Weight in the Pillar(%) |
|---|---|---|---|---|
| ENV | Ressource use | 19 | 11 | 32.35 |
| | Emissions | 22 | 12 | 35.29 |
| | Innovation | 20 | 11 | 32.35 |
| SOC | Workforce | 29 | 16 | 45.07 |
| | Humanrights | 8 | 4.5 | 12.68 |
| | Community | 14 | 8 | 22.54 |
| | Product Responsibility | 12 | 7 | 19.72 |

Note: We collect CSR components scores from the Refinitiv database. The database calculates CSR/ESG scores using a subset of 186 metrics, which are regrouped into 10 components. Components' scores are summed up into three pillars: Environment, Social, and Governance. A higher score reflects better CSR disclosure and performance. In this study, we only focus on Environment and Social pillars. We identify three components for the environment: resources use (Res. Use), emissions (EMS), and environmental innovation (Env. In.). The Social pillar is divided into four components: workforce (WF), human rights (HR), community (COM), and product responsibility (Prdt Resp.). We include a controversial score related to deterioration in global CSR performance. In this table, we present components we use in computing CSR score indices. In column 5, we present the weights we apply to compute global ES index and to calculate the weighted average index for each pillar: "ENV" for the environment pillar and "SOC" for the social pillar.

For the control variables, we use earnings per share (EPS) to proxy for profitability. Firm size is the natural logarithm of the average market capitalization (MKTCAP) over the year. To control for stock liquidity, we use the natural logarithm of the stock turnover (TURN), calculated as the number of shares traded divided by the number of shares outstanding. The market to book (MTB) ratio is the firm's market capitalization is divided by its book value. Leverage (LEV) is the natural logarithm of the ratio of the firm's long-run debt value to its total market capitalization.

### 2.3.2. The Impact of the CSR scores on the idiosyncratic volatility

This section discusses the relationship between each variable in the global CSR scores and the idiosyncratic volatility. We run a panel regression for each variable using pooled ordinary least square, random effects, and fixed effects methods. We selected the most appropriate estimation technique based on a Pagan Lagrangian multiplier test and Hausmann test for each specification. It should be noted that the fixed effects models were found to be the most appropriate estimation technique for the majority of the countries for

[27] GOV stands for Governance pillar score.

this section. In each panel of Table B.2, we present the results for the regressions covering the Full period, the Pre-crisis period, and the Post-crisis period. We report the adjusted R2 and the Hausman test statistic. Each column represents a different specification. In the first specification, we use the weighted average environmental-social score (ES). Columns 2 and 3 present the environment (ENV) and social (SOC) average weighted scores.

**Table 2: Summary Statistics**

| | ES | | | ENV | | | SOC | | | Observations | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | MEAN | MEDIAN | SD | MEAN | MEDIAN | SD | MEAN | MEDIAN | SD | Number | Percentage |
| Belgium | 50.575 | 50.354 | 3.834 | 52.37 | 54.821 | 5.862 | 48.855 | 49.083 | 3.507 | 277 | 3.49% |
| France | 66.639 | 66.867 | 5.096 | 70.606 | 72.301 | 6.262 | 62.838 | 62.394 | 4.518 | 1088 | 19.32% |
| Germany | 61.528 | 62.573 | 5.127 | 62.99 | 64.753 | 4.287 | 60.128 | 59.721 | 6.264 | 894 | 13.76% |
| Italy | 57.307 | 58.935 | 5.537 | 56.516 | 57.852 | 7.204 | 58.064 | 60.168 | 4.042 | 558 | 7.75% |
| Netherlands | 66.661 | 67.487 | 4.042 | 56.65 | 56.66 | 2.174 | 67.684 | 67.968 | 3.076 | 294 | 2.84% |
| Spain | 69.488 | 70.594 | 6.209 | 68.333 | 70.33 | 6.543 | 70.597 | 71.58 | 6.215 | 416 | 4.15% |
| Sweden | 60.747 | 62.624 | 5.449 | 62.748 | 65.379 | 5.94 | 59.532 | 61.114 | 4.697 | 483 | 9.06% |
| Switzerland | 55.524 | 55.735 | 3.202 | 57.001 | 56.515 | 3.645 | 53.641 | 53.369 | 2.859 | 665 | 9.17% |
| UK | 55.984 | 56.665 | 1.722 | 59.889 | 60.706 | 2.4 | 52.559 | 53.007 | 1.718 | 2915 | 30.46% |

Note: In this table, we report summary statistics for the CSR indices. Our sample includes 7590 firms nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). In addition to hosting the largest market exchanges in Europe, these countries represent over 70% of European GDP. In columns 10 and 11, we present the number of firms used to test the effect of the CSR on the idiosyncratic volatility in each country. We also report the percentage of each country in the sample.

In the first specification, we regress idiosyncratic volatility on the lagged ESG variables (ES, ENV, and SOC) and the control variables used to proxy for firm fundamentals (EPS, MKTCAP, LEV, MTB, TURN). The coefficients of the ES variable are insignificant for five countries (Belgium, Germany, Italy, Spain, and Sweden)[28] and negative and statistically significant for France (-2.604), Netherlands (-0.041), Switzerland (-0.022), and the UK (-0.894). The ENV score coefficients are mostly not significant except France, Italy, and the Netherlands which have statistically significant coefficients. While the coefficients ENV for France (-1.591) and the Netherlands (-0.012) are negative, they are positive for Italy (0.011). When we consider the SOC variable, the coefficients are insignificant for Belgium, Germany, Italy, Netherlands, and Spain. However, the effect of the SOC variable on idiosyncratic volatility is negative and statistically significant in the cases of France (-2.072), Sweden (-0.034), Switzerland (-0.023) and the UK (-1.063). If

[28] Although the relationship is not significant for the Full period sample, it is statistically significant in the post-crisis sample. It should be highlighted that Sweden implemented CSR into its legislation in 2017 as a reaction to European Union Directive 2014/95/EU.

we include in the regression all firms in all countries, we refer to the results as 'Europe' since these countries have the biggest and most important stock markets in Europe. Results are reported in table 3. ES and SOC scores are respectively -1.281 and -1.372 and significant at the 1% level.

**Table 3: CSR Impact on the idiosyncratic volatility**

| | Europe | | | | | |
|---|---|---|---|---|---|---|
| | ES | | ENV | | SOC | |
| | Full Period | | | | | |
| CSR | -1.281*** | -3.365 | -0.406 | -1.242 | -1.372*** | -4.966 |
| EPS | 0.398*** | 4.385 | 0.406*** | 4.436 | 0.391*** | 4.355 |
| MKTCAP | -3.799*** | -21.558 | -3.865*** | -21.823 | -3.793*** | -21.743 |
| LEV | 0.215** | 2.031 | 0.200** | 1.897 | 0.218** | 2.084 |
| MTB | -0.684*** | -4.411 | -0.664*** | -4.258 | -0.689*** | -4.448 |
| TURN | 0.780*** | 4.631 | 0.805*** | 4.696 | 0.758*** | 4.563 |
| R^2 | | 0.199 | | 0.196 | | 0.202 |
| Hausman test | | 24.648 | | 231.472 | | 98.912 |
| | Pre-crisis Period | | | | | |
| CSR | 0.142 | 0.214 | 0.765 | 1.591 | -0.829 | -1.558 |
| EPS | 0.476*** | 2.945 | 0.471* | 2.921 | 0.485*** | 3.026 |
| MKTCAP | -4.758*** | -16.846 | -4.761*** | -16.899 | -4.729*** | -16.787 |
| LEV | 0.501** | 2.181 | 0.508** | 2.2 | 0.507** | 2.246 |
| MTB | 0.708** | 2.219 | 0.699** | 2.173 | 0.698** | 2.208 |
| TURN | 1.117*** | 3.601 | 1.091*** | 3.519 | 1.121*** | 3.719 |
| R^2 | | 0.105 | | 0.287 | | 0.107 |
| Hausman test | | 121.095 | | 311.655 | | 308.082 |
| | Post-crisis Period | | | | | |
| CSR | -2.757*** | -4.508 | -1.376** | -2.545 | -2.254*** | -5.637 |
| EPS | 0.511*** | 4.682 | 0.522*** | 4.722 | 0.501*** | 4.656 |
| MKTCAP | -3.762*** | -15.29 | -3.842*** | -15.532 | -3.778*** | -15.61 |
| LEV | 0.373*** | 2.746 | 0.364*** | 2.708 | 0.356*** | 2.73 |
| MTB | -0.725*** | -3.919 | -0.730*** | -3.925 | -0.727*** | -3.867 |
| TURN | 1.221*** | 4.137 | 1.273*** | 4.256 | 1.192*** | 4.077 |
| $R^2$ | | 0.185 | | 0.177 | | 0.307 |
| Hausman test | | 136.706 | | 488.624 | | 109.966 |

Note: In each panel of Table 3, we present results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted $R^2$ and the Hausman test statistic. Each column represents a different specification. In the first specification, we use the weighted average environmental-social score (ES). Columns 2 and 3 present the environment (ENV) and social (SOC) average weighted scores. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). We report estimates for control variables, we use earnings per share (EPS) to proxy for profitability. Firm size is the natural logarithm of the average market capitalization (MKTCAP) over the year. To control for stock liquidity, we use the natural logarithm of the stock turnover (TURN), calculated as the number of shares traded divided by the number of shares outstanding. The market to book (MTB) ratio is the firm's market capitalization is divided by its book value. Leverage (LEV) is natural logarithm of the ratio of the firm's long-run debt value to its total market capitalization. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

Our results show that the impact of the CSR variables is either not significant or is negative and of a weak significance for all countries except France.[29] This is expected given the weak correlations between the CSR proxies and idiosyncratic volatility when estimated over the Full period.

We further investigate the relationship between idiosyncratic volatility and the CSR variables considering two sub-periods (Pre-Crisis and Post-Crisis). The financial crisis in 2008 represents a pivotal event, which affected all world economies and financial systems. We explore the effect of the CSR proxies on idiosyncratic volatility by repeating the same regressions for the period before the financial crisis (2000-2007 Pre-Crisis) and the period after the crisis (2009-2018 Post-Crisis). The respective results for the Pre- and Post-crisis periods are presented in Table B.2.

In the Pre-Crisis period, except for Italy, none of the ES and ENV score loadings are significant. Italy's coefficients are positive at the 10% significance level. This reflects a positive impact of the ES score on idiosyncratic volatility. In general, the SOC score coefficients are not statistically significant over the Pre-Crisis period. However, Italy has a coefficient that is positive at the 10% level of statistical significance and the UK's coefficient is negative at the 1% level of statistical significance. These results show that the effect of the social score on idiosyncratic volatility is definitely not negative. In addition, the positive relationship in the case of Italy contrasts with the results present in prior works of literature. It should be noted that previous work focuses on Europe as a whole. Nevertheless, if we focus only on the Pre-crisis period, the negative relationship between idiosyncratic volatility and CSR disappears. The disappearance of this relationship is confirmed while testing all sample firms into regressions (Table 3). All the scores' coefficients are insignificant. It should be noted also that many coefficients are positive although being statistically insignificant. It is worth mentioning that, in the majority of the sample countries, there was no law requiring CSR information-related disclosure in Europe

[29] This is explained by the fact that France is the first country in the European Union to include extra-financial reporting in the law. Thus, the strong evidence of a negative relationship between CSR scores and Idiosyncratic Volatility in France for the Full period comes from the continuous efforts France have made since 2001 with the "*Loi sur la généralisation de l'épargne salariale*." Article 21 requires the disclosure of the environmental, social, and ethical information related to funds' investment decisions. Concerning French firms, in the year 2001, article 116 of the "*Loi des Nouvelles régulations économiques*" provides the application of extra-financial reporting covering environmental and social consequences of their activities.

before the 2008 global financial crisis.

The Post-crisis period is characterized by more significant coefficients than either the Full period or the Pre-crisis period. Most of the ES coefficients are negative and statistically significant except for Belgium which is positive (0.05) at the 5% level of statistical significance. The strongest negative CSR coefficients are found for France (-4.027), Germany[30] (-2.786), and the UK (-2.236), respectively at 1%, 5%, and 1% levels of significance. The weakest ES coefficient is for Italy[31] (-0.036). For ENV, the impact is mostly negative, although, in the case of Belgium, the coefficient of ENV is 0.036 at the 10% level of statistical significance, reflecting a positive relationship between ENV and idiosyncratic volatility. France has the strongest negative ENV effect (-2.591) at the 1% level of statistical significance and Switzerland has the weakest significant coefficient (-0.13). There is as well a negative, but statistically, insignificant relation observed for Spain and Sweden. The results are similar for SOC. Belgium is the only country with a positive (0.036) and statistically significant (at the 10% level) SOC coefficient. The strongest negative impact of the SOC score on idiosyncratic volatility is found for France and Germany with coefficients of respectively -3.329 and -3.103, significant at the 1% level. Spain has the weakest SOC score coefficient (-0.111) although it is statistically significant at the 1% level. If we include all the sample companies in the regression, all the CSR scores are significantly negative.

Among the control variables, turnover (TURN), leverage (LEV), and market to book (MTB) have mostly positive and significant coefficients. In other words, an increase in these variables will be followed by an increase in idiosyncratic volatility. The earnings per share (EPS) and market capitalization (MKTCAP) coefficients are mostly negative and

[30] Until 2017, the absence of a law, that requires non financial disclosure from firms in Germany, explains the insignificant relationship found between CSR scores and Idiosyncratic Volatility when the Full period a sample is considered. In March 2017, the German Bundestag introduces an act to make it mandatory for large publicly traded companies to provide environmental, social, and governance-related information. The strong negative significant relationship could be the result of the behavior of multinational manufacturing companies, which were already facing CSR requirements in other countries, such as the USA, UK, and France.

[31] For the first time, in the year 2016, the Italian law (Decree 254/2016) urge « Public Interest Entities » to disclose non-financial information related to their environmental, social and governance activities (Balluchi, Furlotti and Torelli, 2020). This delay explains the weak positive relationship found between CSR scores and Idiosyncratic Volatility in the Pre-Crisis period. The Italian Legislative Decree, following the European Directive 2014/95/EU, may be the reason for the relationship sign to flip into negative significance.

significant, which means they decrease idiosyncratic volatility.

Our results confirm generally both of our hypotheses. They show that a negative relationship between the CSR scores and idiosyncratic volatility found in the literature is driven mainly by the Post-crisis period and it disappears if we run the regressions over the Pre-crisis period only. The Pre-crisis coefficients are mostly positive but are insignificant. Furthermore, Focusing on Europe as a whole entity overlooks any heterogeneity among European countries. Moreover, in the case of Belgium, we notice a positive relationship proven statistically.

### 2.3.3. The Impact of the CSR components scores on the idiosyncratic volatility

In this section, we reduce the CSR scores into their components to distinguish those with a significant impact on idiosyncratic volatility from those unrelated to idiosyncratic volatility. This sheds light on the components that affect idiosyncratic volatility which should facilitate managers' management of risk.

The CSR components provided by Refinitiv are resource use, emissions, and environmental innovations for the environment pillar, and workforce, human rights, community, and product responsibility for the social pillar. We add controversies as the effect of companies' actions that undermine the overall CSR score. They have no significant effect across either most of the countries or most of the different periods considered. However, it has a positive relationship with idiosyncratic volatility in the Post-crisis period when we consider the whole sample.

First, we run the test for the Full period for each component. Then, as in the previous section, we consider the same two sub-periods and conduct the same tests. In each specification, we regress idiosyncratic volatility on the lagged CSR component score and the lagged control variables. In Table B.3, each panel presents the results for a given country in the sample. As before, in each panel, we report the results for the Full, the Pre-crisis, and the Post-crisis periods respectively.

The results for the Full period show that six out of nine countries experience statistically significant impacts. This suggests that most of the components with significant coefficients have negatively impacted idiosyncratic volatility. In other words, high component scores are associated with lower levels of idiosyncratic volatility. Human resources and community components have the strongest influence on the idiosyncratic volatility. Speaking of the CSR components, France experiences the most pronounced effect, with significant coefficients of resource use, emissions, workforce, community, and product responsibility. The Netherlands and the UK are ranked next with significant coefficients for resource use, emissions components. In both countries, human rights and product responsibility have a significant negative impact. However, the community is negatively related to idiosyncratic volatility in the UK and environmental innovation decreases idiosyncratic volatility in the Netherlands. These results are in line with the results in Section 3.2. For example, when we consider the Full period, we find a significant impact only for the social pillar index and its components on the idiosyncratic volatility in the United Kingdom.

While most of the significant components increase idiosyncratic volatility in the Pre-crisis period, in the case of France and the UK, human rights and the community maintain their negative coefficients. These results reflect the weakness of the relationship between the CSR components and idiosyncratic volatility and reject the negative relationship found if we include the periods before and after the 2008 financial crisis.

Unlike the Pre-crisis period, the Post-crisis period is characterized by a strong negative relationship between multiple CSR components and idiosyncratic volatility. However, Belgium remains the only country where CSR components increase the idiosyncratic volatility. We find the most significant effect of the CSR components in France and Germany, with six out of seven statistically significant coefficients, compared to Italy and Switzerland where only two components have a significant negative influence on idiosyncratic volatility. The most significant CSR component with a negative impact on idiosyncratic volatility is resource use. The community has the same number of significant coefficients, but their variation increases idiosyncratic volatility in the Netherlands. Environmental innovation has the least effect, and it is positive and negative respectively for Belgium and Italy.

**Table 4: The Impact of CSR components on the idiosyncratic volatility**

| Europe | | | | | | | |
|---|---|---|---|---|---|---|---|
| **Res Use** | **EMS** | **Env. In** | **WF** | **HR** | **COM** | **Prod.Resp.** | **Cont.** |
| **Full Period** | | | | | | | |
| -0.006 | -0.006 | -0.003 | -0.004 | -0.016*** | -0.017*** | -0.011*** | 0.003 |
| -1.364 | -1.384 | -0.878 | -0.97 | -3.999 | -4.67 | -3.263 | 1.012 |
| **Pre-crisis Period** | | | | | | | |
| 0.008 | 0.011** | 0.009 | 0.006 | 0.015** | -0.013** | -0.006 | 0.007 |
| 1.243 | 2.032 | 1.267 | 1.109 | 2.093 | -2.239 | -1.044 | 1.228 |
| **Post-crisis Period** | | | | | | | |
| -0.012** | -0.014* | 0 | -0.107 | -0.018*** | -0.019*** | -0.010** | 0.015* |
| -2.499 | -1.897 | 0.051 | -0.431 | -3.619 | -3.422 | -2.118 | 1.737 |

Note: In this table, we present the results of regressions covering the Full period, the Pre-crisis period and Post-crisis period for the whole sample. We report the adjusted R2 and the Hausman test statistic. Each column represents results of panel data regressions when only one component of the CSR. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). Robust standard errors in parentheses. *** $p<0.01$, ** $p<0.05$, * $p<0.1$.

In table 4, we show that, at the aggregate (Europe) level, in line with Section 3.2, only the social pillar components significantly decrease idiosyncratic volatility, at the 1% level. These results are in line with those of Section 3.2. Before the 2008 crisis, we found a substantial positive impact of emissions and human rights and a negative significant effect for the community. In the Post-crisis period, we find a risk mitigation effect for resource use, emissions, human rights, community, and product responsibility. We also highlight a significant positive impact of controversies variable on the idiosyncratic risk. It is proof of conflicts and problems associated with CSR would increase firm-specific volatility. Our results are in accordance with the results that Utz (2017) found for Europe. Although the significant effect of workforce disappears when we include all the sample companies in the regression, its effect, whether positive or negative, is significant for only five countries. In other words, at the aggregate or European level, the heterogeneity among countries is overlooked although it might be advantageous. We observe an increase in the number (from 3 to 6) of significant CSR component coefficients for all countries if we consider just the Post-crisis period. Thus, the increase in the significance of the two pillars documented in the previous section is explained by an increase in the significance of the influence of CSR components on idiosyncratic volatility.

## 2.4. Conclusion

Studying the determinants of idiosyncratic volatility becomes more interesting after empirical evidence on its pricing, whether positively or negatively. Since the firm's CSR performance affects its productivity, production operation, and reputation, it should have an impact on its idiosyncratic volatility according to the valuation theory and informed trading hypothesis. Therefore, we study the impact of CSR performance on idiosyncratic volatility in nine European countries and find that it is significantly negative. We conduct tests on a global level, the environmental and social global index, the environment index, and the social index, and on a finer level, by including each index's components.

Hopefully, this study will be of interest for the firms' managers and investors who would like to understand the relevance of public non-financial information and CSR to risk management in Europe. Our results show heterogeneity among different European countries in terms of the magnitude and impact's sign of different CSR proxies. For most countries, the environmental, social, and global ES coefficients are insignificant over the Full period, indicating the lack of effect of CSR performance on idiosyncratic volatility. The low correlation between the CSR scores for all 9 countries and idiosyncratic volatility, and the insignificance of the coefficients, over the full period of analysis, suggested the need for a finer grained investigation and consideration of the two sub-periods separately. The first period covers the years before the 2008 financial crisis and the second period considers only the years after 2008. In the Pre-crisis period, we found that most of the estimates are insignificant for almost the whole sample, however the Post-crisis period is characterized by an increase in the significance of the ES coefficients for all countries. These are mostly negative and significant which means that the negative relationship found in the literature is driven by the Post-crisis years. Therefore, we show that the relationship between the idiosyncratic volatility and firm's CSR performance is a recent phenomenon that could be driven by a shift in investor behavior concerning their investment decisions, with a great reliance on both CSR performance and financial performance. These results provide evidence of our second hypothesis predicting the emergence, and the significance, of the relationship between a firm's CSR performance and the idiosyncratic volatility after 2008 financial crisis, while being quasi inexistent before 2008.

The existence and the significance of the negative relationship between the idiosyncratic volatility and firm's CSR performance for almost all countries prove our first hypothesis stating a negative impact of CSR performance on the idiosyncratic volatility. Thereby, we highlight that improving the firm's CSR performance allows the firm to control and reduce its idiosyncratic volatility.

We considered the components of CSR to try to identify the biggest contributors to the CSR impact on the idiosyncratic volatility in European countries. Resource use, which is an environmental component, has mostly significant and negative coefficients in the Post-crisis period. Community, which is a social component, has a negative and significant effect in each of five countries, and remains negative when we consider the whole sample. This information is useful for firms' managers because it points the CSR components/categories that affect the most the idiosyncratic volatility, and consequently, the stock volatility. The significant impact of these components could be due to a relative importance given by the investors. We tested as well the importance of controversies. In general, this is not related significantly to idiosyncratic volatility. However, if we consider the whole sample, controversies have a significant positive coefficient in the Post-crisis period.

Our results suggest that studying the effect of CSR performance on the idiosyncratic volatility on European countries as one entity risks unnoticing heterogeneity among European countries emerging from different national laws or any possible reasons. While France is the country with highest CSR scores' coefficients; Italy is the one with the weakest impact of CSR performance on the idiosyncratic risk, whether in the case of CSR global scores or CSR components. Moreover, the negative relation between CSR and idiosyncratic volatility observed isn't always held. We show that Belgium, which has the least CSR scores in Europe, have a positive effect of the CSR on the idiosyncratic volatility. For practical reasons, these results are critical for investors bearing the idiosyncratic risk while holding under-diversified portfolios in Europe. They give portfolio managers and investors insights of the impact of firms' CSR performance on their portfolios' risks by highlighting countries where it is best to invest into socially responsible stocks and those to avoid.

CSR is a promising and rich research topic to be discovered. One of the various points pending in the CSR literature is the explanation of the change in the investors' behavior who rely more on the extra-financial in their investment decision making process. This change in the investor behavior is the reason for the existence of the impact of the CSR performance on the idiosyncratic volatility. However, there is a scarcity of research work on this subject that needs to be enlightened.

## APPENDIX B

### Table B.1: Correlations

| | Ivol | ENV | SOC | GOV | ES | Ivol | ENV | SOC | GOV | ES |
|---|---|---|---|---|---|---|---|---|---|---|
| | **Panel A: Belgium** | | | | | **Panel B: France** | | | | |
| **Ivol** | 1 | | | | | 1 | | | | |
| **ENV** | -0.050 | 1 | | | | -0.209 | 1 | | | |
| **SOC** | -0.005 | 0.481 | 1 | | | -0.226 | 0.509 | 1 | | |
| **GOV** | 0.110 | 0.234 | 0.339 | 1 | | -0.017 | 0.123 | 0.172 | 1 | |
| **ES** | -0.073 | 0.820 | 0.877 | 0.279 | 1 | -0.24 | 0.825 | 0.886 | 0.18 | 1 |
| | **Panel C: Germany** | | | | | **Panel D: Italy** | | | | |
| | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** |
| **Ivol** | 1 | | | | | 1 | | | | |
| **ENV** | -0.171 | 1 | | | | 0.067 | 1 | | | |
| **SOC** | -0.233 | 0.517 | 1 | | | 0.032 | 0.54 | 1 | | |
| **GOV** | 0.04 | 0.044 | 0.039 | 1 | | 0.085 | 0.141 | 0.299 | 1 | |
| **ES** | -0.17 | 0.88 | 0.842 | 0.059 | 1 | 0.014 | 0.881 | 0.878 | 0.242 | 1 |
| | **Panel E: Netherlands** | | | | | **Panel F: Spain** | | | | |
| | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** |
| **Ivol** | 1 | | | | | 1 | | | | |
| **ENV** | -0.094 | 1 | | | | -0.042 | 1 | | | |
| **SOC** | -0.068 | 0.347 | 1 | | | -0.077 | -0.018 | 1 | | |
| **GOV** | -0.189 | 0.192 | 0.192 | 1 | | -0.023 | 0.121 | 0.395 | 1 | |
| **ES** | -0.139 | 0.754 | 0.809 | 0.283 | 1 | -0.14 | 0.124 | 0.284 | 0.308 | 1 |
| | **Panel G: Sweden** | | | | | **Panel H: Switzerland** | | | | |
| | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** |
| **Ivol** | 1 | | | | | 1 | | | | |
| **ENV** | -0.103 | 1 | | | | -0.17 | 1 | | | |
| **SOC** | -0.022 | 0.347 | 1 | | | -0.131 | 0.513 | 1 | | |
| **GOV** | -0.103 | 0.192 | 0.192 | 1 | | 0.037 | 0.2 | 0.162 | 1 | |
| **ES** | -0.068 | 0.754 | 0.809 | 0.283 | 1 | -0.181 | 0.837 | 0.865 | 0.208 | 1 |
| | **Panel I: United Kingdom** | | | | | **Panel J: Europe** | | | | |
| | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** | **Ivol** | **ENV** | **SOC** | **GOV** | **ES** |
| **Ivol** | 1 | | | | | 1 | | | | |
| **ENV** | -0.11 | 1 | | | | -0.098 | 1 | | | |
| **SOC** | -0.121 | 0.252 | 1 | | | -0.094 | 0.399 | 1 | | |
| **GOV** | -0.076 | 0.088 | 0.055 | 1 | | -0.015 | 0.153 | 0.212 | 1 | |
| **ES** | -0.141 | 0.751 | 0.784 | 0.098 | 1 | -0.126 | 0.738 | 0.789 | 0.219 | 1 |

Note: Table B.1 reports times series averages of annually Pearson correlations between idiosyncratic volatility and ES, ENV, SOC, and GOV indices per country. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). In addition to hosting the largest market exchanges in Europe, these countries represent over 70% of European GDP. We assign panel J of table B.1 for correlations between the ES indices for the whole sample.

## Table B.2: CSR Impact on the idiosyncratic volatility

**Panel A: Belgium**

| | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| | **Estimate** | **t-value** | **Estimate** | **t-value** | **Estimate** | **t-value** |
| | **Full Period** | | | | | |
| CSR | 0,036 | 1,234 | 0,023 | 0,776 | 0,032 | 1,548 |
| EPS | -0,032 | -0,973 | -0,033 | -1,206 | -0,029 | -0,836 |
| MKTCAP | -3,428*** | -5,299 | -3,358*** | -5,297 | -3,425*** | -5,149 |
| LEV | 0,035 | 1,407 | 0,037 | 1,47 | 0,038 | 1,614 |
| MTB | 0,150 | 1,131 | 0,153 | 1,125 | 0,153 | 1,215 |
| TURN | 1,085** | 1,877 | 1,097** | 1,86 | 1,109* | 1,94 |
| $R^2$ | | 0,158 | | 0,152 | | 0,158 |
| Hausman test | | 3,745 | | 4,239 | | 3,702 |
| | **Pre-Crisis Period** | | | | | |
| CSR | 0.024 | 0.68 | 0.041 | 1.468 | 0.018 | 0.67 |
| EPS | -0.029 | -0.923 | -0.011 | -0.869 | -0.017 | -1.447 |
| MKTCAP | -3.679*** | -5.668 | -5.077*** | -5.654 | -5.375*** | -6.61 |
| LEV | 1.019*** | 3.854 | 1.088*** | 4.627 | 0.123*** | 3.577 |
| MTB | 0.197 | 0.502 | 0.22 | 1.6 | -0.15 | -0.68 |
| TURN | 1.834** | 2.245 | 3.218*** | 3.215 | 3.786*** | 5.489 |
| $R^2$ | | 0.192 | | 0.175 | | 0.182 |
| Hausman test | | 10.512 | | 17.019 | | 26.417 |
| | **Post-Crisis Period** | | | | | |
| CSR | 0.050** | 2.128 | 0.036* | 1.752 | 0.039* | 1.891 |
| EPS | -0.350*** | -4.447 | -0.353*** | -4.481 | -0.354** | -4.495 |
| MKTCAP | -3.264*** | -7.512 | -3.148*** | -7.226 | -3.233*** | -7.405 |
| LEV | -0.102 | -0.359 | -0.101 | -0.349 | -0.049 | -0.171 |
| MTB | 0.05 | 0.407 | 0.044 | 0.353 | 0.06 | 0.493 |
| TURN | 1.080*** | 2.889 | 1.099*** | 2.887 | 1.162*** | 3.133 |
| $R^2$ | | 0.183 | | 0.18 | | 0.176 |
| Hausman test | | 3.193 | | 4.551 | | 4.024 |

**Panel B: France**

| | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| | **Estimate** | **t-value** | **Estimate** | **t-value** | **Estimate** | **t-value** |
| | **Full Period** | | | | | |
| CSR | -2.604*** | -3.421 | -1.591** | -2.357 | -2.072*** | -3.59 |
| EPS | -0.057 | -1.574 | -0.058 | -1.606 | -0.055 | -1.507 |
| MKTCAP | -3.478*** | -10.147 | -3.557*** | -10.746 | -3.561*** | -10.303 |
| LEV | 0.188*** | 0.737 | 0.098*** | 0.375 | 0.132*** | 0.521 |
| MTB | 0.035 | 0.43 | 0.057 | 0.62 | 0.039 | 0.468 |
| TURN | 1.18 | 3.753 | 1.182 | 3.712 | 1.117 | 3.533 |
| $R^2$ | | 0.28 | | 0.27 | | 0.28 |
| Hausman test | | 21.258 | | 14.864 | | 23.839 |
| | **Pre-Crisis Period** | | | | | |
| CSR | -2.249 | -1.543 | -1.185 | -1.019 | -1.081 | -1.1 |
| EPS | 0.005 | 0.041 | -0.004 | -0.034 | -0.003 | -0.021 |
| MKTCAP | -4.415*** | -6.241 | -4.502*** | -6.138 | -4.595*** | -6.76 |
| LEV | 2.674** | 2.444 | 2.501** | 2.195 | 2.658** | 2.375 |
| MTB | 0.294 | 1.272 | 0.33 | 1.369 | 0.287 | 1.265 |
| TURN | -1.264* | -1.923 | -1.181* | -1.744 | -1.212* | -1.809 |
| $R^2$ | | 0.289 | | 0.284 | | 0.282 |
| Hausman test | | 66.83 | | 64.208 | | 65.731 |
| | **Post-Crisis Period** | | | | | |
| CSR | -4.027*** | -3.636 | -2.591*** | -2.613 | -3.329*** | -4.552 |
| EPS | -0.070* | -1.915 | -0.073* | -1.916 | -0.071* | -1.913 |
| MKTCAP | -2.948*** | -7.149 | -3.114*** | -7.674 | -2.923*** | -7.004 |
| LEV | 0.594** | 2.185 | 0.547** | 2.045 | 0.472* | 1.774 |
| MTB | 0.042 | 0.509 | 0.053 | 0.592 | 0.044 | 0.532 |
| TURN | 1.936*** | 3.931 | 1.994*** | 3.872 | 1.885*** | 3.939 |
| $R^2$ | | 0.251 | | 0.229 | | 0.258 |
| Hausman test | | 3.364 | | 23.867 | | 3.814 |

**Panel C: Germany**

| | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| | **Estimate** | **t-value** | **Estimate** | **t-value** | **Estimate** | **t-value** |
| | **Full Period** | | | | | |
| CSR | -1.324 | -0.356 | 0.635 | 0.246 | -1.121 | -1.277 |
| EPS | 0.666** | 2.534 | 0.666** | 2.538 | 0.666** | 2.534 |
| MKTCAP | -3.413*** | -6.154 | -3.452*** | -6.147 | -3.367*** | -5.965 |
| LEV | 0.445 | 1.141 | 0.397 | 1.044 | 0.445 | 1.146 |
| MTB | 0.951 | 1.6 | 0.955 | 1.602 | 0.912 | 1.536 |
| TURN | 0.969*** | 3.179 | 1.010*** | 3.41 | 0.874*** | 2.936 |
| $R^2$ | | 0.194 | | 0.194 | | 0.197 |
| Hausman test | | 25.234 | | 23.283 | | 26.253 |
| | **Pre-Crisis Period** | | | | | |
| CSR | -1.338 | -0.759 | 0.006 | 0.005 | -2.253 | -1.435 |
| EPS | 0.648 | 0.87 | 0.585 | 0.771 | 0.746 | 1.023 |
| MKTCAP | -4.249*** | -4.722 | -4.351*** | -4.745 | -4.226*** | -4.764 |
| LEV | 3.038** | 2.553 | 2.932** | 2.392 | 3.058*** | 2.761 |
| MTB | 0.569 | 0.654 | 0.502 | 0.582 | 0.572 | 0.649 |
| TURN | 1.200* | 1.941 | 1.194* | 1.791 | 1.193* | 2.001 |
| $R^2$ | | 0.142 | | 0.137 | | 0.154 |
| Hausman test | | 15.233 | | 10.929 | | 23.105 |
| | **Post-Crisis Period** | | | | | |
| CSR | -2.786** | -2.117 | -1.428* | -1.683 | -3.103*** | -3.258 |
| EPS | 0.624** | 2.423 | 0.634*** | 3.32 | 0.595** | 2.335 |
| MKTCAP | -3.266*** | -4.901 | -3.301*** | -7.15 | -3.311*** | -4.859 |
| LEV | 0.943* | 1.838 | 0.925** | 2.978 | 0.827* | 1.813 |
| MTB | 1.282** | 2.014 | 1.297*** | 2.711 | 1.269** | 1.993 |
| TURN | 1.336*** | 3.606 | 1.437*** | 5.854 | 1.267*** | 3.521 |
| $R^2$ | | 0.221 | | 0.215 | | 0.228 |
| Hausman test | | 38.003 | | 35.65 | | 37.562 |

Note: In each panel of Table B.2, we present results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted $R^2$ and the Hausman test statistic. Each column represents a different specification. In the first specification, we use the weighted average environmental-social score (ES). Columns 2 and 3 present the environment (ENV) and social (SOC) average weighted scores. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). We report estimates for control variables, we use earnings per share (EPS) to proxy for profitability. Firm size is the natural logarithm of the average market capitalization (MKTCAP) over the year. To control for stock liquidity, we use the natural logarithm of the stock turnover (TURN), calculated as the number of shares traded divided by the number of shares outstanding. The market to book (MTB) ratio is the firm's market capitalization is divided by its book value. Leverage (LEV) is natural logarithm of the ratio of the firm's long-run debt value to its total market capitalization. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table B.2: CSR Impact on the idiosyncratic volatility (Continued)

| Panel D: Italy | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| **Full Period** | | | | | | |
| CSR | 0.023 | 1.025 | 0.011** | 0.563 | 0.023 | 1.119 |
| EPS | -0.003*** | -4.158 | -0.003*** | -3.458 | -0.003*** | -4.015 |
| MKTCAP | -2.908*** | -12.504 | -2.830*** | -12.187 | -2.898*** | -12.174 |
| LEV | 0.366 | 0.518 | 0.346 | 0.485 | 0.386 | 0.537 |
| MTB | 0.069 | 0.666 | 0.068 | 0.664 | 0.068 | 0.647 |
| TURN | 0.408 | 1.111 | 0.43 | 1.123 | 0.408 | 1.109 |
| $R^2$ | | 0.152 | | 0.152 | | 0.154 |
| Hausman test | | 7.315 | | 8.251 | | 6.149 |
| **Pre-crisis Period** | | | | | | |
| CSR | 0.057* | 1.702 | 0.030* | 1.197 | 0.052* | 1.961 |
| EPS | -0.002*** | -2.701 | -0.002*** | -3.777 | -0.002*** | -3.301 |
| MKTCAP | -6.982*** | -8.085 | -6.795*** | -8.102 | -7.034*** | -8.064 |
| LEV | 0.88 | 0.97 | 1.072 | 1.145 | 0.823 | 0.964 |
| MTB | 0.039 | 1.014 | 0.037 | 0.956 | 0.036 | 0.948 |
| TURN | 0.980** | 2.035 | 1.112** | 2.381 | 0.984* | 1.91 |
| $R^2$ | | 0.287 | | 0.269 | | 0.292 |
| Hausman test | | 61.022 | | 42.764 | | 94.954 |
| **Post-crisis Period** | | | | | | |
| CSR | -0.036** | -2.003 | -0.030** | -1.899 | -0.024 | -1.463 |
| EPS | -0.002 | -1.367 | -0.002 | -1.416 | -0.002*** | -5.138 |
| MKTCAP | -2.995*** | -8.477 | -2.953*** | -8.331 | -3.031*** | -5.3 |
| LEV | 1.122* | 1.695 | 1.245* | 1.864 | 1.006 | 0.8 |
| MTB | 0.195*** | 5.171 | 0.196*** | 5.183 | 0.193*** | 7.995 |
| TURN | 0.224 | 1.215 | 0.229 | 1.232 | 0.181 | 0.743 |
| $R^2$ | | 0.227 | | 0.226 | | 0.224 |
| Hausman test | | 38.298 | | 93.505 | | 28.435 |

| Panel E: Netherlands | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| **Full Period** | | | | | | |
| CSR | -0.041* | -1.712 | -0.012** | -2.171 | -0.021 | -1.12 |
| EPS | -0.195* | -1.807 | -0.189** | -1.99 | -0.189* | -1.685 |
| MKTCAP | -1.709** | -2.378 | -1.693*** | -3.552 | -1.735** | -2.308 |
| LEV | 0.003 | 1.009 | 0.002 | 1.142 | 0.003 | 1.071 |
| MTB | -0.063 | -1.027 | -0.054 | -1.198 | -0.065 | -1.038 |
| TURN | 0.013* | 1.784 | 0.012*** | 3.657 | 0.013* | 1.737 |
| $R^2$ | | 0.146 | | 0.15 | | 0.139 |
| Hausman test | | 24.498 | | 7.796 | | 20.595 |
| **Pre-crisis Period** | | | | | | |
| CSR | 1.527 | 1.218 | 1.322 | 0.845 | 0.012 | 0.717 |
| EPS | -0.151 | -0.391 | -0.192 | -0.508 | -0.125 | -0.322 |
| MKTCAP | -3.603*** | -5.239 | -3.529*** | -4.874 | -3.648*** | -5.315 |
| LEV | 0.016*** | 2.818 | 0.015*** | 2.77 | 0.015*** | 2.598 |
| MTB | 0.108 | 0.47 | 0.101 | 0.453 | 0.109 | 0.461 |
| TURN | 0.021* | 1.772 | 0.022* | 1.824 | 0.021* | 1.809 |
| $R^2$ | | 0.312 | | 0.314 | | 0.309 |
| Hausman test | | 19.798 | | 48.561 | | 16.889 |
| **Post-crisis Period** | | | | | | |
| CSR | -0.068** | -2.423 | -0.025*** | -3.42 | -0.02 | -0.842 |
| EPS | -0.106 | -1.075 | -0.112 | -1.153 | -0.094 | -0.941 |
| MKTCAP | -1.580*** | -3.667 | -1.541*** | -3.576 | -1.639*** | -3.776 |
| LEV | 0.003* | 1.666 | 0.004* | 1.772 | 0.003 | 1.554 |
| MTB | -0.074 | -1.563 | -0.077 | -1.641 | -0.072 | -1.493 |
| TURN | 0.008** | 2.083 | 0.008** | 2.135 | 0.008** | 2.204 |
| $R^2$ | | 0.213 | | 0.23 | | 0.129 |
| Hausman test | | 7.732 | | 5.234 | | 11.035 |

| Panel F: Spain | ES | | ENV | | SOC | |
|---|---|---|---|---|---|---|
| **Full Period** | | | | | | |
| CSR | 1.134 | 0.828 | 1.592 | 1.196 | 0.381 | 0.368 |
| EPS | 0.484 | 1.195 | 0.493 | 1.217 | 0.473 | 1.187 |
| MKTCAP | -2.332*** | -2.889 | -2.365*** | -2.993 | -2.291*** | -2.809 |
| LEV | 0.464 | 0.799 | 0.461 | 0.811 | 0.473 | 0.793 |
| MTB | -0.434 | -0.592 | -0.407 | -0.571 | -0.414 | -0.555 |
| TURN | -0.448 | -1.206 | -0.464 | -1.201 | -0.423 | -1.121 |
| $R^2$ | | 0.114 | | 0.123 | | 0.11 |
| Hausman test | | 2.79 | | 2.615 | | 3.101 |
| **Pre-crisis Period** | | | | | | |
| CSR | 0.043 | 0.323 | -0.04 | -0.324 | 0.086 | 1.252 |
| EPS | -0.073* | -1.778 | -0.065 | -1.622 | -0.082* | -1.945 |
| MKTCAP | -0.146*** | -2.976 | -0.145*** | -2.844 | -0.137*** | -2.803 |
| LEV | -0.018 | -0.388 | -0.023 | -0.485 | -0.015 | -0.333 |
| MTB | 0.247** | 2.475 | 0.254** | 2.592 | 0.244** | 2.486 |
| TURN | -0.082* | -1.694 | -0.081* | -1.713 | -0.081* | -1.684 |
| $R^2$ | | 0.072 | | 0.073 | | 0.082 |
| Hausman test | | 15.807 | | 15.412 | | 15.742 |
| **Post-crisis Period** | | | | | | |
| CSR | -0.113** | -2.194 | -0.037 | -0.674 | -0.111*** | -3.573 |
| EPS | 0.039*** | 3.003 | 0.040*** | 3.844 | 0.039*** | 3.075 |
| MKTCAP | -0.141*** | -3.807 | -0.147*** | -5.987 | -0.140*** | -3.691 |
| LEV | 0.032*** | 2.622 | 0.034** | 2.55 | 0.033*** | 2.698 |
| MTB | 0.029** | 2.475 | 0.028* | 1.661 | 0.031*** | 2.671 |
| TURN | 0.421 | 1.506 | 0.427 | 2.063 | 0.415 | 1.531 |
| $R^2$ | | 0.117 | | 0.105 | | 0.125 |
| Hausman test | | 13.421 | | 9.758 | | 15.188 |

Note: In each panel of Table B.2, we present results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted $R^2$ and the Hausman test statistic. Each column represents a different specification. In the first specification, we use the weighted average environmental-social score (ES). Columns 2 and 3 present the environment (ENV) and social (SOC) average weighted scores. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). We report estimates for control variables, we use earnings per share (EPS) to proxy for profitability. Firm size is the natural logarithm of the average market capitalization (MKTCAP) over the year. To control for stock liquidity, we use the natural logarithm of the stock turnover (TURN), calculated as the number of shares traded divided by the number of shares outstanding. The market to book (MTB) ratio is the firm's market capitalization is divided by its book value. Leverage (LEV) is natural logarithm of the ratio of the firm's long-run debt value to its total market capitalization. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

.

## Table B.2: CSR Impact on the idiosyncratic volatility (Continued)

| | Panel G: Sweden | | | | | |
|---|---|---|---|---|---|---|
| | ES | | ENV | | SOC | |
| | **Full Period** | | | | | |
| CSR | -0.026 | -1.416 | -0.001 | -0.052 | -0.034** | -2.122 |
| EPS | -0.020*** | -3.89 | -0.020*** | -11.771 | -0.020*** | -3.926 |
| MKTCAP | -3.548*** | -11.412 | -3.617*** | -5.589 | -3.537*** | -11.478 |
| LEV | 0.003* | 1.707 | 0.004 | 1.161 | 0.003 | 1.559 |
| MTB | -0.06 | -1.456 | -0.065 | -1.159 | -0.054 | -1.314 |
| TURN | -1.154*** | -3.768 | -1.217** | -2.425 | -1.085*** | -3.518 |
| $R^2$ | | 0.208 | | 0.204 | | 0.213 |
| Hausman test | | 35.223 | | 38.475 | | 31.725 |
| | **Pre-crisis Period** | | | | | |
| CSR | 0.027 | 0.567 | 1.121 | 0.486 | 0.004 | 0.163 |
| EPS | -0.007 | -1.595 | -0.009 | -1.582 | -0.015 | -1.389 |
| MKTCAP | -3.881*** | -4.724 | -3.858*** | -4.738 | -3.569*** | -7.446 |
| LEV | 0.014** | 2.001 | 0.013* | 1.7 | 0.004* | 1.654 |
| MTB | 0.253 | 0.661 | 0.278 | 0.734 | 0.206 | 0.67 |
| TURN | -1.069** | -2.196 | -1.030** | -2.182 | -0.342 | -0.813 |
| $R^2$ | | 0.302 | | 0.301 | | 0.3 |
| Hausman test | | 12.955 | | 61.961 | | 3.526 |
| | **Post-crisis Period** | | | | | |
| CSR | -0.122* | -1.74 | -0.045 | -0.76 | -0.117** | -2.351 |
| EPS | -0.010*** | -3.611 | -0.013*** | -7.796 | -0.009*** | -2.947 |
| MKTCAP | -2.412* | -1.763 | -2.444 | -1.632 | -2.513* | -1.942 |
| LEV | 0.004 | 0.859 | 0.005 | 1.061 | 0.003 | 0.679 |
| MTB | -0.068 | -0.919 | -0.089 | -1.12 | -0.049 | -0.688 |
| TURN | 0.016** | 1.902 | 0.016* | 1.874 | 0.016* | 1.883 |
| $R^2$ | | 0.212 | | 0.177 | | 0.226 |
| Hausman test | | 24.359 | | 14.769 | | 23.418 |

| | Panel H: Switzerland | | | | | |
|---|---|---|---|---|---|---|
| | ES | | ENV | | SOC | |
| | **Full Period** | | | | | |
| CSR | -0.022* | -1.713 | -0.003 | -0.866 | -0.023** | -1.983 |
| EPS | -0.030** | -2.253 | -0.031** | -2.305 | -0.030** | -2.223 |
| MKTCAP | -4.489*** | -14.296 | -4.582*** | -14.659 | -4.498*** | -14.59 |
| LEV | -0.007 | -0.543 | -0.007 | -0.515 | -0.007 | -0.549 |
| MTB | 0.401*** | 4.748 | 0.399*** | 4.709 | 0.400*** | 4.737 |
| TURN | 0.185*** | 4.363 | 0.180*** | 4.244 | 0.186*** | 4.385 |
| $R^2$ | | 0.305 | | 0.303 | | 0.306 |
| Hausman test | | 69.593 | | 29.676 | | 31.675 |
| | **Pre-crisis Period** | | | | | |
| CSR | 0.011 | 0.442 | 0.006 | 0.941 | -0.002 | -0.108 |
| EPS | -0.023 | -0.967 | -0.025 | -1.054 | -0.022 | -0.973 |
| MKTCAP | -5.607*** | -7.884 | -5.592*** | -7.912 | -5.570*** | -6.749 |
| LEV | 0.076*** | 2.92 | 0.078*** | 2.981 | 0.075*** | 2.522 |
| MTB | 1.182*** | 4.211 | 1.193*** | 4.257 | 1.175*** | 3.67 |
| TURN | 1.470** | 2.396 | 1.457** | 2.392 | 1.510** | 2.382 |
| $R^2$ | | 0.28 | | 0.299 | | 0.294 |
| Hausman test | | 25.656 | | 2.439 | | 21.163 |
| | **Post-crisis Period** | | | | | |
| CSR | -0.043* | -1.841 | -0.013* | -1.961 | -0.027 | -1.327 |
| EPS | -0.018 | -1.534 | -0.021 | -1.751 | -0.017 | -1.519 |
| MKTCAP | -5.785*** | -8.378 | -5.766*** | -8.301 | -5.877*** | -8.555 |
| LEV | -0.04 | -1.155 | -0.039 | -1.117 | -0.041 | -1.174 |
| MTB | 0.402*** | 3.98 | 0.389*** | 3.929 | 0.393*** | 3.821 |
| TURN | 0.211*** | 5.034 | 0.216*** | 5.108 | 0.211*** | 5.05 |
| $R^2$ | | 0.272 | | 0.272 | | 0.268 |
| Hausman test | | 49.849 | | 47.937 | | 51.506 |

| | Panel I: United Kingdom | | | | | |
|---|---|---|---|---|---|---|
| | ES | | ENV | | SOC | |
| | **Full Period** | | | | | |
| CSR | -0.894* | -1.775 | -0.001 | -0.003 | -1.063*** | -3.028 |
| EPS | 0.034 | 0.709 | 0.062 | 1.334 | 0.024 | 0.515 |
| MKTCAP | -3.948*** | -17.846 | -3.992*** | -18.229 | -3.938*** | -17.66 |
| LEV | 0.065 | 0.588 | 0.051 | 0.468 | 0.069 | 0.628 |
| MTB | 0.392 | 0.279 | 0.404 | 0.281 | 0.418 | 0.299 |
| TURN | 1.036** | 2.51 | 1.056** | 2.529 | 1.017** | 2.502 |
| $R^2$ | | 0.238 | | 0.236 | | 0.241 |
| Hausman test | | 17.773 | | 16.817 | | 14.983 |
| | **Pre-crisis Period** | | | | | |
| CSR | -1.034 | -0.991 | 0.285 | 0.356 | -1.714*** | -2.289 |
| EPS | -0.062 | -0.678 | -0.105 | -1.113 | -0.005 | -0.058 |
| MKTCAP | -3.777*** | -8.014 | -3.755*** | -7.882 | -3.767*** | -8.083 |
| LEV | 0.951 | 0.502 | 1.119 | 0.575 | 0.723 | 0.391 |
| MTB | -1.918 | -0.87 | -1.157 | -0.539 | -2.334 | -1.077 |
| TURN | 2.699*** | 4.121 | 2.696*** | 4.114 | 2.623*** | 4.132 |
| $R^2$ | | 0.259 | | 0.257 | | 0.266 |
| Hausman test | | 221.485 | | 135.709 | | 160.684 |
| | **Post-crisis Period** | | | | | |
| CSR | -2.236*** | -2.867 | -0.959** | -2.119 | -1.564*** | -3.079 |
| EPS | -0.287** | -1.981 | -0.278** | -2.055 | -0.263* | -1.823 |
| MKTCAP | -4.233*** | -15.716 | -4.303*** | -27.02 | -4.256*** | -15.943 |
| LEV | 0.085 | 0.772 | 0.068 | 0.292 | 0.073 | 0.674 |
| MTB | 0.792 | 0.689 | 0.652 | 0.313 | 0.777 | 0.671 |
| TURN | 1.402** | 2.067 | 1.441*** | 11.26 | 1.380** | 2.045 |
| $R^2$ | | 0.27 | | 0.265 | | 0.271 |
| Hausman test | | 18.038 | | 15.487 | | 18.827 |

Note: In each panel of Table B.2, we present results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted $R^2$ and the Hausman test statistic. Each column represents a different specification. In the first specification, we use the weighted average environmental-social score (ES). Columns 2 and 3 present the environment (ENV) and social (SOC) average weighted scores. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). We report estimates for control variables, we use earnings per share (EPS) to proxy for profitability. Firm size is the natural logarithm of the average market capitalization (MKTCAP) over the year. To control for stock liquidity, we use the natural logarithm of the stock turnover (TURN), calculated as the number of shares traded divided by the number of shares outstanding. The market to book (MTB) ratio is the firm's market capitalization is divided by its book value. Leverage (LEV) is natural logarithm of the ratio of the firm's long-run debt value to its total market capitalization. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table B.3: The Impact of CSR components on the idiosyncratic volatility

| | Res Use | EMS | Env. In | WF | HR | COM | Prod.Resp. | Cont. |
|---|---|---|---|---|---|---|---|---|
| | **Panel A: Belgium** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | -0.016 | 0.01 | 0.004 | 0.009 | 0.015 | -0.004 | -0.01 | 0.004 |
| t-value | -0.827 | 0.872 | 0.211 | 0.883 | 1.047 | -0.28 | -0.522 | 0.282 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | -0.032 | 0.048 | -0.029 | 0.011 | -0.02 | -0.037 | -0.029 | 0.04 |
| t-value | -0.922 | 1.669 | -0.79 | 0.452 | -0.503 | -1.202 | -1.378 | 1.297 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | 0.004 | 0.013 | 0.031*** | 0.01 | 0.011 | 0.037** | 0.012 | 0.014 |
| t-value | 0.172 | 0.62 | 2.111 | 0.513 | 0.631 | 2.565 | 0.424 | 0.819 |
| | **Panel C: Germany** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | -0.007 | -0.006 | -0.001 | 0.003 | -0.024* | -0.029** | -0.001 | 0.007 |
| t-value | -0.67 | -0.491 | -0.057 | 0.183 | -1.674 | -2.407 | -0.109 | 1.043 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | 0.012 | -0.009 | 0.029* | -0.013 | -0.007 | -0.03 | -0.009 | 0.018 |
| t-value | 0.523 | -0.462 | 1.768 | -0.781 | -0.244 | -1.444 | -0.417 | 1.577 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.047*** | -0.060*** | -0.016 | -0.035* | -0.041** | -0.028** | -0.036*** | -0.014* |
| t-value | -2.808 | -3.762 | -0.984 | -1.872 | -2.511 | -2.189 | -2.754 | -1.72 |

| | Res Use | EMS | Env. In | WF | HR | COM | Prod.Resp. | Cont. |
|---|---|---|---|---|---|---|---|---|
| | **Panel B: France** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | -0.028*** | -0.023*** | -0.004 | -0.017* | -0.012 | -0.027*** | -0.019*** | 0.011** |
| t-value | -2.69 | -2.688 | -0.494 | -1.857 | -1.445 | -4.433 | -2.877 | 2.058 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | -0.014 | -0.012 | -0.01 | 0.004 | 0.01 | -0.030*** | -0.013 | 0.017** |
| t-value | -0.936 | -0.979 | -0.567 | 0.306 | 1.005 | -2.733 | -1.055 | 1.969 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.039*** | -0.047*** | -0.013 | -0.030** | -0.034*** | -0.034*** | -0.035*** | 0.005 |
| t-value | -2.785 | -3.53 | -1.258 | -2.389 | -2.793 | -4.465 | -4.864 | 0.76 |
| | **Panel D: Italy** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | 0.279* | 0.143 | 0.005 | 0.276 | 0.388 | 0.319 | 0.08 | -0.002 |
| t-value | 1.877 | 0.602 | 0.546 | 1.018 | 0.565 | 1.388 | 0.278 | -0.321 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | 0.796*** | 1.893** | -0.187 | 0.032*** | 0.032 | 0.027* | 0.049*** | -0.001 |
| t-value | 2.823 | 2.101 | -0.307 | 2.686 | 1.461 | 1.88 | 2.832 | -0.06 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.013 | -0.017 | -0.025*** | -0.573** | -0.839 | -0.222 | -0.372 | -0.004 |
| t-value | -0.933 | -1.55 | -2.413 | -2.061 | -1.051 | -0.799 | -1.573 | -0.481 |

Note: In each panel of Table B.3, we present the results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted R2 and the Hausman test statistic. Each column represents results of panel data regressions when only one component of the CSR. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table B.3: The Impact of CSR components on the idiosyncratic volatility (Continued)

| | Res Use | EMS | Env. In | WF | HR | COM | Prod.Resp. | Cont. |
|---|---|---|---|---|---|---|---|---|
| | **Panel E: Netherlands** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | -0.015 | -0.005 | -0.033** | 0.021 | -0.028* | -0.004 | -0.018* | 0.002 |
| t-value | -0.889 | -0.335 | -2.413 | 1.354 | -1.68 | -0.341 | -1.835 | 0.186 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | 0.001 | 0.003 | -0.005 | 0.008 | -0.008 | 0.013 | -0.011 | 0.009 |
| t-value | 0.062 | 0.168 | -0.126 | 0.559 | -0.393 | 0.803 | -0.522 | 0.501 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.035** | -0.042* | -0.034 | 0.046* | 0.001 | -0.035 | -0.020*** | 0.003 |
| t-value | -1.926 | -1.711 | -1.362 | 1.857 | 0.031 | -1.245 | -1.322 | 0.277 |
| | **Panel G: Sweden** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | 0.061 | -0.002 | 0.003 | -0.016 | -0.020* | -0.020** | -0.006 | -0.005 |
| t-value | 0.057 | -0.173 | 0.167 | -1.006 | -1.726 | -1.987 | -0.348 | -0.583 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | -0.021 | -0.011 | -0.027 | -0.017 | -0.009 | 0.009 | 0.006 | -0.021 |
| t-value | -0.849 | -0.866 | -1.138 | -0.919 | -0.528 | 0.55 | 0.349 | -0.835 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.045** | -0.025 | -0.021 | -0.05 | -0.061*** | -0.057*** | -0.013 | -0.021 |
| t-value | -2.003 | -0.823 | -0.88 | -1.624 | -2.954 | -3.352 | -0.477 | -1.065 |

| | Res Use | EMS | Env. In | WF | HR | COM | Prod.Resp. | Cont. |
|---|---|---|---|---|---|---|---|---|
| | **Panel F: Spain** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | 0.018 | 0.028 | 0.013 | 0 | 0.024 | 0.013 | 0.007 | 0.005 |
| t-value | 0.899 | 1.274 | 0.928 | -0.003 | 0.977 | 0.536 | 0.523 | 0.226 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | -0.41 | 0.029 | 0.043** | 0.004 | 0.032 | 0.045** | 0.027 | 0.009 |
| t-value | -0.406 | 1.228 | 2.048 | 0.156 | 1.569 | 2.387 | 1.533 | 0.355 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.045** | -0.024 | -0.007 | -0.060** | -0.021 | -0.044*** | 0.012 | 0.001 |
| t-value | -2.518 | -1.076 | -0.849 | -2.213 | -0.903 | -2.798 | 0.89 | 0.056 |
| | **Panel H: Switzerland** | | | | | | | |
| | **Full Period** | | | | | | | |
| Estimate | -0.014* | -0.004 | -0.002 | -0.015** | -0.012 | -0.008 | -0.006 | 0.004 |
| t-value | -1.77 | -0.508 | -0.265 | -2.019 | -1.456 | -0.898 | -0.647 | 0.395 |
| | **Pre-crisis Period** | | | | | | | |
| Estimate | 0.006 | 0.011 | 0.001 | 0.002 | -0.003 | 0.001 | -0.011 | -0.005 |
| t-value | 0.426 | 1.162 | 0.046 | 0.16 | -0.134 | 0.051 | -0.66 | -0.29 |
| | **Post-crisis Period** | | | | | | | |
| Estimate | -0.016 | -0.024** | -0.012 | 0.001 | -0.027** | -0.011 | -0.008 | 0.018** |
| t-value | -1.412 | -1.946 | -0.841 | 0.082 | -2.049 | -0.774 | -0.776 | 2.205 |

Note: In each panel of Table B.3, we present the results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted R2 and the Hausman test statistic. Each column represents results of panel data regressions when only one component of the CSR. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table B.3: The Impact of CSR components on the idiosyncratic volatility (Continued)

| | Res Use | EMS | Env. In | WF | HR | COM | Prod.Resp. | Cont. |
|---|---|---|---|---|---|---|---|---|
| | | | | | **Panel I: United Kingdom** | | | |
| | | | | | **Full Period** | | | |
| Estimate | 0.026 | 0.035 | -0.304 | 0.004 | -0.011** | -0.009** | -0.008* | 0.002 |
| t-value | 0.083 | 0.226 | -1.564 | 0.737 | -2.164 | -2.111 | -1.903 | 0.64 |
| | | | | | **Pre-crisis Period** | | | |
| Estimate | -0.006 | -0.006 | -0.01 | -0.01 | -0.021* | -0.003 | -0.012 | -0.087*** |
| t-value | -0.698 | -0.823 | -1.011 | -1.464 | -1.75 | -0.415 | -1.47 | -3.458 |
| | | | | | **Post-crisis Period** | | | |
| Estimate | -0.593** | -0.35 | -0.287 | -0.002 | -0.026*** | -0.027*** | -0.01 | 0 |
| t-value | -2.181 | -1.125 | -1.266 | -0.238 | -3.989 | -4.155 | -1.537 | -0.167 |

Note: In each panel of Table B.3, we present the results for the regressions covering the Full period, the Pre-crisis period and Post-crisis period for a specific country. We report the adjusted R2 and the Hausman test statistic. Each column represents results of panel data regressions when only one component of the CSR. Our sample includes 7590 firms in nine European countries (Belgium, France, Germany, Italy, Netherlands, Spain, Sweden, Switzerland, and the United Kingdom). Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

# Chapter 3

## The Earnings Quality and the Idiosyncratic Risk in France[32]

[32] This chapter is based on the study made in the article: KHALED FAROUK SOLIMAN, A. et E. LE SAOUT, "The Earnings Quality and the Idiosyncratic Risk in France", 2021.

## 3.1. Introduction

In a seminal paper, Campbell et al. (2001) find a positive trend and a possibility of pricing the idiosyncratic volatility. Their work triggered an interest in studying the idiosyncratic risk by attracting the attention of scholars. However, before this article, Studies on idiosyncratic risk were abandoned because of Modern Portfolio Theory findings (Markowitz, 1952; Sharpe, 1964, Lintner, 1965). It states that the idiosyncratic risk is diversifiable, and therefore should not have a premium added to the required return. Systematic risk is unavoidable. It is the only risk associated with a premium required by investors. In the year 2006, Ang et al. discover the idiosyncratic volatility puzzle. They argue that idiosyncratic volatility has a negative premium. In other words, the idiosyncratic volatility is negatively correlated to future expected returns. Thus, the higher is the volatility the lower is the return. This counterintuitive empirical result emphasized the importance of idiosyncratic volatility and its premium studies. The idea of the investor's asymmetric reaction to downside losses and upside gains has always been accepted (Roy, 1952; Markowitz, 1959). Theories have been developed where investors consider more unfavorable market conditions (Bawa and Lindenberg, 1977; Kahneman and Tversky, 1979; Gul, 1991). Recently, many studies discuss the role and the pricing of the (systematic) downside risk in a cross-section of stock returns (Ang et al., 2006; Lettau et al., 2014, Bollerslev et al., 2021).

In Parallel, studies on Earning Quality attract attention within accounting research as of the early 2000s following financial scandals in Europe and the USA. Corporate accounting scandals between 2000 and 2005 (eg. Enron, Merrill Lynch, Peregrine Systems, WorldCom, AIG) highlight the importance of financial reporting quality, especially earnings quality. However, there is no commonly known definition for earnings quality. Teets (2002) argue that earnings quality is a multidimensional concept. The way it is perceived depends on the nature of the information that the interested seeks. This latter could be managers, auditors, regulators or, investors. the concept is conditional to decision context. Thus, the concept is conditional to the decision context and the decision-maker.

Firm’s related information is very important for different parties like managers, creditors and, government agencies. The informed trading hypothesis states that investment decisions are based upon a firm’s information made public for all investors. Under the informed trading hypothesis, any information related to the firm, whether financial like net income or non-financial like Corporate Social Responsibility, should be reflected in the idiosyncratic stock volatility. When the firm-specific information is spread to the universe of investors, the latter start trading the stock based on this information. Consequently, the stock price will be less correlated with the market index evolution. Therefore, this hypothesis states a positive relationship between the firm's specific information and stock's idiosyncratic volatility (Morck et al., 2000; Durnev et al., 2003; Jin and Myers, 2006).

Accurate reporting and reliable information, regarding the firm's financial and non-financial condition, is of extreme importance for investors. They use financial statements to conclude many aspects like the firm's liquidity, profitability, transparency of its reporting, and more. They include earnings into their firm's value assessment and the process of investment decision-making (Schipper and Vincent, 2003; Gaio and Rapozo, 2011). Earnings are used for different reasons such as making forecasts, evaluating the management performance, and the quality of reporting (Siegel, 1982; Lev, 2003; Schipper and Vincent, 2003).

Since earnings quality is a piece of firm-specific information, it should have an impact on idiosyncratic volatility. Literature establishes that there is a negative association between stock total volatility and idiosyncratic volatility (Diamond and Verrecchia, 1991; Rajgopal and Venkatachalam; 2011). Moreover, the information environment would have an impact on the significance and the power of the relationship between idiosyncratic volatility and financial reporting, in general, or financial quality, specifically. According to Signaling Theory (Spence, 1973), the firm gains many benefits by sending signals so it can differentiate itself from other competitors. However, the effect of a certain signal can be reduced when other signals are more consistent with the firm's fair value (Christensen & Feltam, 2006).

Prior literature has found evidence of the effect of the information environment on the relationship between the idiosyncratic volatility and the different aspects of financial reporting (Botosan, 1997; Aman, 2011; Kitagawa and Okuda, 2016). In this study, we are following Dechow and Dichev (2002) view of earnings quality. Earnings are of high quality when they reflect past, present, and future cash flows. This is the best definition suiting financial analysts' needs. Analysts find earnings of "high" quality when they reflect the company's current and future operating performance, hence, they can be used to assess firm value. However, realized cash flows that are reported in financial statements suffer from timing and matching problems making it less informative for different stakeholders, hence we use the working capital accruals. Our objective is to test the significance of the impact of earnings quality in France. We search to discover if this effect holds under different information environments. We examine as well the earnings quality impact on the idiosyncratic downside risk. This chapteradds to the literature studying the effect of the quality of accounting information on the firm's idiosyncratic risk in different information environments.

This paper is organized as follows. Section 2 provides a literature review and discusses prior research on idiosyncratic volatility and its relationship with earnings quality. Our empirical analysis are presented in section 3. We explain different models used to compute earnings quality proxy and the idiosyncratic volatility. Then, we discuss the results of different models studying the impact of earnings quality on idiosyncratic volatility and idiosyncratic downside volatility. Finally, we study the effect of the information environment on this impact. Section 4 concludes.

## 3.2. The literature review and the model

In this section, we shed the light first on the main findings in the literature on the idiosyncratic risk, earnings quality, and their relationship. Then, we explain the models we are using in the estimation of the earnings quality measure and the idiosyncratic volatility. Finally, we present the model used to test the impact of earnings quality on idiosyncratic risk.

### 3.2.1. Literature review

This subsection is a state-of-the-art review on idiosyncratic risk, earnings quality, and their relationship. We also mention the importance of the information environment and how it is affecting this relationship.

#### 3.2.1.1. Idiosyncratic volatility

The Modern Portfolio Theory states that the risk has two main components (Markowitz, 1952; Sharpe, 1964, Lintner, 1965). The first component, which is the systematic component. It is non-diversifiable and related to the co-movement of the stock return with the market return. Since it cannot be avoided, investors require a premium for bearing this risk. The idiosyncratic risk is the second component of the stock volatility. It is also called firm-specific risk because it is associated with the stock and cannot be explained by common risk factors. According to the theory, the idiosyncratic risk shouldn't have a premium because it can be eliminated when the investor holds the market portfolio. The idiosyncratic risk can be defined as the portion of the stock volatility that cannot be explained by the exposure to the market. It is the difference between the stock total volatility and the stock's systematic volatility.

Due to its consequences on portfolio investment strategy, the relation between the idiosyncratic risk and the stock returns is a focus of debate. According to the financial theory, with higher the risk comes higher the return. However, the authors don't agree on the direction of the relation. In a seminal paper, Ang et al. (2006) find a negative relation between the idiosyncratic risk and the stock returns in the United States stock market. This result is counter-intuitive and against the financial theory which states that with higher risk comes higher return. In addition, Ang et al. (2009) replying to Fu (2009) critics, extend their sample to include 22 developed markets in addition to the United States stock markets. They get the same conclusion relative to the relation between idiosyncratic risk and expected returns. Hereafter, many other studies also notice the negative relation (Stambaugh et al., 2015; Gu et al., 2018; Zhong 2017). In an emerging country like China, Nartea et al. (2013) document a negative relation.

Oppositely, Fu (2009) finds a positive relationship between the idiosyncratic risk and the firm returns. Brockman et al. (2020) find a similar positive relation. They replicate Fu's study on 57 countries and for 21 years period. Even before, the positive relation between idiosyncratic volatility and returns has been supported (Merton, 1987; Malkiel and Xu, 2002). Regarding the emergent markets, Nartea et al. (2011) report a positive relation between idiosyncratic volatility and cross-sectional returns in Indonesia, Malaysia, Singapore, and Thailand. Malagon et al. (2018) observe a positive relation between idiosyncratic risk and returns only during recessions.

We can spot only two measures used as a proxy for idiosyncratic risk. The standard deviation of the error term in the asset pricing model is the first measure used for idiosyncratic risk. The second measure for idiosyncratic risk is the portion of the variance not explained by the model relative to the portion of variance explained by the asset pricing model ( $\frac{(1-R^2)}{R^2}$).

#### 3.2.1.2. Earnings quality

Following early 2000s financial scandals, academic research in accounting becomes more interested in disclosure and reporting transparency, especially earnings quality. Nonetheless, there is no consensus on one definition for earnings quality (Schipper and Vincent, 2003). The concept of earnings quality is multidimensional (Teets, 2002). Its perception depends on the user of the information. While a financial analyst uses earnings for forecasting future stocks' outcomes (Seigel, 1982), the institutional investor use earnings to evaluate the management performance (Lev, 2003). For this reason, earning quality definitions depend on earnings attributes like persistence (Penman and Zhang, 2002; Richardson et al., 2005), predictability (Doyle et al., 2003; Van der Meulen et al., 2007; Barragato and Markelevich, 2008), variability (Clubb and Wu, 2014) and value relevance (Leuz et al., 2003; Cheng et al., 2007; Ferrer et al., 2016). Hence, different measures of earnings quality are calculated based on every definition. Nevertheless, other measures are developed to account for multiple attributes (Menicucci, 2019). They are the Penman Index (Penman and Zhang, 2002), Leuz Index (Leuz et al., 2003), Jones Model (1991) and Dichev and Dechow Model (2002).

There is a demand for accurate reporting and reliable information (Menicucci, 2019), whether financial or non-financial. Earnings information is central to investment decisions. Investors place great weight on earnings when they are assessing the firm value and for making an investment decision (Gaio and Raposo, 2011). Thus, high-quality financial reporting is important for the process of valuation. Oppositely, false reporting for the information related to earnings can be harmful to investors' wealth and could have negative consequences on the economy as a whole (Pergola, 2005).

To evaluate and assess the firm's financial health on many aspects, investors stress on the information related to liquidity, earnings quality, financial reporting transparency (Menicucci, 2019). Earnings are considered the cornerstone of a company's financial information. Dechow et al. (1998) show that they provide better information about a firm's performance than cash flows. Hence, investors use reported earnings to collect information relevant to the firm's value (Francis et al., 2004). In addition, valuation models proposed by the financial theory are based upon accounting information, especially earnings. All this demonstrates how earnings are essential information for capital markets. Therefore, it highlights the importance of reliable and relevant financial reporting, especially for earnings. It also emphasizes the essential information contained in earnings.

#### 3.2.1.3. Idiosyncratic risk, earnings quality and information environment

Although measures of Idiosyncratic volatility are widely accepted, the concept of idiosyncratic risk differs among different theories and perspectives. In the context of valuation theory, the informed trading hypothesis states that any kind of information associated with the firm should be reflected in the volatility of the idiosyncratic component. Consequently, the idiosyncratic component will depend on firms' characteristics and fundamentals (Malagon et al., 2015). Morck et al. (2000) find that the co-movement between stock returns in a market decreases when the information environment is improved. They explain that, in a better information environment, the asset pricing model $R^2$ declines and the weight of idiosyncratic component rises. Durnev et al. (2003) share the same view. They observe a positive relationship between the stock price informativeness and idiosyncratic volatility. Jin and Myers (2006) predict also the countries with great opaqueness display higher stock price synchronicity and they are characterized by high $R^2$.

Nevertheless, the costly arbitrage theory considers that idiosyncratic volatility depends on the investor's preferences. In this case, the idiosyncratic volatility is not related to the firm's fundamentals and it is closer to noise trading and mispricing. De Long et al. (1990) show that noise traders' beliefs are unpredictable to the point it becomes risky for arbitrageurs to bet against them. Kelly (2014) proves that a poor information environment and greater obstacles to informed trading are associated with low $R^2$. Dontoh et al. (2004) show that noise trading can negatively alter the relation between stock prices and accounting information. According to this view, the idiosyncratic risk (volatility) should decrease when the information environment is improved and the access to firm-specific information becomes easier. Thus, the stock price will tend to its fundamental value when the idiosyncratic risk decreases and mispricing declines.

For the relation between idiosyncratic volatility and quality of reported accounting, Diamond and Verrecchia (1991) find a negative relationship between disclosure improvement and stock market volatility. In the same vein, Rajgopal and Venkatachalam (2011) document a negative relationship between earnings quality and idiosyncratic risk for American firms. They used earnings quality as a proxy for the quality of disclosed accounting information.

In a study covering firms listed on the Japanese stock market, Okuda and Kitagawa (2011) examine the relationship between the idiosyncratic risk and earnings quality measures during reforms related to the accounting standard. They find a negative relation between the idiosyncratic risk and earnings quality. In this study, we examine the impact of earnings quality on idiosyncratic risk. Thus, our first hypothesis is:

*H1: the impact of the earnings quality measure on idiosyncratic risk is positive. In other words, deterioration in earnings quality will be associated with a rise in idiosyncratic volatility.*

Signaling theory (Spence, 1973) states that it is beneficial for firms to send a signal to differentiate themselves from competitors. Nonetheless, the effect of a signal can be reduced if other signals are more coherent with the firm's "True" value (Christensen and Feltham, 2009). In other terms, in a poor information environment, the signal would not have an alternative and, therefore disclosed information will reduce investor noise. However, in a good information environment, investors may not care for every disclosed information because all firm-specific information is public and more accessible for investors (Kitagawa and Okuda, 2016).

The association between earnings quality and information environment remains a debate. Eames and Glover (2003) find no relation between analysts' forecasts accuracy and earnings predictability which is a measure of earnings quality. Whereas Behn et al. (2008) document a negative relation between audit quality and forecast dispersion, Lobo and Stanford (2012) find that earnings quality is negatively associated with the number of analysts following. Recently, Eliwa et al. (2020) suggest a positive impact of earnings quality on the information environment in the European Union. These studies show that the effect of the information environment on earnings quality is not conclusive. Thus, better earnings quality doesn't necessarily mean a better information environment. Therefore, we highlight the importance of testing the effect of the information environment on the relation between earnings quality and idiosyncratic volatility.

Many studies examine the effect of the information environment on disclosed information. Botosan (1997) finds that the relation between the disclosure quality and cost of capital is less significant when the firm is followed by a greater number of analysts. In addition, Aman (2011) suggests that the information environment affects the impact of management forecast. Atiase (1985) proves that, following the earnings reports, bigger firms experience fewer price movements than smaller firms. He documents a positive association between the amount of information incorporated in the stock price and the firm's size. Moreover, Freeman (1987) shows that earnings information is incorporated faster in large stocks than in small stocks. Grant (1980) shows that annual earnings reports are for OTC stocks are more informative than those listed on NYSE. Lang and Lundholm (1996) document a negative relation between the firm size is negatively related to analysts' forecasts dispersion. Thus, The firm's information environment gets improved as its size increases. Nonetheless, a firm's market capitalization can be a proxy for the information environment.

Supposing that the analysts are sort of information intermediaries between investors and firms, improved quality of disclosed information would enhance the quality of forecasts made by analysts following the company's performance. This leads to higher demand for analysts' services which increases the number of analysts following the firm (Bhushan, 1989). Frankel and Li (2004) find evidence for a negative association between the number of analysts following the firm's performance and the information asymmetry. While investigating the benefits of voluntary disclosure. Healy, Hutton and Papelu (1999) show that the increase in the number of analyst following is accompanied by an increase in a firm's disclosure ratings, hence its information environment. Therefore, we use size (Grant, 1980; Atiase, 1985; Freeman, 1987; Lang and Lundholm, 1996) and the number of analysts who follow the firm's performance (Bhushan, 1989; Frankel and Li, 2004; Eliwa, Haslam and Abraham, 2020) as a proxy for the information environment. Thus, we develop our second hypothesis:

> *H2: the impact of the earnings quality measure on the idiosyncratic volatility becomes weaker in a good information environment and it is stronger in a bad information environment.*

#### 3.2.1.4. Idiosyncratic downside risk

We are also interested in studying the idiosyncratic downside risk. We use the square root of the variance of idiosyncratic negative returns. The way a firm's fundamentals affect the idiosyncratic downside volatility is still not well discovered. Nevertheless, the systematic downside risk is attracting the attention of academics recently although being mentioned in Roy (1952) and Markowitz (1959). There is growing literature on the role and the premium of downside risk in the cross-section of returns. Ang et al. (2006) prove that the systematic downside risk is priced in the cross-section of returns. Its premium is significant and it is explained neither by the market beta nor by other common risk variables33. Botshekan et al. (2012) demonstrate that downside cash flow and discount rate risks are compensated for and they have consistently a premium. Galsband (2012) investigates the downside risk in 14 major industrialized economies. She observes that value premium can be explained by differences in international stock returns' sensitivities to market downside risks. While value stocks are more sensitive to the market's permanent downside shock related to downside cash flow beta, growth stocks are particularly sensitive to discount rate downside shocks which are temporary. Since Jegadeesh and Titman's (1993) works, the momentum strategy has been widely used. Nonetheless, Min and Kim (2016) show that the momentum strategy is related to greater downside risk. Bollerslev et al. (2021) propose a new decomposition for the market beta into four "realized semi-betas". They show that semi-betas associated with the negative market and stock return covariation contribute to predicting higher future stock returns, whereas semi-betas stemming from the negative market and positive stock return covariation predict lower future returns.

This research strand is based on the asymmetric reaction of the investor to downside and upside risks. If a stock price is more sensitive to market decline than to the rising market, the investor, who places a greater weight on the unfavorable market conditions, requires a premium for holding the stock. The pricing of the downside risk has been also traced back to the partial moment framework (Bawa and Lindenberg, 1977), the prospect theory (Kahneman and Tversky; 1979), and the disappointment aversion (Gul, 1991; Routledge and Zin, 2010). Since empirically an idiosyncratic risk premium has been proven (Ang et al., 2006/2009; Fu, 2009), we find that it is recommended to study the impact of earnings returns on idiosyncratic downside volatility. Patton and Sheppeard (2015) prove that negative realized semivariance is more strongly correlated to future volatility than the volatility of past positive returns. They argue also that the volatility of pas negative returns are more useful than positive semivariance in predicting total variance, positive semivariance and negative semivariance. Public information on the deterioration of accruals management would have a significant impact on the idiosyncratic downside volatility since it would

[33] They find that neither liquidity risk, nor size, value and momentum factors don't explain the downside risk.

generate more negative returns. It would be even more beneficial for the firm improve their earnings quality because its deterioration affects the more the negative idiosyncratic semivariance.

*H3: the impact of the earnings quality measure on idiosyncratic downside risk is positive and stronger than its impact on idiosyncratic volatility.*

And similarly, to our second hypothesis, we test the effect of the information environment on the impact of earnings quality on the idiosyncratic downside risk.

*H4: the impact of the earnings quality measure on the idiosyncratic downside volatility becomes weaker in a good information environment and it is stronger in a bad information environment.*

## 3.2.2. Estimation models

In this subsection, we present different models we use to estimate our variables of interest and panel data models that we perform. First, we used Dechow and Dichev (2002) model to estimate the earnings quality proxy. Then, we present both of our proxies for idiosyncratic volatility proxy. Finally, we describe the panel data model specifications that we use to test the impact of earnings quality on idiosyncratic volatility.

### 3.2.2.1. The earnings quality measure

We follow Dechow and Dichev (2002) in the calculation of the earnings quality measure. The accounting accruals are supposed to reflect information about the past and current cash flows and or anticipate the future cash flow. Bad measurement of accruals would lead to a distortion in their ability to reflect cash flows related information. The reasons behind this measurement error could be intentional or unintentional. They are intentional when earnings are manipulated because of managerial incentives. The measurement error is unintentional when it is arising from business uncertainty or management lapses. The relation between working capital accruals and cash flows is modeled by Dechow and Dichev (2002) and modified by s used by McNichols (2002) and Francis et al. (2005). as the following:

$$\Delta WCA_{it} = \alpha_0 + \alpha_1 CF_{i,t-1} + \alpha_2 CF_{it} + \alpha_3 CF_{it+1} + \alpha_4 \Delta Rev + \alpha_5 PPE + \upsilon_{it} \quad (1)$$

$\Delta WCA_{it}$ is the working capital accruals change for the company *i* during the year *t*; CF is the cash flows from operations. We consider the lagged, the contemporaneous, and the leading cash flows. $\Delta Rev$ is the change in sales revenues of a firm between time $t$ and $t$-$1$. $PPE$ is the gross, plant, equipment of a firm in year $t$. The υ is the residual from the regression. When past, current, and future cash flows explain more precisely accounting accruals, the residual factor will decrease. In the same perspective, if cash flow measures explain with less precision the working capital accrual, the residual will rise. Therefore, the model considers the standard deviation of firm-specific residual over 4 years as the measurement of earnings quality. The larger is the standard deviation the larger the poorer is the quality of earnings. All variables are scaled by average assets.

For robustness, we use a second proxy for earnings quality which is the earnings smoothing measure in section 3.6. The latter is usually associated with earnings manipulations and therefore it can also be used as a proxy for earnings quality. Income Smoothing can be defined as a technique used by managers to decrease the volatility of earnings through real or artificial earnings management. From the manager's point of view, income smoothing is highly desirable because it reduces earnings uncertainty for investors which makes them willing to pay a premium to stocks with steady and stable earnings flow. In this sense, reducing earnings variability is desirable also for the investor. Another income smoothing advantage is that it can minimize the risk of a possible debt and it can maximize management bonuses (Menicucci. 2019). Nevertheless, managers can refer to deceptive accounting techniques to control and reduce the variability of earnings from one period to another. As a consequence, smoothness is related positively or negatively to earnings quality.

On one hand, smoothing can be considered positively associated with earnings quality because the more earnings are smoother, the easier it becomes to predict their future values. To keep a steady earnings stream, managers can use private information about future cash flows and incorporate it into current earnings (Baik, Choi, and Farber, 2020). On the other hand, any manipulation of earnings can induce noise in the accounting information, and consequently, it reduces the earnings quality. In this regard, income smoothing is considered a manipulative technique to decrease the natural volatility of earnings. Therefore, income smoothing is negatively related to earnings quality (Leuz et al., 2003; Dechow and Skinner, 2000; Zeghal, Chtourou and Fourati, 2012). According to this view, earnings quality deviates from the real value of earnings by reporting manipulated earnings that are less related to the economic activity of the firm, as a consequence, earnings don’t reflect the real performance of the firm. We believe that smoothness is associated with fewer earnings quality.

Smoothness is defined as the ratio of earnings volatility to the volatility of cash flows from operations.

Smooth = Vol(ER) / Vol(CFO) (2)

Where ER is the firm's *i* net income in year t and CFO is the cash flow from operations value of the firm $i$ in year *t.* When the variability of income is less than the variability of cash flows, the value of "smooth" is lower indicating a higher level of artificial income smoothing. However, high values of smooth reflect high changes in the net income relative to changes in operating cash flows. Consequently, earnings become less predictable than the operating cash flows which means a decrease in earnings quality but not through income smoothing.

#### 3.2.2.2. Idiosyncratic risk estimation

We estimate two measures for the idiosyncratic risk. The first measure is the principal component idiosyncratic volatility34 (PCIV). It is estimated using a return factor model using a purely statistical method because its factors $F_{\omega t}$ estimations rely on the first 6 principal components[35] of the cross-section of returns within the same day. The model is described as:

$$R_{it} - r_t = \alpha_{it} + \beta_{Fi}F_t + \upsilon_{it} \quad (3)$$

Where $R_{it}$ is the return of the stock i in during the month t ; $r_t$is the free risk rate ; $\alpha_{it}$is the intercept; $\beta_{Fi}$ is each component loading; $F_t$ are the first three principal components in the cross-section of returns in each market; $\upsilon_{it}$ is the residual.

The idiosyncratic volatility is considered as the standard deviation of this residual. Since we used daily data, the standard deviation of the estimated residuals is also daily and should be converted into a yearly standard deviation36. Thereby, we multiply the daily standard deviation by the square root of the number of trading days in the corresponding year.

[34] We also use Idiosyncratic risk as a synonym for idiosyncratic volatility.

[35] Since the first principal component is the one who accounts for most of the variance, roughly 10%.

[36] We apply KPSS test to examine the stationarity of each firm's Idiosyncratic Risk series. We find that 95% of the idiosyncratic volatility series are stationary. Consequently, the 5% non-stationary series are all excluded.

We also estimate the firm-specific risk as to the realized idiosyncratic volatility (RIV). For this idiosyncratic risk measure, we follow Ang et al. (2006, 2009) to estimate the idiosyncratic volatility. For each month and every country, we regress the stock excess return on the different daily Fama and French (1992, 2015) risk factors and Carhart (1997) momentum factor. The model is described below:

$$R_{i\omega t} - r_t = \alpha_{i\omega t} + \beta_{mi\omega}(R_{m\omega t} - r_t) + \beta_{SMBi\omega} SMB_{\omega t} + \beta_{HMLi\omega} HML_{\omega t} + \beta_{RMWi\omega} MOM_{\omega t} + \beta_{RMWi\omega} RMW_{\omega t} + \beta_{CMAi\omega} CMA_{\omega t} + \varepsilon_{i\omega t} \quad (4)$$

Where $R_{i\omega t}$ is the return of the stock i in the country ω during the month t ; $r_t$is the free risk rate ; $\alpha_{i\omega t}$is the intercept ; $\beta_{mi\omega}$is the market coefficient; $R_{m\omega t}$ is the value-weighted market return ; $\beta_{SMBi\omega}$ is the size factor coefficient ; $SMB_{\omega t}$ the return of the portfolio small minus big ; $\beta_{HMLi\omega}$is the book to market coefficient; $HML_{\omega t}$ is the difference between the return of the portfolio including the high book to market ratio firms and low book to market ratio portfolio return; $MOM_{\omega t}$ is the average return of high momentum portfolios minus the average return of low momentum portfolios; $RMW_{\omega t}$ the average return on robust operating profitability portfolios minus the average return on the two weak operating profitability portfolios; $CMA_{\omega t}$is an investment factor estimated as the difference between the average return on the conservative investment portfolios and the average return on aggressive investment portfolios; $\varepsilon_{i\omega t}$ is the residual. The realized idiosyncratic volatility is considered as the standard deviation of this residual. Since we use daily data, the standard deviation of the estimated residuals is also daily and should be converted into a yearly standard deviation. Thereby, we multiply the daily standard deviation by the square root of the number of trading days in the corresponding year.

Since an increase in the Dechow and Dichev measure means a deterioration in the earnings quality, we suppose that it will have a positive and more significant effect on the idiosyncratic downside risk. To test the effect of earnings quality on the volatility of negative idiosyncratic returns, we compute yearly idiosyncratic downside volatility for both idiosyncratic measures37 using the following formula:

[37] We denote the idiosyncratic downside volatility estimated using principal components factor model and Fama and French model by “dwn_iv” and “dwn_riv” respectively.

$$dwn\_vol = \sqrt{\frac{1}{n} * \sum(-ir)^2} * \sqrt{251} \quad (5)$$

Where *-ir* is the negative idiosyncratic returns, *n* is the number of days where negative idiosyncratic residuals occurred. We use the semi-variance method, we only negative residuals in the year, as they represent the idiosyncratic downside deviations, and calculate the sum of their squared values. Then, we divide this value by the number of days where negative idiosyncratic returns occurred during the year. Finally, we multiply the square root of this semi-variance by the square root of the number of trading days in the year.

#### 3.2.2.3. Cross-sectional analysis

To test the relationship between the Idiosyncratic Risk and the firms' Earnings Quality, we estimate the following Panel Data Model using the M_DD measure:

$$Vol_{i\tau} = \alpha_i + \beta_{DD}DD_{i,\tau-1} + \beta_{MKTCAP}MKTCAP_{i,\tau-1} + \beta_{LEV}LEV_{i,\tau-1} + \beta_{MTB}\,BTM_{i,\tau-1} + \beta_{Numb\_Analysts}\ Numb\_Analysts_{i,\tau-1} + \beta_{RET}RET_{i,\tau-1} + \beta_{CF}CF_{i,\tau-1} + \beta_{VCF}\,VCF_{i,\tau-1} + \varepsilon_{i,t} \quad (6)$$

Where for each firm *i* and during the year $\tau$, *Vol* is either a total idiosyncratic volatility measure (PCIV and RIV) or the downside idiosyncratic volatility (dwn_iv and dwn_riv). *DD* is a natural logarithm of the earnings quality measure calculated as described above; $MKTCAP$ is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm’s stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. All the variables are lagged. We follow Petersen (2009) by adjusting the standard errors using two-way clustering, by both firms (the individual effect) and by year (the time effect). In order to choose the appropriate estimation technique (Fixed Effects or Random Effects) for each country, we use the Hausman test for each specification.

To test the effect of the information environment on the impact of earnings quality on the idiosyncratic volatility and the idiosyncratic downside risk, Equations 5 and 6 are estimated. We add to equation 4 four variables. While *Size_q4* is a dummy variable set to one, if the level of market capitalization is in the first quartile, *Size_q1* is a dummy variable that takes the value of one, if the level of market capitalization is in the lowest quartile. *num_anal_q4* and *num_anal_q1* are constructed the same way as *Size_q4* and *Size_q1*, but based on the number of analysts following companies for robustness purposes. These measures are a proxy for the information environment given that the higher market capitalization and higher number of analysts following a company are a reflection of less asymmetric information and a better information environment. To account for the interaction between these variables and DD, we multiply these variables by earnings quality measure (DD). We call these variables *DD_q4* and *DD_q1* for variables based on market capitalization, *DD_nanal_q4* and *DD_nanal_q1*for number of analysts variables.

$$Vol_{i\tau} = \alpha_i + \beta_{DD} DD_{i,\tau-1} + \beta_{LEV} LEV_{i,\tau-1} + \beta_{MTB} BTM_{i,\tau-1} + \beta_{RET} RET_{i,\tau-1} + \beta_{CF} CF_{i,\tau-1} + \beta_{VCF} VCF_{i,\tau-1} + \beta_{DD\_q4} DD\_q4_{i,\tau-1} + \beta_{DD\_q1} DD\_q1_{i,\tau-1} + \beta_{Size\_q4} Size\_q4_{i,\tau-1} + \beta_{Size\_q1} Size\_q1_{i,\tau-1} + \varepsilon_{i,t} \quad (7)$$

$$Vol_{i\tau} = \alpha_i + \beta_{DD} DD_{i,\tau-1} + \beta_{LEV} LEV_{i,\tau-1} + \beta_{MTB} BTM_{i,\tau-1} + \beta_{RET} RET_{i,\tau-1} + \beta_{CF} CF_{i,\tau-1} + \beta_{VCF} VCF_{i,\tau-1} + \beta_{DD\_nanal\_q4} DD\_nanal\_q4_{i,\tau-1} + \beta_{DD\_nanal\_q1} DD\_nanal\_q1_{i,\tau-1} + \beta_{num\_anal\_q4} num\_anal\_q4_{i,\tau-1} + \beta_{num\_anal\_q1} num\_anal\_q1_{i,\tau-1} + \varepsilon_{i,t} \quad (8)$$

## 3.3. Empirical analysis

This third subsection is dedicated to present results of our empirical analysis. First, we present our sample and the data used. Second, we show results related to the impact of the earnings quality on the idiosyncratic volatility, we also test this relation in different information environment. Third, we examine the asymmetric response of the idiosyncratic risk to the deterioration in the accounting information by testing the impact of earnings quality on the volatility of negative idiosyncratic returns. We replicate the analysis under different information environment. Finally, we conduct robustness checks through replacing Dechow and Dichev measure (2002) by smoothness.

### 3.3.1. Data

We have extracted from Bloomberg market data from 2006 to 2018. We collect daily stock returns, annual market capitalization, annual leverage ratio, annual Cash flow from operations, and the number of analysts following the firm for each year. Our sample covers 431 firms listed on Euronext Paris in France. All financial institutions are excluded since the nature of their assets and liabilities is different than other industries' balance sheet elements.

Summary statistics for our key variables are presented in table 1. Results show that the average annual principal components model idiosyncratic volatility (realized idiosyncratic volality) is 21.84% (11.73%), whereas the Principal Components Model Idiosyncratic Downside Volatility (dwn_riv) is 29.7% (12.49%). for the average firm characteristics, it has a $3 billion market capitalization (untabulated) and 0.82 books to market ratio. Its operating cash flows represents 2.1% of their assets' average value and its financial leverage is about 12% of the book value of total assets. Our main independent variable, Dechow and Dichev (DD), has a mean of 0.672 and a median of 0.482. We also notice that the PCIV and dwn_riv are higher than the RIV and dwn_riv on average for the sample.

**Table 1: Summary Statistics**

| Variable | Min | 1st Qu. | Median | Mean | 3rd Qu. | Max |
|---|---|---|---|---|---|---|
| PCIV (x 100) | 11.109 | 16.998 | 21.563 | 21.838 | 26.284 | 33.879 |
| RIV(x100) | 5.364 | 8.519 | 11.061 | 11.731 | 14.795 | 19.426 |
| dwn_iv (x 100) | 7.146 | 16.251 | 26.168 | 29.703 | 39.687 | 66.752 |
| dwn_riv(x100) | 6.117 | 9.406 | 11.908 | 12.491 | 15.480 | 19.955 |
| DD | 0.124 | 0.283 | 0.482 | 0.672 | 0.874 | 2.211 |
| MKTCAP | 1.828 | 3.679 | 5.398 | 5.641 | 7.450 | 10.290 |
| BTM | -1.669 | -0.892 | -0.379 | -0.401 | 0.116 | 0.773 |
| LEV | 0.000 | 2.607 | 9.962 | 12.583 | 19.773 | 38.022 |
| RET | -0.753 | -0.151 | 0.097 | 0.060 | 0.311 | 0.679 |
| Numb_Analysts | 0.000 | 1.000 | 3.000 | 7.730 | 13.000 | 30.000 |
| CF | -0.136 | -0.008 | 0.025 | 0.021 | 0.058 | 0.141 |
| V_CF (x 100) | 0.67 | 4.46 | 15.17 | 109.65 | 88.87 | 785.28 |

Note: We have extracted from Bloomberg market data from 2006 to 2018. We collect daily stock returns, annual market capitalization, annual leverage ratio, annual Cash flow from operations, and the number of analysts following the firm for each year. Our sample covers 431 firms listed on Euronext Paris in France. All financial institutions are excluded. *DD* is a natural logarithm of the earnings quality measure calculated as described above; $MKTCAP$ is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window.

In table 2, we report the correlations between all variables, dependent, variable of interest, and control variables. While the lower part of table 2 focuses on the correlations between the Idiosyncratic Volatility and Dechow and Dichev measure (DD) and the control variables, the upper part concerns the idiosyncratic downside risk. As we expect, the correlation between the Dechow and Dichev measure (DD) and the idiosyncratic downside volatility (dwn_iv and dwn_riv) is higher than the correlation between DD and the idiosyncratic volatility (PCIV and RIV). As for control variables, correlations are negative between volatility measures, whether total or downside idiosyncratic volatility, and size, returns, number of analysts, and volatility of cash flows, and positive between the book-to-market ratio and leverage.

**Table 2: Correlations**

| Panel A : Principal Components Idiosyncratic Volatility | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **PCIV** | **DD** | **MKTCAP** | **BTM** | **LEV** | **RET** | **Null** | **CF** | **VCF** |
| dwn_iv | | 0.3 | -0.442 | 0.005 | 0.098 | -0.403 | -0.345 | 0.05 | -0.231 |
| DD | 0.247 | | -0.359 | -0.085 | 0.295 | -0.41 | -0.227 | -0.396 | -0.229 |
| MKTCAP | -0.419 | -0.359 | | -0.263 | -0.109 | 0.29 | 0.829 | 0.179 | 0.533 |
| BTM | 0.005 | -0.085 | -0.263 | | 0.054 | -0.171 | -0.249 | -0.067 | -0.056 |
| LEV | 0.205 | 0.295 | -0.109 | 0.054 | | -0.025 | -0.031 | -0.54 | -0.015 |
| RET | -0.322 | -0.41 | 0.29 | -0.171 | -0.025 | | 0.118 | 0.125 | 0.047 |
| Number of Analysts | -0.378 | -0.227 | 0.829 | -0.249 | -0.031 | 0.118 | | 0.083 | 0.626 |
| CF | 0.152 | -0.396 | 0.179 | -0.067 | -0.54 | 0.125 | 0.083 | | 0.032 |
| VCF | -0.258 | -0.229 | 0.533 | -0.056 | -0.015 | 0.047 | 0.626 | 0.032 | |
| **Panel B: Realized Idiosyncratic Volatility** | | | | | | | | | |
| | **RIV** | **DD** | **MKTCAP** | **BTM** | **LEV** | **RET** | **Numb_Anal** | **CF** | **VCF** |
| dwn_riv | | 0.412 | -0.499 | 0.036 | 0.058 | -0.471 | -0.363 | -0.338 | -0.404 |
| DD | 0.384 | | -0.244 | -0.229 | 0.011 | -0.433 | -0.197 | -0.449 | -0.25 |
| MKTCAP | -0.456 | -0.242 | | -0.221 | 0.166 | 0.377 | 0.835 | 0.239 | 0.871 |
| BTM | 0.016 | -0.23 | -0.22 | | -0.066 | -0.084 | -0.131 | 0.121 | 0.035 |
| LEV | 0.069 | 0.017 | 0.162 | -0.072 | | -0.061 | 0.17 | -0.129 | 0.193 |
| RET | -0.449 | -0.428 | 0.382 | -0.083 | -0.07 | | 0.227 | 0.481 | 0.247 |
| Numb_Analysts | -0.355 | -0.196 | 0.834 | -0.132 | 0.169 | 0.23 | | 0.172 | 0.773 |
| CF | -0.232 | -0.381 | 0.22 | 0.1 | -0.118 | 0.408 | 0.158 | | 0.212 |
| VCF | -0.361 | -0.248 | 0.87 | 0.037 | 0.189 | 0.251 | 0.772 | 0.191 | |

Note: In Table 2, we report the correlations between all variables, dependent, variable of interest, and control variables. *DD* is a natural logarithm of the earnings quality measure estimated using Dechow and Dichev (2002); *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor; *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; $MKTCAP$ is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. While the lower part of Table 2 focuses on the correlations between the Idiosyncratic Volatility and Dechow and Dichev (DD) control variables, the upper part concerns the idiosyncratic downside risk. Whereas panel A is dedicated for correlations related to principal component idiosyncratic volatility (PCIV), panel B presents correlations for realized idiosyncratic volatility (RIV). As for control variables, correlations are negative between volatility measures, whether total or downside idiosyncratic volatility, and size, returns, number of analysts, and volatility of cash flows, and positive between the book-to-market ratio and leverage.

### 3.3.2. The impact of the earnings quality measure on the idiosyncratic risk

To test the relationship between earnings quality and the Idiosyncratic Risk, we estimate the cross-sectional regression according to equation 6. Table 3 reports the results of the regressions. While in Panel A, PCIV is the dependent variable, we regress RIV on the Earnings Quality proxy (DD) and other control variables in Panel B. We estimate three specifications for idiosyncratic volatility (PCIV and RIV) and downside volatility (dwn_iv and dwn_riv). In the first specification, we use the OLS pooling technique, while we estimate Fixed effects and the random effects for the second and third specifications. We report coefficients of the independent variables, their standard errors, the model's adjusted R-squared, Hausman test statitic's and its p-value for each specification.

**Table 3: The Effect of Earnings Quality on The Idiosyncratic Volatility**

| | **Panel A: PCIV** | | | **Panel B: RIV** | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.175*** | 0.0247* | 0.0482*** | 0.180*** | 0.0251* | 0.0487*** |
| | (0.0188) | (0.0127) | (0.0125) | (0.0154) | (0.0128) | (0.0126) |
| *MKTCAP* | -1.876*** | -0.841*** | -0.980*** | -1.934*** | -0.797*** | -0.921*** |
| | (0.149) | (0.0874) | (0.0821) | (0.105) | (0.0881) | (0.0827) |
| *BTM* | -1.110*** | -0.287*** | -0.378*** | -1.666*** | -0.256*** | -0.342*** |
| | (0.169) | (0.0780) | (0.0780) | (0.169) | (0.0787) | (0.0786) |
| *LEV* | -1.952*** | 1.002** | 0.794* | -1.967*** | 1.016** | 0.793* |
| | (0.690) | (0.437) | (0.440) | (0.674) | (0.441) | (0.444) |
| *RET* | -0.108*** | -0.0206*** | -0.0234*** | -0.105*** | -0.0197*** | -0.0227*** |
| | (0.0107) | (0.00422) | (0.00426) | (0.00778) | (0.00426) | (0.00430) |
| *VCF* | 0.587*** | 0.156** | 0.110* | 0.739*** | 0.162*** | 0.122** |
| | (0.125) | (0.0605) | (0.0606) | (0.105) | (0.0611) | (0.0611) |
| *Numb_Analysts* | 0.0718*** | -0.0180 | -0.0239 | 0.0825*** | -0.0260 | -0.0297* |
| | (0.0193) | (0.0163) | (0.0161) | (0.0183) | (0.0164) | (0.0163) |
| *CF* | -2.574** | -0.162 | -1.152** | -2.446*** | -0.451 | -1.417*** |
| | (1.213) | (0.497) | (0.493) | (0.782) | (0.501) | (0.497) |
| Constant | 29.18*** | 25.82*** | 26.36*** | 30.47*** | 26.66*** | 27.01*** |
| | (0.998) | (0.593) | (0.627) | (0.720) | (0.599) | (0.630) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.350 | 0.164 | 0.224 | 0.346 | 0.204 | 0.362 |
| Hausman Test | | | 63.21 | | | 37.04 |
| | | | (0.000) | | | (0.0234) |

Note: Table 3 reports the results of panel regressions testing the impact of earnings quality on the idiosyncratic volatility. While in Panel A, PCIV is the dependent variable, we regress RIV on the Earnings Quality proxy (DD) and other control variables in Panel B. *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *MKTCAP* is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We estimate three specifications for idiosyncratic volatility (PCIV and RIV). In the first specification, we use the OLS pooling technique, while we estimate Fixed effects and the random effects for the second and third specifications. We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

In our three specifications, in the case of PCIV or RIV, the effect of the DD on the idiosyncratic volatility is positive and significant. Its coefficients are lower in the case of random and fixed effects. To choose the most appropriate technique, we use the Hausman test. It shows that fixed effects are the appropriate technique. As for control variables, the firm's size, Book-to-Market ratio, stock return, and cash flows from operations have a negative significant impact on the Idiosyncratic Volatility. However, leverage ratio and volatility of cash flows have positive significant coefficients in the fixed effects and the random-effects model. These results show that earnings quality measures have a positive impact on the idiosyncratic risk, whether PCIV or RIV. In other words, the deterioration/manipulation in earnings quality leads to a rise in idiosyncratic volatility, supporting our first hypothesis.

### 3.3.3. The effect of the information environment on the relationship between the idiosyncratic risk and the earnings quality

In this subsection, we explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results of equations 7 and 8 in tables 4 and 5. Panel A and B in each table are for results related to PCIV and RIV respectively.

We find an increase in the loadings of DD, which are still positive and statistically significant when we consider the information environment variables. In addition, our main variable in this subsection, which is *DD_q4,* is negative and statistically significant at 10% and 5% levels in OLS pooling, Random effects, and Fixed effects settings. We also observe a general increase in the DD coefficients when the information environment variables are included. Hausman test results indicate that Fixed effects are the most appropriate estimation technique. Supporting our second hypothesis, these results prove that the improved earnings quality of large firms has a less significant effect on the idiosyncratic risk. In addition, *Size_q4* coefficients are negative and statistically significant in all settings at 1% and 5% levels for both idiosyncratic measures. It means that a good information environment reduces idiosyncratic volatility.

**Table 4: Information Environment Effect, proxied by size, on The Relationship Between Earnings Quality and the Idiosyncratic Volatility**

| | Panel A: PCIV | | | Panel B: RIV | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.309*** | 0.0528** | 0.0747*** | 0.312*** | 0.0516** | 0.0734*** |
| | (0.0247) | (0.0243) | (0.0119) | (0.0145) | (0.0258) | (0.0119) |
| *DD_q4* | -0.300* | -0.374** | -0.373** | -0.219 | -0.369** | -0.371** |
| | (0.174) | (0.166) | (0.155) | (0.263) | (0.169) | (0.155) |
| *DD_q1* | 0.162 | 0.0499 | 0.0449 | 0.162*** | 0.0471 | 0.0423 |
| | (0.102) | (0.0420) | (0.0310) | (0.0621) | (0.0413) | (0.0310) |
| *Size_q4* | -1.514** | -1.505** | -1.804*** | -1.236 | -1.451** | -1.736*** |
| | (0.592) | (0.628) | (0.524) | (0.894) | (0.631) | (0.525) |
| *Size_q1* | 7.237*** | 1.981*** | 2.177*** | 7.085*** | 1.904*** | 2.090*** |
| | (0.532) | (0.368) | (0.214) | (0.350) | (0.367) | (0.214) |
| *BTM* | -0.344** | 0.111 | 0.0651 | -0.315*** | 0.133 | 0.0879 |
| | (0.148) | (0.125) | (0.0723) | (0.122) | (0.130) | (0.0724) |
| *LEV* | -0.443 | 1.189* | 0.989*** | -0.629 | 1.156* | 0.946*** |
| | (0.468) | (0.665) | (0.309) | (0.481) | (0.653) | (0.310) |
| *RET* | -1.075*** | -0.429** | -0.453*** | -1.012*** | -0.442** | -0.464*** |
| | (0.401) | (0.197) | (0.0872) | (0.169) | (0.197) | (0.0874) |
| *VCF* | -0.151 | 0.0353 | -0.0512 | -0.0927 | 0.0448 | -0.0322 |
| | (0.0977) | (0.0789) | (0.0585) | (0.0929) | (0.0819) | (0.0585) |
| *CF* | 0.0413*** | -0.0002 | 0.0006 | 0.0421*** | 0.0013 | 0.0021 |
| | (0.007) | (0.001) | (0.005) | (0.013) | (0.001) | (0.005) |
| Constant | 16.11*** | 21.09*** | 20.50*** | 17.21*** | 22.13*** | 21.44*** |
| | (0.322) | (0.395) | (0.440) | (0.328) | (0.404) | (0.440) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.353 | 0.132 | 0.209 | 0.332 | 0.162 | 0.179 |
| Hausman Test | | | 100.27 | | | 73.94 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 4. Panel A and B in each table are for results related to PCIV and RIV respectively. *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Size as A Proxy for Information Environment and Dechow and Dichev (2002) measure as a proxy for Earnings Quality. *Size_q4* is a dummy variable set to one, if the level of market capitalization is in the first quartile, *Size_q1* is a dummy variable that takes the value of one, if the level of market capitalization is in the lowest quartile. *DD_q4* (*DD_q1*) is the product of the dummy variable *Size_q4* (*Size_q1*) and *DD.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table 5: Information Environment Effect, proxied by the number of analysts following, on The Relationship Between Earnings Quality and the Idiosyncratic Volatility**

| | Panel A : PCIV | | | Panel B : RIV | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.319*** | 0.0551*** | 0.0747*** | 0.321*** | 0.0519** | 0.0734*** |
| | (0.0279) | (0.0124) | (0.0119) | (0.0274) | (0.0217) | (0.0119) |
| *DD_nanal_q4* | -0.619*** | -0.266* | -0.373** | -0.537*** | -0.224* | -0.371** |
| | (0.203) | (0.145) | (0.155) | (0.208) | (0.122) | (0.155) |
| *DD_nanal_q1* | 0.136** | -0.00198 | 0.0449 | 0.142** | 0.0106 | 0.0423 |
| | (0.0689) | (0.0273) | (0.0310) | (0.0672) | (0.0299) | (0.0310) |
| *num_anal_q4* | -0.919 | -0.720 | -1.804*** | -0.564 | -0.638 | -1.736*** |
| | (0.671) | (0.483) | (0.524) | (0.690) | (0.422) | (0.525) |
| *num_anal_q1* | 1.942*** | 0.123 | 2.177*** | 1.935*** | 0.167 | 2.090*** |
| | (0.335) | (0.170) | (0.214) | (0.331) | (0.175) | (0.214) |
| *BTM* | 0.241* | 0.232*** | 0.0651 | 0.256* | 0.246** | 0.0879 |
| | (0.146) | (0.0706) | (0.0723) | (0.146) | (0.102) | (0.0724) |
| *LEV* | -0.487 | 1.263*** | 0.989*** | -0.682 | 1.230** | 0.946*** |
| | (0.516) | (0.312) | (0.309) | (0.500) | (0.493) | (0.310) |
| *RET* | -1.675*** | -0.572*** | -0.453*** | -1.601*** | -0.579*** | -0.464*** |
| | (0.525) | (0.0857) | (0.0872) | (0.508) | (0.201) | (0.0874) |
| *VCF* | -0.977*** | 0.00631 | -0.0512 | -0.905*** | 0.0157 | -0.0322 |
| | (0.0899) | (0.0597) | (0.0585) | (0.0895) | (0.0598) | (0.0585) |
| *CF* | 0.0308*** | -0.00316 | 0.000630 | 0.0319*** | -0.00154 | 0.00212 |
| | (0.00287) | (0.00535) | (0.00542) | (0.00295) | (0.00131) | (0.00543) |
| Constant | 14.49*** | 21.27*** | 20.50*** | 15.60*** | 16.55*** | 21.44*** |
| | (0.328) | (0.301) | (0.440) | (0.325) | (0.554) | (0.440) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.290 | 0.113 | 0.159 | 0.270 | 0.162 | 0.125 |
| Hausman Test | | | 190.55 | | | 3539.2 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 5. Panel A and B in each table are for results related to PCIV and RIV respectively. *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Number of Analysts as A Proxy for Information Environment and Dechow and Dichev (2002) measure as a proxy for Earnings Quality. *num_anal_q4* is a dummy variable set to one, if the level of number of analysts is in the first quartile, *num_anal_q1* is a dummy variable that takes the value of one, if the level of the number of analysts is in the lowest quartile. *DD_nanal_q4* (*DD_nanal_q1*) is the product of the dummy variable *num_anal_q4* (*num_anal_q1*) and *DD.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

As a robustness check, we replace size variables with variables based on the number of analysts following. All results are presented in table 5. We eventually reach the same conclusions. DD coefficients are still positive and statistically significant at 1% level across all models for PCIV and at 1% and 5% level across all models for RIV. More importantly, the interaction variable *DD_nanal_q4* loadings are negative and significant regardless of the estimation technique used or the idiosyncratic proxy included. Hausman test results indicate that the fixed effects model is the most appropriate. Results show also that firms followed by the highest number of analysts are associated with less idiosyncratic volatility. In accordance with our second hypothesis, our results suggest that a good information environment will reduce the impact of earnings quality on idiosyncratic volatility.

### 3.3.4. The impact of the earnings quality measure on the idiosyncratic downside risk

This subsection focuses on the relationship between Earnings Quality and the Idiosyncratic Downside Risk defined as the volatility of negative idiosyncratic return. As defined above, the dwn_iv is the idiosyncratic downside risk for the Principal Components Model, and the dwn_riv is the idiosyncratic downside risk estimated based on The Six-Factor Model.

We predict that the effect of deterioration or manipulation in earnings quality should be stronger in the case of Idiosyncratic downside volatility. In other terms, the poor management of accruals would eventually lead to more occurrence of negative idiosyncratic returns, and hence more increase in the idiosyncratic downside volatility. The results for equation 6 when dwn_iv (dwn_riv) is the dependent variable are presented in table 6. Regardless of the model or the idiosyncratic risk measure that we use, the DD coefficient is always positive and statistically significant at a 1% level. They are greater than coefficients found in idiosyncratic risk regressions. These results confirm our hypothesis that inadequate accruals management leads to higher volatility of negative idiosyncratic returns. Control variables loadings have the same signs as in the case of idiosyncratic volatility.

Stock returns and Cash flows from operations have a higher impact on the Idiosyncratic downside risk than on the idiosyncratic risk, regardless of the estimation model used. Coefficients of leverage and the number of analysts variables become insignificant in the fixed effects and random effects models, whereas they are statistically significant in the OLS pooling model. Hausman test results state that the fixed effects model is the most adequate when the dependent variable is idiosyncratic downside risk. Confirming our third hypothesis, the results demonstrate the existence of the impact of earnings quality on idiosyncratic downside volatility. Moreover, the impact on idiosyncratic downside volatility is even stronger than the impact on idiosyncratic volatility, which means also that it exists an asymmetric effect of earnings quality on idiosyncratic volatility.

**Table 6: The Effect of Earnings Quality on The Idiosyncratic Downside Volatility**

| | **Panel A : dwn_iv** | | | **Panel B : dwn_riv** | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.125*** | 0.0478*** | 0.0591*** | 0.129*** | 0.0490*** | 0.0597*** |
| | (0.0173) | (0.0134) | (0.0123) | (0.0176) | (0.0137) | (0.0125) |
| *MKTCAP* | -1.294*** | -0.444*** | -0.526*** | -1.273*** | -0.425*** | -0.483*** |
| | (0.115) | (0.0940) | (0.0820) | (0.116) | (0.0960) | (0.0834) |
| *BTM* | -0.823*** | -0.513*** | -0.525*** | -0.798*** | -0.496*** | -0.499*** |
| | (0.139) | (0.0835) | (0.0813) | (0.140) | (0.0852) | (0.0829) |
| *LEV* | -2.270*** | 0.689 | 0.403 | -2.480*** | 0.735 | 0.422 |
| | (0.601) | (0.465) | (0.454) | (0.615) | (0.474) | (0.463) |
| *RET* | -0.0805*** | -0.0459*** | -0.0477*** | -0.0769*** | -0.0452*** | -0.0473*** |
| | (0.00848) | (0.00457) | (0.00449) | (0.00863) | (0.00466) | (0.00458) |
| *VCF* | 0.490*** | -0.123* | -0.113* | 0.525*** | -0.134** | -0.115* |
| | (0.0987) | (0.0653) | (0.0639) | (0.100) | (0.0667) | (0.0652) |
| *Numb_Analysts* | 0.0486*** | -0.00825 | -0.0121 | 0.0581*** | -0.0130 | -0.0136 |
| | (0.0148) | (0.0179) | (0.0169) | (0.0151) | (0.0182) | (0.0172) |
| *CF* | 1.429 | 1.041** | 0.894** | 1.622* | 0.911** | 0.844** |
| | (0.932) | (0.450) | (0.411) | (0.946) | (0.459) | (0.419) |
| Constant | 20.09*** | 10.92*** | 10.76*** | 20.73*** | 11.33*** | 10.96*** |
| | (0.776) | (0.625) | (0.580) | (0.789) | (0.638) | (0.590) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.320 | 0.202 | 0.356 | 0.289 | 0.219 | 0.355 |
| Hausman Test | | | 396.99<br>(0.000) | | | 423.51<br>(0.000) |

Note: Table 6 reports the results of panel regressions testing the impact of earnings quality on the idiosyncratic downside volatility. While in Panel A, dwn_iv is the dependent variable, we regress dwn_riv on the Earnings Quality proxy (DD) and other control variables in Panel B. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; $MKTCAP$ is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We estimate three specifications for idiosyncratic volatility (PCIV and RIV). In the first specification, we use the OLS pooling technique, while we estimate Fixed effects and the random effects for the second and third specifications. We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

### 3.3.5. The effect of the information environment on the relationship between the downside idiosyncratic risk and the earnings quality

We discuss the impact that the information environment would have on the relationship between earnings quality degradation and the idiosyncratic downside risk. Results are reported in table 7. The interaction variable *DD_q4* has negative and statistically significant coefficients in fixed effects and random effects models, which confirms our fourth hypothesis.

Hausman test results favor the fixed effects model over the Random Effects model. Our results prove that the effect of deteriorating accruals management on the idiosyncratic downside volatility is weaker when the information environment is improved. Inversely, when the information environment is opaque, the Idiosyncratic downside volatility and earnings quality become more correlated, and the impact of the deterioration of earnings quality on idiosyncratic downside risk is stronger.

In all models, while coefficients of variable *Size_q4* are always negative and statistically significant at 1% and 5% level, Size*_q1* coefficients are positive and significant at 1%. In other terms, being in the fourth size quantile is related to less idiosyncratic downside risk, and inversely, firms in the bottom size quantile have more volatile negative idiosyncratic returns. Both of our idiosyncratic risk proxies confirm this finding.

When size variables are replaced by variables based on the number of analysts following the firm's performance, we find the same conclusions. Table 8 presents the regression results. In OLS pooling model, *DD_nanal_q4* and *DD_nanal_q1* coefficients are significant at 1%, 5% and 10% levels. Coefficients signs are those predicted and found in the prior subsection. While *DD_nanal_q1* coefficient is significantly positive at 1% and 10% levels in the OLS pooling and random effects model, *DD_nanal_q4* loading is negative and significant in the fixed and random-effects models. Hausman test results recommend the fixed effects model. These results are following our fourth hypothesis in the preceding subsection. We find that a firm with a better information environment would have less correlation between its idiosyncratic downside risk and deterioration, or manipulation, manipulation in its earnings quality. In other words, when a company is followed by a high number of analysts following its performance and publishing their opinions on its activities, its deterioration of accruals would have less effect on its idiosyncratic downside volatility than a company followed by no or a limited number of analysts.

## Table 7: Information Environment Effect, proxied by size, on The Relationship Between Earnings Quality and The Idiosyncratic Downside Risk

| | Panel A : dwn_iv | | | Panel B : dwn_riv | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.141*** | 0.0586*** | 0.0693*** | 0.144*** | 0.0604*** | 0.0704*** |
| | (0.0188) | (0.0141) | (0.0128) | (0.0190) | (0.0144) | (0.0131) |
| *DD_q4* | -0.176 | -0.317** | -0.301** | -0.117 | -0.326** | -0.311** |
| | (0.130) | (0.149) | (0.147) | (0.137) | (0.152) | (0.150) |
| *DD_q1* | 0.291* | 0.0339 | 0.0356 | 0.284 | 0.0125 | 0.0164 |
| | (0.176) | (0.0597) | (0.0586) | (0.174) | (0.0609) | (0.0598) |
| *Size_q4* | 0.718 | -1.170** | -1.134** | 0.883* | -1.202** | -1.154** |
| | (0.438) | (0.518) | (0.513) | (0.464) | (0.529) | (0.524) |
| *Size_q1* | 3.095*** | 1.269*** | 1.389*** | 3.036*** | 1.152*** | 1.290*** |
| | (0.605) | (0.301) | (0.294) | (0.601) | (0.307) | (0.301) |
| *BTM* | -1.057*** | -0.249** | -0.308*** | -1.041*** | -0.237** | -0.272*** |
| | (0.133) | (0.106) | (0.0964) | (0.135) | (0.108) | (0.0983) |
| *LEV* | -0.738*** | -0.498*** | -0.506*** | -0.714*** | -0.482*** | -0.481*** |
| | (0.136) | (0.0833) | (0.0810) | (0.138) | (0.0851) | (0.0827) |
| *RET* | -2.190*** | 0.708 | 0.403 | -2.405*** | 0.760 | 0.423 |
| | (0.601) | (0.475) | (0.461) | (0.617) | (0.485) | (0.470) |
| *VCF* | -0.0746*** | -0.0450*** | -0.0468*** | -0.0713*** | -0.0444*** | -0.0465*** |
| | (0.00851) | (0.00456) | (0.00449) | (0.00866) | (0.00466) | (0.00458) |
| *CF* | -0.0169 | -0.0152 | -0.0239 | -0.00596 | -0.0197 | -0.0253 |
| | (0.0134) | (0.0179) | (0.0170) | (0.0138) | (0.0183) | (0.0173) |
| Constant | 18.07*** | 9.493*** | 9.224*** | 18.76*** | 9.960*** | 9.470*** |
| | (0.830) | (0.690) | (0.649) | (0.845) | (0.704) | (0.660) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.342 | 0.208 | 0.365 | 0.310 | 0.197 | 0.3631 |
| Hausman Test | | | 448.09 | | | 471.12 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic downside volatility. We report the results in table 7. Panel A and B in each table are for results related to dwn_iv and dwn_riv respectively. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Size as A Proxy for Information Environment and Dechow and Dichev (2002) measure as a proxy for Earnings Quality. *Size_q4* is a dummy variable set to one, if the level of market capitalization is in the first quartile, *Size_q1* is a dummy variable that takes the value of one, if the level of market capitalization is in the lowest quartile. *DD_q4* (*DD_q1*) is the product of the dummy variable *Size_q4* (*Size_q1*) and *DD*. We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

## Table 8: Information Environment Effect, proxied by the number of analysts following, on The Relationship Between Earnings Quality and The Idiosyncratic Downside Risk

| | Panel A : dwn_iv | | | Panel B : dwn_riv | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *DD* | 0.125*** | 0.0602*** | 0.0694*** | 0.127*** | 0.0605*** | 0.0691*** |
| | (0.0200) | (0.0144) | (0.0132) | (0.0202) | (0.0147) | (0.0134) |
| *DD_nanal_q4* | -0.407** | -0.296** | -0.294** | -0.345** | -0.270* | -0.269* |
| | (0.159) | (0.139) | (0.137) | (0.167) | (0.142) | (0.140) |
| *DD_nanal_q1* | 0.223* | -0.0372 | -0.0195 | 0.221* | -0.0358 | -0.0168 |
| | (0.129) | (0.0426) | (0.0427) | (0.128) | (0.0435) | (0.0436) |
| *num_anal_q4* | -0.106 | -0.998** | -0.975** | 0.169 | -0.919* | -0.891* |
| | (0.524) | (0.475) | (0.470) | (0.555) | (0.485) | (0.480) |
| *num_anal_q1* | 0.687 | -0.295 | -0.241 | 0.673 | -0.265 | -0.202 |
| | (0.426) | (0.204) | (0.202) | (0.427) | (0.208) | (0.206) |
| *BTM* | -0.827*** | -0.515*** | -0.525*** | -0.802*** | -0.497*** | -0.499*** |
| | (0.139) | (0.0835) | (0.0813) | (0.140) | (0.0853) | (0.0830) |
| *LEV* | -2.446*** | 0.728 | 0.403 | -2.676*** | 0.783 | 0.423 |
| | (0.608) | (0.477) | (0.463) | (0.623) | (0.487) | (0.472) |
| *RET* | -0.0804*** | -0.0450*** | -0.0470*** | -0.0770*** | -0.0444*** | -0.0467*** |
| | (0.00852) | (0.00458) | (0.00451) | (0.00866) | (0.00468) | (0.00460) |
| *VCF* | 0.477*** | -0.121* | -0.111* | 0.513*** | -0.132** | -0.112* |
| | (0.0987) | (0.0654) | (0.0641) | (0.100) | (0.0668) | (0.0654) |
| *CF* | 1.443 | 0.948** | 0.854** | 1.621* | 0.817* | 0.807* |
| | (0.937) | (0.453) | (0.412) | (0.953) | (0.463) | (0.420) |
| Constant | 20.18*** | 11.02*** | 10.86*** | 20.85*** | 11.41*** | 11.03*** |
| | (0.804) | (0.656) | (0.607) | (0.818) | (0.670) | (0.617) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,835 | 4,870 |
| R-squared | 0.326 | 0.203 | 0.354 | 0.295 | 0.220 | 0.353 |
| Hausman Test | | | 756.02 | | | 806.03 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic downside volatility. We report the results in table 8. Panel A and B in each table are for results related to dwn_iv and dwn_riv respectively. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Number of Analysts as A Proxy for Information Environment and Dechow and Dichev (2002) measure as a proxy for Earnings Quality. *num_anal_q4* is a dummy variable set to one, if the level of number of analysts is in the first quartile, *num_anal_q1* is a dummy variable that takes the value of one, if the level of the number of analysts is in the lowest quartile. *DD_nanal_q4* (*DD_nanal_q1*) is the product of the dummy variable *num_anal_q4* (*num_anal_q1*) and *DD.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

### 3.3.6. Robustness tests

To verify our results, we use "smooth" as a second proxy for Earnings Quality. We replicate all the study using income smoothness "smooth" instead of the Dechow and Dichev (2002) measure. First, we test the effect of smooth on our two proxies for idiosyncratic volatility, PCIV, and RIV. Then, we test the significance of this relationship with the presence of different variables associated with the information environment. Thirdly, we test the relationship between the downside idiosyncratic volatility measures, dwn_iv and dwn_riv, and the earnings quality using smooth as a proxy for the latter. Finally, we the impact of the information environment on the effect of smooth on dwn_iv and dwn_riv. All robustness check tests' results are reported in tables in appendix C.

#### 3.3.6.1. The effect of earnings quality (*smooth*) on the idiosyncratic risk volatility

As in subsection 3.2., we test the significance of the impact of Earnings Quality on idiosyncratic volatility measures. We replace DD with *Smooth* in equation 6. We report regressions' results in table C.1. We observe the same tendencies found in the case of DD. *Smooth* coefficients are all positive and significant in all estimated models and regardless of the idiosyncratic measure included in the regression. The fixed-effects model is the appropriate estimation model according to Hausman test results. It is worth mentioning that *Smooth* coefficients are significantly higher than DD coefficients. *Smooth* coefficients are significant for PCIV and RIV at a 1% level across all models. The control variables have very close coefficients to those found in the case of DD. These results provide more evidence of our first hypothesis stating that the impact of the earnings quality measure on idiosyncratic risk is positive. Thus, the idiosyncratic volatility experiences a rise in level following a deterioration in earnings quality.

#### 3.3.6.2. The impact of the information environment on the relationship between earnings quality and the idiosyncratic risk

We include Smooth in equations 7 and 8 instead of DD to test the significance of the effect of earning quality on idiosyncratic risk in different information environments. We present relative results in table C.2, for variables on a size basis, and table C.3, for variables based on the number of analysts following the firm. Smooth loadings are still statistically significant at a 1% level in all models. While the interaction variable (*smooth_Size_q4*) is statistically significant in OLS, the variable associated with the bottom quartile (*smooth_Size_q1*) is positive and statistically significant at a 10% level. This finding suggests that the impact of earnings quality is stronger when the firm's information environment is weak. Variables for companies in the top and bottom size quartiles are significant across all models proving that companies in the top will be associated with less idiosyncratic volatility than firms in the bottom size quartile. These results support our second hypothesis showing that the information environment has a significant impact on the relationship between idiosyncratic volatility risk and earnings quality.

When variables based on the number of analysts following the company are included, results reported in table C.3 show the same pattern observed when size variables are used. Coefficients of *smooth* are significant suggesting a positive effect on the idiosyncratic volatility. *smooth_numanal_q4*, which is made out of the product of *smooth* and *nanal_q4*, has a significant and negative coefficient only in the OLS model. However, *smooth_numanal_q4* is significant in OLS and fixed effects model at 5% and 10% levels. We notice that *num_anal_q4* and *num_anal_q1* don't have significant coefficients in fixed-effects and random-effects models. Hausman's test still indicates the appropriateness of fixed-effects model.

#### 3.3.6.3. The effect of earnings quality (using *smooth* as a proxy) on the idiosyncratic downside volatility

This subsection is reserved to discuss the result of replicating subsection 3.4 but with replacing DD by *Smooth.* The results in table C.4 show a statistically significant effect for *Smooth* on the idiosyncratic downside risk, whether measured by dwn_iv or dwn_riv. The coefficients of *Smooth* in the fixed effects and random effects models doubled relative to those found when the dependent variables are PCIV and RIV. Thus, it is evidence supporting our third hypothesis stating that the response of idiosyncratic downside risk (dwn_iv and dwn_riv) to earnings quality is stronger than the response of total idiosyncratic risk (PCIV and RIV).

#### 3.3.6.4. The impact of the information environment on the relationship between the downside idiosyncratic risk and the earnings quality

When we consider *Smooth* in the place of DD in order to test the robustness of the relationship found between Earnings Quality and Idiosyncratic risk, we reach the same conclusion. As it is shown in Table C.5, the relationship between *Smooth* and idiosyncratic volatility is still present and statistically significant at a 1% level for dwn_iv and dwn_riv. Results also support our fourth hypothesis since coefficients of *smooth_ Size_q4* are negative and significant. In other terms, when the firm's information environment is good it weakens the effect of earnings quality on the idiosyncratic risk.

In the case of the number of analysts as a proxy for the information environment, our fourth hypothesis is still supported. Besides the significance of *Smooth* coefficients, *smooth_numanal_q1* coefficients are all positive and significant in table C.6. This result means that the effect of earnings quality on idiosyncratic becomes stronger in a bad information environment. Thereby, our results are supporting our fourth hypothesis.

## 3.4. Conclusion

In this article, we are studying the effect of Earnings Quality on the idiosyncratic volatility and the idiosyncratic downside volatility in France. We estimate two measures for the idiosyncratic risk. The first one is based on a principal factor model, and the second is estimated using a six-factor model with Fama and French 5 (1992, 2015) risk factors and the momentum factor of Carhart (1997). We also test the significance and the power of this relationship in different information environments. We choose two proxies for the information environment based on the market capitalization and the number of analysts following the firm.

Our results can be summarized into three main points. First, we find a positive and significant effect of the deterioration of accruals management on the idiosyncratic risk. We also observe a positive impact of earnings quality measure on the idiosyncratic downside risk regardless of the estimation model used (OLS pooling, Fixed Effects, and Random Effects). These results confirm our first hypothesis predicting a rise in the idiosyncratic volatility following a deterioration in the earnings quality.

Secondly, Dechow and Dichev measure has higher coefficients in case of idiosyncratic downside risk. This proves our third hypothesis stating a more powerful earnings quality deterioration impact on the volatility of negative idiosyncratic returns. In other words, the impact of unintentional deterioration or intentional managerial manipulation of accruals management is more pronounced on idiosyncratic downside volatility than in the case of idiosyncratic risk. Bad or manipulated accruals management leads to an increase in volatility of negative idiosyncratic returns. This increase is stronger than the reaction of idiosyncratic volatility to deteriorating earnings quality.

The third conclusion is that the information environment affects the power of the impact of earnings quality on idiosyncratic (downside) risk. While an improved information environment is more likely to reduce the correlation between earnings quality and idiosyncratic (downside) volatility, a bad information environment makes this correlation stronger. Briefly, for big companies (or those followed by a high number of analysts), the impact of deteriorating earnings quality on the idiosyncratic (downside) volatility becomes weak. However, in an opaque information environment, the impact of earnings quality on the idiosyncratic (downside) risk is stronger. Thereby, we find evidence confirming our second and fourth hypotheses highlighting the conditional aspect of the earnings quality impact to the firm’s information environment.

Our results are robust since we use income smoothness as a second proxy for earnings quality. We replace Dechow and Dichev's measure with income smoothness measure in all the tests. We reach our three main conclusions by finding evidence supporting all four hypotheses.

# APPENDIX C

**Table C.1: The Effect of Earnings Quality (Smoothness) on The Idiosyncratic Volatility**

| | **Panel A : PCIV** | | | **Panel B : RIV** | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *Smooth* | 1.711*** | 0.217*** | 0.223*** | 1.784*** | 0.235*** | 0.247*** |
| | (0.121) | (0.0646) | (0.0595) | (0.122) | (0.0594) | (0.0600) |
| *MKTCAP* | -2.652*** | -0.896*** | -1.083*** | -2.647*** | -0.845*** | -1.022*** |
| | (0.155) | (0.119) | (0.0853) | (0.155) | (0.0908) | (0.0859) |
| *BTM* | -2.622*** | -0.432*** | -0.634*** | -2.598*** | -0.368*** | -0.565*** |
| | (0.196) | (0.146) | (0.109) | (0.196) | (0.110) | (0.110) |
| *LEV* | -1.342* | 1.059** | 0.871** | -1.604** | 1.074** | 0.868** |
| | (0.777) | (0.486) | (0.439) | (0.776) | (0.438) | (0.443) |
| *RET* | -0.0935*** | -0.0183*** | -0.0225*** | -0.0881*** | -0.0177*** | -0.0214*** |
| | (0.0109) | (0.00528) | (0.00434) | (0.0110) | (0.00431) | (0.00437) |
| *VCF* | 1.547*** | 0.311*** | 0.269*** | 1.629*** | 0.328*** | 0.292*** |
| | (0.128) | (0.0752) | (0.0730) | (0.129) | (0.0739) | (0.0736) |
| *Numb_Analysts* | 0.0149 | -0.0202 | -0.0266 | 0.0265 | -0.0285* | -0.0331** |
| | (0.0182) | (0.0127) | (0.0162) | (0.0184) | (0.0164) | (0.0163) |
| *CF* | -5.100*** | -0.411 | -1.259** | -5.012*** | -0.432 | -1.529*** |
| | (1.148) | (1.144) | (0.494) | (1.153) | (0.501) | (0.498) |
| Constant | 36.87*** | 26.65*** | 27.63*** | 38.04*** | 27.50*** | 28.34*** |
| | (1.033) | (0.617) | (0.655) | (1.042) | (0.622) | (0.658) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.450 | 0.166 | 0.220 | 0.425 | 0.206 | 0.220 |
| Hausman Test | | | 142.85<br>(0.000) | | | 117.0<br>(0.000) |

Note: Table 9 reports the results of panel regressions testing the impact of earnings quality on the idiosyncratic volatility. While in Panel A, PCIV is the dependent variable, we regress RIV on the Earnings Quality proxy (smooth) and other control variables in Panel B. *Smooth* is defined as the ratio of earnings volatility to the volatility of cash flows from operations; *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *MKTCAP* is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We estimate three specifications for idiosyncratic volatility (PCIV and RIV). In the first specification, we use the OLS pooling technique, while we estimate Fixed effects and the random effects for the second and third specifications. We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table C.2: Information Environment Effect, proxied by size, on The Relationship Between Earnings Quality and the Idiosyncratic Volatility**

| | Panel A : PCIV | | | Panel B : RIV | | |
|---|---|---|---|---|---|---|
| VARIABLES | Pooling | Fixed | Random | Pooling | Fixed | Random |
| *Smooth* | 1.625*** | 0.303*** | 0.270*** | 1.678*** | 0.309*** | 0.282*** |
| | (0.130) | (0.0611) | (0.0615) | (0.130) | (0.0612) | (0.0616) |
| *smooth_ Size_q4* | -0.259*** | -0.0252 | -0.0331 | -0.250*** | -0.0252 | -0.0326 |
| | (0.0876) | (0.0311) | (0.0318) | (0.0927) | (0.0311) | (0.0318) |
| *smooth_ Size__q1* | -0.000356 | 0.00102* | 0.000544 | -0.000226 | 0.00116* | 0.000729 |
| | (0.000883) | (0.00223) | (0.00228) | (0.000882) | (0.00223) | (0.00228) |
| *Size_q4* | -2.370*** | -0.462* | -0.791*** | -2.409*** | -0.423* | -0.733*** |
| | (0.287) | (0.240) | (0.241) | (0.292) | (0.241) | (0.241) |
| *Size_q1* | 7.100*** | 1.800*** | 2.026*** | 6.957*** | 1.733*** | 1.949*** |
| | (0.435) | (0.187) | (0.189) | (0.431) | (0.188) | (0.189) |
| *BTM* | -0.102 | 1.073*** | 0.942*** | -0.281 | 1.030*** | 0.892*** |
| | (0.630) | (0.289) | (0.292) | (0.636) | (0.290) | (0.292) |
| *LEV* | -1.523*** | -0.419*** | -0.458*** | -1.453*** | -0.431*** | -0.467*** |
| | (0.443) | (0.0862) | (0.0875) | (0.428) | (0.0864) | (0.0876) |
| *RET* | 0.396*** | 0.247*** | 0.123* | 0.473*** | 0.262*** | 0.151** |
| | (0.103) | (0.0717) | (0.0699) | (0.104) | (0.0719) | (0.0700) |
| *VCF* | -0.224*** | -0.0651*** | -0.0915*** | -0.209*** | -0.0692*** | -0.0925*** |
| | (0.0138) | (0.0172) | (0.0168) | (0.0142) | (0.0172) | (0.0168) |
| *CF* | 20.66*** | 22.22*** | 21.71*** | 21.85*** | 23.26*** | 22.67*** |
| | (0.333) | (0.311) | (0.457) | (0.337) | (0.312) | (0.456) |
| Constant | 36.87*** | 22.53*** | 27.63*** | 38.04*** | 27.50*** | 28.34*** |
| | (1.033) | (1.162) | (0.655) | (1.042) | (0.622) | (0.658) |
| Observations | 4,880 | 4,880 | 4,880 | 4,880 | 4,880 | 4,880 |
| R-squared | 0.316 | 0.131 | 0.125 | 0.295 | 0.161 | 0.179 |
| Hausman Test | | | 23.88 | | | 30.75 |
| | | | (0.002) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 10. Panel A and B in each table are for results related to PCIV and RIV respectively. *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Size as A Proxy for Information Environment and *smooth* measure as a proxy for Earnings Quality. *Size_q4* is a dummy variable set to one, if the level of market capitalization is in the first quartile, *Size_q1* is a dummy variable that takes the value of one, if the level of market capitalization is in the lowest quartile. *smooth_ Size_q4* (*smooth_ Size_q1*) is the product of the dummy variable *Size_q4* (*Size_q1*) and *smooth.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table C.3: Information Environment Effect, proxied by the number of analysts following, on The Relationship Between Earnings Quality and the Idiosyncratic Volatility**

| | Panel A : PCIV | | | Panel B : RIV | | |
|---|---|---|---|---|---|---|
| VARIABLES | Pooling | Fixed | Random | Pooling | Fixed | Random |
| *Smooth* | 1.383*** | 0.305*** | 0.256*** | 1.433*** | 0.311*** | 0.268*** |
| | (0.135) | (0.0615) | (0.0615) | (0.135) | (0.0615) | (0.0616) |
| *smooth_numanal_q4* | -0.301*** | -0.0345 | -0.0436 | -0.290*** | -0.0331 | -0.0416 |
| | (0.0841) | (0.0323) | (0.0329) | (0.0870) | (0.0323) | (0.0329) |
| *smooth_numanal_q1* | -0.002** | 0.0028* | 0.0004 | -0.00188* | 0.00111* | 0.000586 |
| | (0.001) | (0.00061) | (0.0023) | (0.001) | (0.00061) | (0.0023) |
| *num_anal_q4* | 0.744*** | 0.102 | 0.00897 | 0.833*** | 0.0604 | -0.0265 |
| | (0.279) | (0.234) | (0.237) | (0.288) | (0.234) | (0.237) |
| *num_anal_q1* | 1.458*** | 0.117 | 0.139 | 1.428*** | 0.122 | 0.144 |
| | (0.257) | (0.149) | (0.150) | (0.255) | (0.149) | (0.150) |
| *BTM* | -0.358** | 0.193*** | 0.162** | -0.350** | 0.210*** | 0.178** |
| | (0.157) | (0.0700) | (0.0706) | (0.157) | (0.0701) | (0.0706) |
| *LEV* | -0.146 | 1.139*** | 1.020*** | -0.335 | 1.095*** | 0.969*** |
| | (0.737) | (0.292) | (0.294) | (0.736) | (0.292) | (0.294) |
| *RET* | -2.314*** | -0.558*** | -0.621*** | -2.237*** | -0.564*** | -0.623*** |
| | (0.598) | (0.0859) | (0.0868) | (0.580) | (0.0860) | (0.0868) |
| *VCF* | -0.741*** | 0.208*** | 0.0495 | -0.656*** | 0.225*** | 0.0803 |
| | (0.0930) | (0.0720) | (0.0695) | (0.0934) | (0.0721) | (0.0695) |
| *CF* | 0.0211*** | -0.00413 | -0.00403 | 0.0218*** | -0.00249 | -0.00240 |
| | (0.00383) | (0.00535) | (0.00545) | (0.00381) | (0.00536) | (0.00545) |
| Constant | 18.04*** | 22.34*** | 21.80*** | 19.24*** | 23.38*** | 22.76*** |
| | (0.319) | (0.315) | (0.474) | (0.322) | (0.315) | (0.473) |
| Observations | 4,880 | 4,880 | 4,880 | 4,880 | 4,880 | 4,880 |
| R-squared | 0.240 | 0.137 | 0.113 | 0.220 | 0.144 | 0.126 |
| Hausman Test | | | 69.13 | | | 61.85 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 11. Panel A and B in each table are for results related to PCIV and RIV respectively. *PCIV* is the idiosyncratic volatility we estimate by a market model based on principal components; *RIV* is the realized idiosyncratic volatility we estimate using Fama and French common risk factors and Carhart momentum factor: *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Number of Analysts as A Proxy for Information Environment and *Smooth* measure as a proxy for Earnings Quality. *num_anal_q4* is a dummy variable set to one, if the level of number of analysts is in the first quartile, *num_anal_q1* is a dummy variable that takes the value of one, if the level of number of analysts is in the lowest quartile. *smooth_nanal_q4* (*smooth_nanal_q1*) is the product of the dummy variable *num_anal_q4* (*num_anal_q1*) and *smooth.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table C.4: The Effect of Earnings Quality on The Idiosyncratic Downside Volatility**

| | Panel A : dwn_iv | | | Panel B : dwn_riv | | |
|---|---|---|---|---|---|---|
| **VARIABLES** | **Pooling** | **Fixed** | **Random** | **Pooling** | **Fixed** | **Random** |
| *Smooth* | 1.565*** | 0.548*** | 0.599*** | 1.560*** | 0 .555*** | 0 .615*** |
| | (0.0847) | (0.108) | (0.1059) | (0.086) | (0 .113) | (0.108) |
| *MKTCAP* | -1.777*** | -0.460*** | -0.586*** | -1.780*** | -0.443*** | -0.551*** |
| | (0.121) | (0.0952) | (0.0844) | (0.123) | (0.0972) | (0.0859) |
| *BTM* | -1.334*** | -0.558*** | -0.607*** | -1.329*** | -0.542*** | -0.585*** |
| | (0.137) | (0.0829) | (0.0806) | (0.139) | (0.0846) | (0.0822) |
| *LEV* | -2.113*** | 0.738 | 0.429 | -2.310*** | 0.784* | 0.443 |
| | (0.594) | (0.465) | (0.456) | (0.601) | (0.475) | (0.465) |
| *RET* | -0.0710*** | -0.0472*** | -0.0491*** | -0.0666*** | -0.0465*** | -0.0484*** |
| | (0.00863) | (0.00463) | (0.00457) | (0.00877) | (0.00473) | (0.00467) |
| *VCF* | 1.086*** | -0.0961 | -0.0518 | 1.151*** | -0.0994 | -0.0384 |
| | (0.104) | (0.0780) | (0.0754) | (0.106) | (0.0796) | (0.0769) |
| *Numb_Analysts* | 0.0117 | -0.00673 | -0.0131 | 0.0195 | -0.0116 | -0.0151 |
| | (0.0142) | (0.0179) | (0.0170) | (0.0145) | (0.0183) | (0.0173) |
| *CF* | 0.282 | 1.119** | 0.850** | 0.439 | 0.993** | 0.798* |
| | (1.039) | (0.450) | (0.412) | (1.054) | (0.460) | (0.419) |
| Constant | 25.31*** | 11.36*** | 11.68*** | 26.18*** | 11.81*** | 11.98*** |
| | (0.818) | (0.651) | (0.620) | (0.832) | (0.665) | (0.630) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.337 | 0.199 | 0.365 | 0.308 | 0.216 | 0.368 |
| Hausman Test | | | 609.45<br>(0.000) | | | 636.44<br>(0.000) |

Note: Table 12 reports the results of panel regressions testing the impact of earnings quality on the idiosyncratic downside volatility. While in Panel A, dwn_iv is the dependent variable, we regress dwn_riv on the Earnings Quality proxy (smooth) and other control variables in Panel B. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; $MKTCAP$ is the size variable measured as the natural logarithm of the yearly market capitalization; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *Numb_Analysts* is the number of analysts following the firm's stock; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We estimate three specifications for idiosyncratic volatility (PCIV and RIV). In the first specification, we use the OLS pooling technique, while we estimate Fixed effects and the random effects for the second and third specifications. We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table C.5: Information Environment Effect, proxied by size, on The Relationship Between Earnings Quality and The Idiosyncratic Downside Risk**

| | Panel A : dwn_iv | | | Panel B : dwn_riv | | |
|---|---|---|---|---|---|---|
| VARIABLES | Pooling | Fixed | Random | Pooling | Fixed | Random |
| *Smooth* | 1.159*** | 0.551*** | 0.603*** | 1.219*** | 0 .559*** | 0.621*** |
| | (0.0976) | (0.0741) | (0.1057) | (0.0996) | (0.0755) | (0.0733) |
| *smooth_ Size_q4* | -0.0732*** | -0.034** | -0.0366** | -0.0759*** | -0.0351** | -0.0378** |
| | (0.0208) | (0.1453) | (0.0145) | (0.0211) | (0.0148) | (0.0148) |
| *smooth_ Size__q1* | 0.0086* | 0.0043 | 0.0046 | 0.0085* | 0.0043 | 0.0045 |
| | (0.0044) | (0.003) | (0.003) | (0.0045) | (0.003) | (0.0031) |
| *Size_q4* | 0.857*** | -0.193 | -0.239 | 0.815*** | -0.197 | -0.237 |
| | (0.247) | (0.251) | (0.248) | (0.254) | (0.256) | (0.253) |
| *Size_q1* | 1.671*** | 1.111*** | 1.205*** | 1.603*** | 1.057*** | 1.162*** |
| | (0.328) | (0.248) | (0.242) | (0.329) | (0.253) | (0.247) |
| *BTM* | -1.293*** | -0.541*** | -0.589*** | -1.290*** | -0.525*** | -0.567*** |
| | (0.137) | (0.0832) | (0.0808) | (0.138) | (0.0849) | (0.0825) |
| *LEV* | -2.075*** | 0.738 | 0.436 | -2.274*** | 0.786* | 0.453 |
| | (0.588) | (0.465) | (0.455) | (0.596) | (0.475) | (0.464) |
| *RET* | -0.071*** | -0.048*** | -0.049*** | -0.067*** | -0.0467*** | -0.0487*** |
| | (0.009) | (0.005) | (0.005) | (0.009) | (0.005) | (0.005) |
| *VCF* | 1.010*** | -0.132* | -0.0885 | 1.079*** | -0.136* | -0.0751 |
| | (0.104) | (0.0795) | (0.0770) | (0.106) | (0.0812) | (0.0785) |
| *CF* | 0.254 | 1.089** | 0.831** | 0.413 | 0.962** | 0.780* |
| | (1.040) | (0.450) | (0.411) | (1.055) | (0.459) | (0.418) |
| Constant | 23.61*** | 10.03*** | 10.23*** | 24.55*** | 10.54*** | 10.57*** |
| | (0.864) | (0.717) | (0.690) | (0.881) | (0.732) | (0.702) |
| Observations | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 | 4,870 |
| R-squared | 0.347 | 0.204 | 0.371 | 0.318 | 0.220 | 0.374 |
| Hausman Test | | | 18.53 | | | 724.90 |
| | | | (0.009) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 13. . Panel A and B in each table are for results related to dwn_iv and dwn_riv respectively. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Size as A Proxy for Information Environment and *smooth* measure as a proxy for Earnings Quality. *Size_q4* is a dummy variable set to one, if the level of market capitalization is in the first quartile, *Size_q1* is a dummy variable that takes the value of one, if the level of market capitalization is in the lowest quartile. *smooth_ Size_q4* (*smooth_ Size_q1*) is the product of the dummy variable *Size_q4* (*Size_q1*) and *smooth.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1.

**Table C.6: Information Environment Effect, proxied by analysts following, on The Relationship Between Earnings Quality and the Idiosyncratic Downside Volatility**

| | Panel A : dwn_iv | | | Panel B : dwn_riv | | |
|---|---|---|---|---|---|---|
| VARIABLES | Pooling | Fixed | Random | Pooling | Fixed | Random |
| *Smooth* | 1.226*** | 0.554*** | 0.609*** | 1.283*** | 0.561*** | 0.625** |
| | (0.0978) | (0.1091) | (0.1057) | (0.0995) | (0.1117) | (0.108) |
| *smooth_numanal_q4* | -0.0664 | -0.0145 | -0.0183 | -0.0591 | -0.0137 | -0.0174 |
| | (0.0424) | (0.0312) | (0.0316) | (0.0431) | (0.0319) | (0.0323) |
| *smooth_numanal_q1* | 0.0081*** | 0.0034* | 0.0037** | 0.008*** | 0.0032* | 0.0036* |
| | (0.0044) | (0.0017) | (0.0018) | (0.00453) | (0.0018) | (0.0018) |
| *num_anal_q4* | 1.052*** | -0.0832 | -0.0728 | 1.129*** | -0.0833 | -0.0667 |
| | (0.199) | (0.230) | (0.229) | (0.209) | (0.235) | (0.234) |
| *num_anal_q1* | -0.278 | -0.208 | -0.224 | -0.304 | -0.184 | -0.197 |
| | (0.192) | (0.164) | (0.162) | (0.194) | (0.167) | (0.165) |
| *BTM* | -1.347*** | -0.558*** | -0.609*** | -1.342*** | -0.542*** | -0.586*** |
| | (0.138) | (0.0833) | (0.0810) | (0.139) | (0.0851) | (0.0827) |
| *LEV* | -2.369*** | 0.719 | 0.401 | -2.587*** | 0.769 | 0.419 |
| | (0.594) | (0.466) | (0.457) | (0.601) | (0.476) | (0.466) |
| *RET* | -0.071*** | -0.047*** | -0.049*** | -0.0662*** | -0.0463*** | -0.0483*** |
| | (0.009) | (0.005) | (0.005) | (0.001) | (0.005) | (0.005) |
| *VCF* | 1.096*** | -0.0964 | -0.0478 | 1.162*** | -0.102 | -0.0360 |
| | (0.104) | (0.0793) | (0.0768) | (0.106) | (0.0810) | (0.0783) |
| *CF* | 0.266 | 1.128** | 0.864** | 0.420 | 0.999** | 0.810* |
| | (1.042) | (0.451) | (0.412) | (1.058) | (0.460) | (0.419) |
| Constant | 25.82*** | 11.58*** | 11.93*** | 26.74*** | 12.01*** | 12.19*** |
| | (0.846) | (0.684) | (0.652) | (0.861) | (0.699) | (0.663) |
| Observations | 4,870 | 4,870 | 4,870 | 4,880 | 4,880 | 4,880 |
| R-squared | 0.340 | 0.200 | 0.364 | 0.312 | 0.217 | 0.3674 |
| Hausman Test | | | 829.47 | | | 847.65 |
| | | | (0.000) | | | (0.000) |

Note: We explore the impact of the information environment on the significance of the effect of earnings quality on idiosyncratic volatility. We report the results in table 14. Panel A and B in each table are for results related to dwn_iv and dwn_riv respectively. *dwn_iv* is the idiosyncratic downside volatility estimated by a market model based on principal components analysis. *dwn_riv* is the idiosyncratic downside volatility estimated using a Fama and French common risk factors and Carhart momentum factor; *LEV* is a natural logarithm of the ratio of the debt value relative to total assets value; *BTM* is the natural logarithm of the market to book ratio; *RET* is the firm yearly stock return; *CF* is the Cash Flow from operations; *VCF* is the volatility of Cash flow from operations computed over 4 years rolling window. We use Number of Analysts as A Proxy for Information Environment and *Smooth* measure as a proxy for Earnings Quality. *num_anal_q4* is a dummy variable set to one, if the level of number of analysts is in the first quartile, *num_anal_q1* is a dummy variable that takes the value of one, if the level of the number of analysts is in the lowest quartile. *smooth_nanal_q4* (*smooth_nanal_q1*) is the product of the dummy variable *num_anal_q4* (*num_anal_q1*) and *smooth.* We report coefficients of the independent variables, the model's adjusted R-squared, Hausman test statistic's and its p-value for each specification. Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

# Conclusion générale

La théorie moderne de portefeuille est une théorie financière développée par Harry Markowitz (1952,1959) qui a été adoptée par les professionnels de la finance. Markowitz (1952) a émis l'hypothèse que les investisseurs souhaitent optimiser la rentabilité de leurs placements au regard du niveau de risque pris. Par ailleurs, en investissant dans plus d'un titre, un investisseur peut obtenir les avantages de la diversification. Comme le souligne Elton et Gruber (1997), le message important de la théorie était que les actifs ne pouvaient pas être sélectionnés uniquement sur des caractéristiques propres au titre. Au contraire, un investisseur devait tenir compte de la corrélation des titres entre eux. De plus, la prise en compte de ces co-mouvements a permis de construire un portefeuille ayant la même rentabilité attendue et moins de risque qu'un portefeuille construit en ignorant les interactions entre titres. Dans le développement de la théorie du portefeuille, Markowitz (1952) définit la variance du taux de rentabilité du portefeuille comme une mesure appropriée du risque. Cette mesure du risque peut être divisée en deux types généraux de risque. Les auteurs pionniers distinguent le risque de marché, dit systématique, et le risque spécifique à la firme, appelé idiosyncrasique. Selon Sharpe (1963), le risque systématique se définit comme la partie de la variabilité d'un actif qui peut être attribuée à un facteur commun. Il est aussi parfois appelé risque non diversifiable ou risque de marché. Le risque systématique est le niveau minimal de risque que l'on peut obtenir pour un portefeuille par diversification entre un grand nombre d'actifs choisis au hasard. En tant que tel, le risque systématique est celui qui résulte des conditions générales du marché et de l'économie et qui ne peut être diversifié. Sharpe (1964) et Lintner (1965) précisent que le risque de marché est celui qui doit contenir un coût et le seul à être pris en considération lorsque les investisseurs exigent un taux de rentabilité. Il est mesuré par le bêta dans le modèle d'équilibre des actifs financiers (MEDAF). En d'autres termes, dans le cas d'un investisseur qui détient le portefeuille du marché supposé être par définition le plus diversifié, il ne supporte que le risque du marché incompressible. En revanche, le risque idiosyncrasique est censé être éliminé par la diversification, c'est pourquoi cela ne devrait pas affecter la rentabilité exigée par les investisseurs et l'évaluation du titre financier. On mesure couramment le risque idiosyncrasique comme étant la différence entre la volatilité de l'actif et la volatilité du marché. Une autre façon de concevoir la volatilité idiosyncrasique est qu'elle est l'écart type des résidus d'un modèle d'évaluation d'actif financier. C'est donc la partie de la volatilité du titre qui n'est pas expliquée par les facteurs communs de risque. Cependant, la perception de la volatilité idiosyncrasique dépend de la théorie dans laquelle elle est étudiée. Ainsi, si nous étudions ce type de risque dans le contexte de la théorie de la valorisation, le risque spécifique à la firme est censé être déterminé par les caractéristiques de la firme (Malagon et al., 2015). Par ailleurs, la théorie de l'arbitrage coûteux considère que la volatilité idiosyncrasique reflète uniquement les préférences des investisseurs. Dans ce cas, la volatilité idiosyncrasique est le risque spécifique de l'action et n'est pas lié directement aux fondamentaux de la firme mais aux préférences des investisseurs.

Cette thèse avait pour objet d'analyser la volatilité idiosyncrasique sur les marchés européens des actions dans le cadre de la théorie de la valorisation qui postule que la volatilité idiosyncrasique est déterminée par les caractéristiques de l'entreprise. Notre analyse s'est articulée autour de 3 chapitres.

Après avoir mis en relief au sein du chapitre 1 le rôle significatif du facteur commun européen de la volatilité idiosyncratique dans l'estimation de la volatilité du portefeuille de marché, et la relation entre la volatilité idiosyncrasique et les rentabilités futurs des titres. Nous avons par la suite essayé de rechercher des explications de la variation de la volatilité idiosyncrasique dans la divulgation non-financière et dans la qualité d'information comptable. Cela s'est matérialisé par deux chapitres. Le premier chapitre a trait à l'impact de la responsabilité sociétale de l'entreprise sur la volatilité idiosyncrasique tandis que le second cherche à mettre en relief un lien entre la qualité de bénéfice et la volatilité idiosyncrasique

Au cours du premier chapitre intitulé « *La volatilité idiosyncrasique en Europe : sa relation transversale avec les rentabilités et Le facteur commun* », nous avons étudié l'existence d'un facteur commun dans la volatilité idiosyncratique et la relation entre la volatilité idiosyncrasique et les rentabilités des titres. Nous nous intéressons également ce d'une prime de la volatilité idiosyncrasique. Nous évoquons également les *proxies* de la sous diversification comme étant déterminants de cette prime. Nous menons notre analyse sur 6545 firmes qui opèrent dans quinze pays européens sur la période 2000-2018.

Au départ nous estimons trois mesures de la volatilité idiosyncrasique, en utilisant un modèle à six facteurs, un modèle EGARCH, et un modèle de marché dont les facteurs communs du risque sont définis à partir d'une analyse en composantes principales faite sur l'ensemble des firmes de l'échantillon.

Premièrement, nous démontrons que, en moyenne, la volatilité idiosyncrasique représente 90 % de la volatilité des actions. En plus, Nous n'avons pas trouvé aucune tendance dans les séries de la volatilité idiosyncrasique sur l'ensemble de la période. À l'exception de l'Allemagne, nous avons observé une tendance à la hausse au cours de la période 2004-2011 pour les firmes de l'échantillon, après elle diminue sur le reste de la période d'étude. Nos constatations sont conformes avec les résultats dans Nam, Khaksari et Kang (2017). Nous montrons également que le risque idiosyncrasique augmente pendant les crises et les mouvements des *proxies* des volatilités totales et idiosyncrasique sont alignés. Cela suggère que la volatilité totale est conduite principalement par la volatilité idiosyncrasique. Ces observations nous poussent à soupçonner qu'il existe une sorte d'un effet de la volatilité idiosyncrasique sur la volatilité du portefeuille de marché.

Ainsi, nous examinons deuxièmement la relation entre la volatilité idiosyncrasique et la volatilité de marché. Nous proposons une nouvelle approche pour étudier cette relation. Nous estimons une corrélation entre la volatilité idiosyncrasique et celle du portefeuille de marché pour chaque mois en utilisant les derniers 12 mois. Nous observons qu'avant chaque période de crise, la corrélation entre la moyenne transversale de la volatilité idiosyncrasique (AIV) au niveau des pays et la volatilité du marché devient significativement négative parce que la volatilité du marché réagit avant une crise plus rapidement que la volatilité idiosyncrasique.

Troisièmement, Nous observons un mouvement synchronisé entre les AIV des différents pays. Alors, nous parvenons à identifier l'existence de trois groupes de pays par l'estimation des corrélations entre les AIV. Ensuite, nous tirons la composante principale des AIV constituant chaque groupe et pour toute l'échantillon. La proportion de la variance expliquée par la composante varie est 85% pour le premier groupe, 73% et 62% pour le deuxième et le troisième groupe respectivement. Nous nous servons de ces composantes pour tester la présence de *spillovers* entre les trois groupes de pays à l'aide du modèle VAR. Nous démontrons que la composante principale dans les AIV du second groupe, qui comprend principalement des pays ayant des problèmes d'endettement, a un impact positif et significatif sur la volatilité idiosyncrasique du premier groupe de pays. Par contre, les AIV du premier groupe, celui contenant les pays les plus grands et les plus stable marchés à l'exception du Royaume Uni, a un impact négatif sur les AIV des pays du second groupe. En d'autres termes, la volatilité idiosyncrasique du premier groupe réprime et sert à contenir la volatilité idiosyncrasique du groupe de pays en difficulté. Quant à la composante principale de toutes les AIV, nous la considérons comme étant le facteur commun de la volatilité idiosyncrasique européenne (ECIV). Enfin, nous montrons qu'il existe un effet significatif inattendu d'une volatilité idiosyncrasique européenne commune sur les volatilités des pays. À l'aide du modèle VAR, nous mettons en évidence la relation de causalité entre la volatilité idiosyncrasique européenne commune et la volatilité de portefeuille de marché de la majorité des quinze pays européens. Le modèle VAR estimé pays par pays nous permet de prédire des valeurs assez précises les volatilités de chacune des marchés. Il peut donc y avoir d'autres facteurs à l'origine de la volatilité idiosyncrasique, pas seulement au niveau national, mais aussi au niveau du continent. Ces résultats sont surprenants parce qu'elle démontre que , même, la volatilité du portefeuille de marché est en quelque sorte guidée par la volatilité idiosyncrasique européenne commune. Nous soulignons l'importance et les avantages de prendre compte de la volatilité idiosyncrasique commune lors de l'examen de la gestion indicielle.

Après avoir démontré l'importance de la volatilité idiosyncrasique, nous testerons sa relation avec les rentabilités des titres. Nous documentons à l'aide des régressions transversales de Fama et MacBeth (1973) que la relation entre la volatilité idiosyncrasique et les rentabilités attendues est majoritairement positive pour les volatilités idiosyncrasiques conditionnelles et les rentabilités attendues. Cette relation est maintenue dans le cas de la volatilité idiosyncrasique réalisée mais elle est moins prononcée. Nous soulignons la présence des preuves d'une prime de volatilité idiosyncrasique pour tous les pays. C'est-à-dire que même dans le cas d'un portefeuille très diversifié, il est probable qu'il y ait une importante composante de volatilité idiosyncrasique présente et qui pourrait avoir un coût. Ce résultat conforme à nos résultats qui soulignent l'importance la relation entre les AIV et les volatilités du portefeuille de marché. Quant aux déterminants de la prime idiosyncrasique, les *proxies* de la sous-diversification montrent un effet significatif sur la prime de risque idiosyncrasique. Les coûts de l'information la hausse de la tolérance des investisseurs ont un effet positif sur la prime du risque idiosyncrasique. Par contre, l'augmentation de la part du capital détenu par des investisseurs institutionnels et la richesse des investisseurs réduisent la prime de la volatilité idiosyncrasique.

Nous avons par la suite essayé de rechercher des explications de la variation de la volatilité idiosyncrasique par la divulgation non-financière et par la qualité d'information comptable. Cela s'est matérialisé par deux chapitres. Le chapitre 2 à trait à l'impact de la responsabilité sociétale de l'entreprise sur la volatilité idiosyncrasique tandis que le chapitre 3 cherche à mettre en relief un lien entre la qualité de bénéfice et la volatilité idiosyncrasique.

Le chapitre 2 intitulé « *La responsabilité sociale de l'entreprise en Europe : Impact sur la volatilité idiosyncrasique* » avait pour ambition de considérer les notations ESG, traduction d'un niveau de responsabilité sociétale de l'entreprise, comme possibles déterminants de la volatilité idiosyncrasique.

Comme la performance RSE d'une entreprise touche sa productivité, ses opérations et sa réputation, selon la théorie de valuation, elle devrait avoir un effet sur la volatilité des rentabilités idiosyncrasiques. Au cours de cet article, nous étudions les aspects de la responsabilité sociale de l'entreprise (RSE) en tant que déterminants de la volatilité idiosyncrasique. Nous observons une relation négative entre la volatilité idiosyncrasique et la performance RSE de l'entreprise en Europe au lendemain de la crise de 2008. Nous avons utilisé des mesures globales de la RSE, qui sont l'indice ES, l'indice pour l'environnement et l'indice de la société, et leurs composantes. Cette étude est intéressante pour les investisseurs et pour les dirigeants des entreprises qui voudraient comprendre la pertinence de l'information non-financière, ou la performance RSE d'une entreprise, à la gestion des risques en Europe. Cette étude est faite sur 916 firmes cotées sur neuf marchés des actions européens. Nous utilisons les notations ESG de la base de données Refinitiv. Nous calculons trois indices, un qui pour la performance environnementale et sociétale de l'entreprise (ES), un pour l'environnemental (ENV) et un sociétal (SOC). Nous avons examiné également les effets de chaque composante sur la volatilité idiosyncrasique.

Les études précédentes présentent la relation entre le risque, ou la rentabilité, et la performance RSE comme si elle était mécanique et existait depuis toujours comme la relation entre le risque et les fondamentaux de l'entreprise, comme les bénéfices réalisés.

Par contre, l’information non-financière est en quelque sorte disponible depuis les années 80 (Robertson, 1976 ; Larrinaga et Bebbington, 2021). À la veille de la crise de 2008, les investisseurs incluent dans leur processus de décision d’investissement les informations non-financières (Joliet et Titova, 2018 ; UNEP FI, 2019). Nous avons donc étudié la relation entre la volatilité idiosyncrasique et la performance RSE d’une entreprise sur la période 2000-2018. Nous avons divisé cette période en deux sous-période, une avant la crise financière et une après la crise financière. Comme les corrélations entre la volatilité idiosyncrasique et les indices RSE des firmes étaient faibles sur toute la période, la signification de la relation sur toute la période est modeste. Lorsqu’on mène nos tests sur la première sous-période, celle qui précède la crise financière, presque tous les coefficients de la performance RSE pour tous les pays sont non-significatifs. Alors qu’ils n’étaient jusque-là pas significatifs, nous avons constaté que la période post-crise se caractérisait par une augmentation dans la significativité des coefficients ES pour l'ensemble de l'échantillon. Conformément à la littérature, les coefficients sont, en général, négatifs et statistiquement significatifs. Nous constatons que la relation entre la RSE et la volatilité idiosyncrasique est un phénomène récent qui est la conséquence du changement de comportement des investisseurs vis-à-vis les stratégies d’investissement tout en accordant un poids plus important à la performance RSE dans leur processus de décisions d’investissement.

Nous avons considéré aussi les composantes de la RSE pour essayer d'identifier les plus grands contributeurs à la variation de la volatilité idiosyncrasique. L’utilisation des ressources (*Resource use*), une composante environnementale, a généralement des coefficients négatifs dans la période post-crise. La communauté (*Community*), une composante sociale, a un effet négatif et significatif dans le cas de cinq des pays de notre échantillon, et reste négatif lorsque nous incluons l'ensemble des firmes de l'échantillon. Cette information est utile pour les dirigeants de l’entreprise parce qu’on montre les composantes de la RSE qui diminuent le plus la volatilité idiosyncrasique, et par conséquent la volatilité du titre. Nous avons également testé l'importance des controverses. En général, elles ne sont pas associées de manière significative à la volatilité idiosyncrasique. Cependant, si nous considérons l'ensemble de l'échantillon, les controverses ont un coefficient significativement positif dans la période post-crise.

Dans cette étude, nous avons l’effet de la RSE sur la volatilité idiosyncrasique à deux niveaux. Le niveau continental, celui qui est toujours adopté par les auteurs, et le niveau national au sein de chaque pays. Nos résultats montrent que le fait d'étudier que le niveau continental risque de passer inaperçu les avantages que l'investisseur pourrait tirer des hétérogénéités entre les différents pays européens. Italie est le pays auquel l'effet de la RSE est faible, que ce soit dans le cas des trois scores ES globaux ou dans le cas de leurs composantes, tandis que la France est celle qui a les effets les plus prononcés. Par contre, il n'existe pas de preuve sur la relation négative prévue par la théorie des parties prenantes (Freeman, 1984) en Belgique qui a les scores RSE les plus faibles de toute l'échantillon. La relation en Belgique est positive et significative. Pour des raisons pratiques, ces résultats sont importants pour les investisseurs qui sont exposés au risque idiosyncrasique à cause de la détention un portefeuille sous-diversifié. Ils soulignent, aux gestionnaires de portefeuilles et aux investisseurs concernés par l'investissement socialement responsable, l'impact de la RSE sur la volatilité des composantes de leurs portefeuilles par pays, ce qui leur permet d'investir aux pays où la relation est forte et éviter les pays où la relation est faible ou inexistante. Cette hétérogénéité n'a jamais été mentionnée ou testée malgré sa pertinence pour les gestionnaires de portefeuille et les investisseurs.

Après avoir montré la pertinence de la volatilité idiosyncrasique par rapport à la volatilité de marché et les rentabilités, nous montrons que la divulgation de l'information non-financière est un déterminant de la volatilité idiosyncrasique. Dans le prochain article, nous évoquons l'effet de la qualité de l'information comptable sur la volatilité idiosyncrasique.

Notre chapitre 3 « *La qualité de bénéfice et la volatilité idiosyncrasique en France » constitue le dernier essai de cette thèse. Au cours de ce chapitre, nous avons cherché à* Etudier l'effet de la qualité des bénéfices (*Earnings Quality*) sur la volatilité idiosyncrasique et la volatilité des rentabilités idiosyncrasiques négatives (*Idiosyncratic Downside Volatility*) en France. Nous estimons deux mesures pour le risque idiosyncrasique. Tandis que la première est fondée sur un modèle de composantes principales dans les rentabilités des titres échangé sur Euronext Paris, la seconde est estimée en utilisant un modèle à six facteurs avec les facteurs de risque systématique Fama et French 5 et le facteur *Momentum* de Carhart.

Nos principaux résultats peuvent se résumer en trois points principaux. Tout d'abord, nous trouvons un effet positif et significatif de la dégradation de la gestion des *accruals* sur le risque idiosyncrasique. Nous observons également un impact positif de la mesure de la qualité des bénéfices sur la volatilité idiosyncrasique, et celle des rentabilités idiosyncrasiques négatives, quel que soit le modèle d'estimation utilisé (*pooling OLS*, Effets Fixes et Effets Aléatoires). Deuxièmement, la mesure de Dechow et Dichev (2002) a des coefficients plus élevés au cas de la volatilité « *Downside* ». En d'autres termes, l'impact de la détérioration ou la manipulation de la gestion des *accruals* est plus prononcée sur la volatilité baissière idiosyncrasique que dans le cas du risque idiosyncrasique. Une mauvaise gestion ou la manipulation des *accruals* conduit à une augmentation de la volatilité des rentabilités idiosyncrasiques négatives. Cette augmentation est beaucoup plus forte que la réaction de la volatilité idiosyncrasique à la détérioration de la qualité des bénéfices. Enfin, l'environnement de l'information a un effet sur la puissance de l’impact de la qualité des bénéfices sur le risque idiosyncrasique (totale et *donwside*). Alors qu'un environnement d’information sain est plus susceptible de réduire la corrélation entre les mesures de la qualité des bénéfices et la volatilité idiosyncrasique (totale et *downside*), un mauvais environnement informationnel renforce cette corrélation. Cependant, dans un environnement opaque de l'information, l'impact de la qualité des bénéfices sur le risque idiosyncrasique (totale et *downside*) est plus fort. En d’autres mots, l’effet de la détérioration ou la manipulation de la gestion des *accruals* sur la volatilité idiosyncrasique des grandes sociétés (ou celles suivies par un grand nombre d’analystes financiers) est plus faible que celui observé aux petites entreprises.

La volatilité idiosyncrasique reste un sujet d’actualité. Il existe encore un débat sur la façon de son estimation et les explications de l’existence de sa prime. L’étude des mouvements communs des volatilités idiosyncrasiques reste toujours un terrain inconnu. Les prochains travaux peuvent se pencher sur l’exploitation du facteur commun européen. Il faut proposer des moyens pour l’intégrer dans les différents modèles d’actifs financiers. Il sera autant intéressant d’étudier ce phénomène de la synchronisation de la volatilité idiosyncrasique s’il se produit dans d’autres régions.

# References


Abdoh, Hussein, and Oscar Varela. "Product market competition, idiosyncratic and systematic volatility." *Journal of Corporate Finance* 43 (2017): 500-513.

Albuquerque, Rui, Yrjö Koskinen, and Chendi Zhang. "Corporate social responsibility and firm risk: Theory and empirical evidence." *Management Science* 65, no. 10 (2019): 4451-4469.

Alda, Mercedes. "ESG fund scores in UK SRI and conventional pension funds: Are the ESG concerns of the SRI niche affecting the conventional mainstream?." *Finance research letters* 36 (2020): 101313.

Aman, Hiroyuki. "Firm-specific volatility of stock returns, the credibility of management forecasts, and media coverage: Evidence from Japanese firms." *Japan and the World Economy* 23, no. 1 (2011): 28-39.

Ang, Andrew, Joseph Chen, and Yuhang Xing. "Downside risk." *The review of financial studies* 19, no. 4 (2006): 1191-1239.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang. "High idiosyncratic volatility and low returns: International and further US evidence." *Journal of Financial Economics* 91, no. 1 (2009): 1-23.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang. "The cross-section of volatility and expected returns." *The Journal of Finance* 61, no. 1 (2006): 259-299.

Ang, Andrew, Robert J. Hodrick, Yuhang Xing, and Xiaoyan Zhang. "High idiosyncratic volatility and low returns: International and further US evidence." *Journal of Financial Economics* 91, no. 1 (2009): 1-23.

Ashwin Kumar, N. C., Camille Smith, Leïla Badis, Nan Wang, Paz Ambrosy, and Rodrigo Tavares. "ESG factors and risk-adjusted-performance: a new quantitative model." *Journal of Sustainable Finance & Investment* 6, no. 4 (2016): 292-300.

Atiase, Rowland Kwame. "Predisclosure information, firm capitalization, and security price behavior around earnings announcements." *Journal of accounting research* (1985): 21-36.

Baik, Bok, Sunhwa Choi, and David B. Farber. "Managerial ability and income smoothing." *The Accounting Review* 95, no. 4 (2020): 1-22.

Ballet, Jérôme, and Françoise De Bry. "L'entreprise et l'éthique.". *Éditions du Seuil*, (2001).

Barber, Brad M., and Terrance Odean. "Boys will be boys: Gender, overconfidence, and common stock investment." *The quarterly journal of economics* 116, no. 1 (2001): 261-292.

Barber, Brad M., and Terrance Odean. "The courage of misguided convictions." *Financial Analysts Journal* (1999): 41-55.

Barber, Brad M., and Terrance Odean. "Trading is hazardous to your wealth: The common stock investment performance of individual investors." *The journal of Finance* 55, no. 2 (2000): 773-806.

Barnard, Chester I. "The Functions of the Executive," Harvard University Press. (1938).

Barnea, Amir, and Amir Rubin. "Corporate social responsibility as a conflict between shareholders." *Journal of business ethics* 97, no. 1 (2010): 71-86.

Barragato, Charles A., and Ariel Markelevich. "Earnings quality following corporate acquisitions." *Managerial Finance* (2008).

Bawa, Vijay S., and Eric B. Lindenberg. "Capital market equilibrium in a mean-lower partial moment framework." *Journal of financial economics* 5, no. 2 (1977): 189-200.

Becchetti, Leonardo, Rocco Ciciretti, and Iftekhar Hasan. "Corporate social responsibility, stakeholder risk, and idiosyncratic volatility." *Journal of Corporate Finance* 35 (2015): 297-309.

Behn, Bruce K., Jong-Hag Choi, and Tony Kang. "Audit quality and properties of analyst earnings forecasts." *The Accounting Review* 83, no. 2 (2008): 327-349.

Bekaert, Geert, Robert J. Hodrick, and Xiaoyan Zhang. "Aggregate idiosyncratic volatility." *Journal of Financial and Quantitative Analysis* 47.6 (2012): 1155-1185.

Bénabou, Roland, and Jean Tirole. "Individual and corporate social responsibility." *Economica* 77, no. 305 (2010): 1-19.

Berggrun, Luis, Edmundo Lizarzaburu, and Emilio Cardona. "Idiosyncratic volatility and stock returns: Evidence from the MILA." *Research in International Business and Finance* 37 (2016): 422-434.

Berle, A., and G. Means. "The Modern Corporation and Private Property", *New York, Macmillan.* (1932).

Bhandari, Avishek, and David Javakhadze. "Corporate social responsibility and capital allocation efficiency." *Journal of Corporate Finance* 43 (2017): 354-377.

Bhushan, Ravi. "Firm characteristics and analyst following." *Journal of accounting and economics* 11, no. 2-3 (1989): 255-274.

Black, Fischer. "International capital market equilibrium with investment barriers." *Journal of Financial Economics* 1, no. 4 (1974): 337-352.

Bloomfield, Ted, Richard Leftwich, and John B. Long. "Portfolio strategies and performance." *Journal of Financial Economics* 5, no. 2 (1977): 201-218.

Bollerslev, Tim, Andrew J. Patton, and Rogier Quaedvlieg. "Realized semibetas: Disentangling “good” and “bad” downside risks." *Journal of Financial Economics* (2021).

Bollerslev, Tim. "Generalized autoregressive conditional heteroskedasticity." *Journal of econometrics* 31, no. 3 (1986): 307-327.

Botosan, Christine A. "Disclosure level and the cost of equity capital." *Accounting review* (1997): 323-349.

Botshekan, Mahmoud, Roman Kraeussl, and Andre Lucas. "Cash flow and discount rate risk in up and down markets: What is actually priced?." *Journal of Financial and Quantitative Analysis* 47, no. 6 (2012): 1279-1301.

Boutin-Dufresne, Francois, and Patrick Savaria. "Corporate social responsibility and financial risk." *The Journal of investing* 13, no. 1 (2004): 57-66.

Brandt, Michael W., Alon Brav, John R. Graham, and Alok Kumar. "The idiosyncratic volatility puzzle: Time trend or speculative episodes?." *Review of Financial Studies* 23, no. 2 (2010): 863-899.

Breeden, Douglas T. "An intertemporal asset pricing model with stochastic consumption and investment opportunities." *Journal of financial Economics* 7, no. 3 (1979): 265-296.

Brennan, Michael J. "Taxes, market valuation and corporate financial policy." *National tax journal* 23, no. 4 (1970): 417-427.

Brennan, Michael J. "The optimal number of securities in a risky asset portfolio when there are fixed costs of transacting: Theory and some empirical results." *Journal of Financial and Quantitative analysis* 10, no. 03 (1975): 483-496.

Broadstock, David C., Kalok Chan, Louis TW Cheng, and Xiaowei Wang. "The role of ESG performance during times of financial crisis: Evidence from COVID-19 in China." *Finance research letters* 38 (2021): 101716.

Brockman, Paul, Maria G. Schutte, and Wayne Yu. "Is idiosyncratic risk priced? The international evidence." *Unpublished Working Paper* (2009).

Brockman, Paul and Guo, Tao and Vivero, Maria Gabriela and Yu, Wayne. “Is idiosyncratic risk priced? The international evidence." *Unpublished Working Paper* (2020).

Brooks, Chris, and Ioannis Oikonomou. "The acts of environmental, social and governance disclosures and performance on firm value: A review of the literature in accounting and finance." *The British Accounting Review* 50, no. 1 (2018): 1-15.

Caglayan, Mustafa Onur, Wenjun Xue, and Liwen Zhang. "Global investigation on the country-level idiosyncratic volatility and its determinants." *Journal of Empirical Finance* 55 (2020): 143-160.

Cai, Ye, Carrie H. Pan, and Meir Statman. "Why do countries matter so much in corporate social performance?." *Journal of Corporate Finance* 41 (2016): 591-609.

Campbell, John Y., Martin Lettau, Burton G. Malkiel, and Yexiao Xu. "Have individual stocks become more volatile? An empirical exploration of idiosyncratic risk." *The Journal of Finance* 56, no. 1 (2001): 1-43.

Cao, Jie, and Bing Han. "Idiosyncratic risk, costly arbitrage, and the cross-section of stock returns." *Journal of Banking & Finance* 73 (2016): 1-15.

Carhart, Mark M. "On persistence in mutual fund performance." *The Journal of finance* 52, no. 1 (1997): 57-82.

Cespa, Giovanni, and Giacinta Cestone. "Corporate social responsibility and managerial entrenchment." *Journal of Economics & Management Strategy* 16, no. 3 (2007): 741-771.

Cheng, CS Agnes, Su-Jane Hsieh, and Yewmun Yip. "Impact of accounting choices on firm valuation and earnings quality: The case of transition obligation under SFAS 106." *Review of Accounting and Finance* (2007).

Chollet, Pierre, and Blaise W. Sandwidi. "CSR engagement and financial risk: A virtuous circle? International evidence." *Global Finance Journal* 38 (2018): 65-81.

Chordia, Tarun, Avanidhar Subrahmanyam, and V. Ravi Anshuman. "Trading activity and expected stock returns." *Journal of financial Economics* 59, no. 1 (2001): 3-32.

Christensen, Peter Ove, and Gerald Feltham. *Economics of accounting: Performance evaluation*. Vol. 2. Springer Science & Business Media, 2006.

Clubb, Colin, and Guoli Wu. "Earnings volatility and earnings prediction: analysis and UK evidence." *Journal of Business Finance & Accounting* 41, no. 1-2 (2014): 53-72.

Constantinides, George M. "Capital market equilibrium with transaction costs." *Journal of political Economy* 94, no. 4 (1986): 842-862.

Corporate Social Responsibility, Responsible Business Conduct, and Business & Human Rights. *Overview of Progress, Brussels: European Commission*, March 2019, page 6.

Cotter, John, Niall O'Sullivan, and Francesco Rossi. "The conditional pricing of systematic and idiosyncratic risk in the UK equity market." *International Review of Financial Analysis*37 (2015): 184-193.

Cox, John C., Jonathan E. Ingersoll Jr, and Stephen A. Ross. "A theory of the term structure of interest rates." *Econometrica: Journal of the Econometric Society* (1985): 385-407.

Davis, Mark HA, and Andrew R. Norman. "Portfolio selection with transaction costs." *Mathematics of Operations Research* 15, no. 4 (1990): 676-713.

Day, Ted, Yi Wang, and Yexiao Xu. "Investigating underperformance by mutual fund portfolios." *Working Paper School of Management, The University of Texas at Dallas* (2000).

De Long, J. Bradford, Andrei Shleifer, Lawrence H. Summers, and Robert J. Waldmann. "Noise trader risk in financial markets." *Journal of Political Economy* 98, no. 4 (1990): 703-738.

Dechow, Patricia M., and Douglas J. Skinner. "Earnings management: Reconciling the views of accounting academics, practitioners, and regulators." *Accounting horizons* 14, no. 2 (2000): 235-250.

Dechow, Patricia M., and Ilia D. Dichev. "The quality of accruals and earnings: The role of accrual estimation errors." *The accounting review* 77, no. s-1 (2002): 35-59.

Dechow, Patricia M., Sagar P. Kothari, and Ross L. Watts. "The relation between earnings and cash flows." *Journal of accounting and Economics* 25, no. 2 (1998): 133-168.

Dennis, Patrick, and Deon Strickland. "The determinants of idiosyncratic volatility." *Unpublished working paper, University of Virginia* (2004).

Diamond, Douglas W., and Robert E. Verrecchia. "Disclosure, liquidity, and the cost of capital." *The journal of Finance* 46, no. 4 (1991): 1325-1359.

Dontoh, Alex, Suresh Radhakrishnan, and Joshua Ronen. "The declining value-relevance of accounting information and non-information-based trading: an empirical analysis." *Contemporary Accounting Research* 21, no. 4 (2004): 795-812.

Doyle, Jeffrey T., Russell J. Lundholm, and Mark T. Soliman. "The predictive value of expenses excluded from pro forma earnings." *Review of Accounting Studies* 8, no. 2 (2003): 145-174.

Durnev, Artyom, Randall Morck, Bernard Yeung, and Paul Zarowin. "Does greater rm specific return variation mean more or less informed stock pricing?." *Journal of Accounting Research* 41, no. 5 (2003): 797-836.

Eames, Michael J., and Steven M. Glover. "Earnings predictability and the direction of analysts' earnings forecast errors." *The accounting review* 78, no. 3 (2003): 707-724.

Eliwa, Yasser, Jim Haslam, and Santhosh Abraham. "Earnings quality and analysts' information environment: Evidence from the EU market." *Journal of International Accounting, Auditing and Taxation* 42 (2021): 100373.

Engle, Robert F. "Autoregressive conditional heteroscedasticity with estimates of the variance of United Kingdom inflation." *Econometrica: Journal of the econometric society* (1982): 987-1007.

Eugene, Fama, and Kenneth French. "The cross-section of expected stock returns." *Journal of Finance* 47, no. 2 (1992): 427-465.

Fama, Eugene F., and James D. MacBeth. "Risk, return, and equilibrium: Empirical tests." *Journal of political economy* 81, no. 3 (1973): 607-636.

Fama, Eugene F., and Kenneth R. French. "A five-factor asset pricing model." *Journal of financial economics* 116, no. 1 (2015): 1-22.

Fama, Eugene F., and Kenneth R. French. "Common risk factors in the returns on stocks and bonds." *Journal of financial economics* 33, no. 1 (1993): 3-56.

Fama, Eugene F., and Kenneth R. French. "Multifactor explanations of asset pricing anomalies." *The journal of finance* 51, no. 1 (1996): 55-84.

Fama, Eugene F., and Kenneth R. French. "The cross-section of expected stock returns." *The Journal of Financ*e 47, no. 2 (1992): 427-465.

Ferrer, Cristina, Susana Callao, José Ignacio Jarne, and José Antonio Laínez. "A Structural Equation Model for Analyzing the Association Between Some Attributes of Earnings

Quality and Value Relevance. Results from the Structural Model." In *International Conference on Modeling and Simulation in Engineering, Economics and Management*, pp. 31-39. Springer, Cham, 2016.

Fink, Jason D., Kristin E. Fink, and Hui He. "Expected idiosyncratic volatility measures and expected returns." *Financial Management* 41, no. 3 (2012): 519-553.

Fink, Jason, Gustavo Grullon, Kristin Fink, and James Weston. "IPO vintage and the rise of idiosyncratic risk." *Unpublished Working Paper* (2005).

Fink, Jason, Kristin E. Fink, Gustavo Grullon, and James P. Weston. "What drove the increase in idiosyncratic volatility during the internet boom?." *Journal of Financial and Quantitative Analysis* 45, no. 5 (2010): 1253-1278.

Francis, Jennifer, Ryan LaFond, Per M. Olsson, and Katherine Schipper. "Costs of equity and earnings attributes." *The accounting review* 79, no. 4 (2004): 967-1010.

Frankel, Richard, and Xu Li. "Characteristics of a firm's information environment and the information asymmetry between insiders and outsiders." *Journal of accounting and economics* 37, no. 2 (2004): 229-259.

Freeman, R. Edward. Strategic management: A stakeholder approach. *Cambridge university press*, 1984.

Freeman, Robert N. "The association between accounting earnings and security returns for large and small firms." *Journal of accounting and economics* 9, no. 2 (1987): 195-228.

French, Kenneth R., G. William Schwert, and Robert F. Stambaugh. "Expected stock returns and volatility." *Journal of financial Economics* 19, no. 1 (1987): 3-29.

Friedman, Milton. "A theoretical framework for monetary analysis." *Journal of Political Economy* 78, no. 2 (1970): 193-238.

Fu, Fangjian. "Idiosyncratic risk and the cross-section of expected stock returns." *Journal of Financial Economics* 91, no. 1 (2009): 24-37.

Fu, Fangjian. "Idiosyncratic risk and the cross-section of expected stock returns." *Journal of Financial Economics* 91, no. 1 (2009): 24-37.

Gaio, Cristina, and Clara Raposo. "Earnings quality and firm valuation: international evidence." *Accounting & Finance* 51, no. 2 (2011): 467-499.

Galsband, Victoria. "Downside risk of international stock returns." *Journal of Banking & Finance* 36, no. 8 (2012): 2379-2388.

Gangi, Francesco, and Carmen Trotta. "The ethical finance as a response to the financial crises: An empirical survey of European SRFs performance." *Journal of Management & Governance* 19, no. 2 (2015): 371-394.

Giese, Guido, Linda-Eling Lee, Dimitris Melas, Zoltán Nagy, and Laura Nishikawa. "Performance and risk analysis of index-based ESG portfolios." *The Journal of Index Investing* 9, no. 4 (2019): 46-57.

Godfrey, Paul C. "The relationship between corporate philanthropy and shareholder wealth: A risk management perspective." *Academy of management review* 30, no. 4 (2005): 777-798.

Godfrey, Paul C., Craig B. Merrill, and Jared M. Hansen. "The relationship between corporate social responsibility and shareholder value: An empirical test of the risk management hypothesis." *Strategic management journal* 30, no. 4 (2009): 425-445.

Goetzmann, William N., and Alok Kumar. "Equity portfolio diversification." *Review of Finance* 12, no. 3 (2008): 433-463.

Goyal, Amit, and Pedro Santa-Clara. "Idiosyncratic risk matters!." *The Journal of Finance* 58, no. 3 (2003): 975-1007.

Grant, Edward B. "Market implications of differential amounts of interim information." *Journal of Accounting Research* (1980): 255-268.

Gu, Ming, Wenjin Kang, and Bu Xu. "Limits of arbitrage and idiosyncratic volatility: Evidence from China stock market." *Journal of Banking & Finance* 86 (2018): 240-258.

Gul, Faruk. "A theory of disappointment aversion." *Econometrica: Journal of the Econometric Society* (1991): 667-686.

Guo, Hui, and Robert Savickas. "Does idiosyncratic risk matter: Another look." *Federal Reserve Bank of St. Louis Working Paper Series* 2003-025 (2003).

Han, Yufeng, and David Lesmond. "Liquidity biases and the pricing of cross-sectional idiosyncratic volatility." *The Review of Financial Studies* 24, no. 5 (2011): 1590-1629.

Healy, Paul M., Amy P. Hutton, and Krishna G. Palepu. "Stock performance and intermediation changes surrounding sustained increases in disclosure." *Contemporary accounting research* 16, no. 3 (1999): 485-520.

Herskovic, Bernard, Bryan Kelly, Hanno Lustig, and Stijn Van Nieuwerburgh. "The common factor in idiosyncratic volatility: Quantitative asset pricing implications." *Journal of Financial Economics* 119, no. 2 (2016): 249-283.

Hirshleifer, David. "Residual risk, trading costs, and commodity futures risk premia." *Review of Financial Studies* 1, no. 2 (1988): 173-193.

Hoepner, Andreas GF, Ioannis Oikonomou, Zacharias Sautner, Laura T. Starks, and Xiaoyan Zhou. "ESG shareholder engagement and downside risk." *Unpublished Working Paper* (2018).

Humphrey, Jacquelyn E., and Darren D. Lee. "Australian socially responsible funds: Performance, risk and screening intensity." *Journal of Business Ethics* 102, no. 4 (2011): 519-535.

Humphrey, Jacquelyn E., Darren D. Lee, and Yaokan Shen. "Does it cost to be sustainable?." *Journal of Corporate Finance* 18, no. 3 (2012): 626-639.

Ilhan, Emirhan, Philipp Krueger, Zacharias Sautner, and Laura T. Starks. "Institutional investors' views and preferences on climate risk disclosure." *Swiss Finance Institute Research Paper* 19-66 (2019).

Irvine, Paul J., and Jeffrey Pontiff. "Idiosyncratic return volatility, cash flows, and product market competition." *Review of Financial Studies* 22, no. 3 (2009): 1149-1177.

Jegadeesh, Narasimhan, and Sheridan Titman. "Returns to buying winners and selling losers: Implications for stock market efficiency." *The Journal of finance* 48, no. 1 (1993): 65-91.

Jensen, Michael C., and William H. Meckling. "Theory of the firm: Managerial behavior, agency costs, and ownership structure." *Journal of Financial Economics* 3, no. 4 (1976): 305-360.

Jin, Li, and Stewart C. Myers. "R2 around the world: New theory and new tests." *Journal of Financial Economics* 79, no. 2 (2006): 257-292.

Joliet, Robert, and Yulia Titova. "Equity SRI funds vacillate between ethics and money: An analysis of the funds' stock holding decisions." *Journal of Banking & Finance* 97 (2018): 70-86.

Jones, Jennifer J. "Earnings management during import relief investigations." *Journal of accounting research* 29, no. 2 (1991): 193-228.

Kahneman, Daniel, and Amos Tversky. "On the interpretation of intuitive probability: A reply to Jonathan Cohen." (1979).

Kang, Namho, Péter Kondor, and Ronnie Sadka. "Do hedge funds reduce idiosyncratic risk?." *Journal of Financial and Quantitative Analysis* 49, no. 4 (2014): 843-877.

Kelly, Patrick J. "Information efficiency and firm-specific return variation" *The Quarterly Journal of Finance* 4, no. 04 (2014): 1450018.

Kitagawa, Norio, and Shin'ya Okuda. "Management forecasts, idiosyncratic risk, and the information environment." *The International Journal of Accounting* 51, no. 4 (2016): 487-503.

Kurtz, Lloyd. " Studies in the Field of SRI Investing ", Working Paper sristudies.org (2002).

Lang, Mark H., and Russell J. Lundholm. "Corporate disclosure policy and analyst behavior." *Accounting review* (1996): 467-492.

Larrinaga, Carlos, and Jan Bebbington. "The pre-history of sustainability reporting: a constructivist reading." *Accounting, Auditing & Accountability Journal* (2021).

Le Saout, Erwan. "Finance and Sustainable Development", *Euro-Mediterranean Economics and Finance Review*, 4 (2006): 169-204.

Le Saout, Erwan, and Corinne Buscot. "Comment expliquer la performance de l'investissement socialement responsable?." *Management Avenir* 3 (2009): 153-169.

Lee, Darren D., and Robert W. Faff. "Corporate sustainability performance and idiosyncratic risk: A global perspective." *Financial Review* 44, no. 2 (2009): 213-237.

Lettau, Martin, Matteo Maggiori, and Michael Weber. "Conditional risk premia in currency markets and other asset classes." *Journal of Financial Economics* 114, no. 2 (2014): 197-225.

Leuz, Christian, Dhananjay Nanda, and Peter D. Wysocki. "Earnings management and investor protection: an international comparison." *Journal of financial economics* 69, no. 3 (2003): 505-527.

Lev, Baruch. "Remarks on the measurement, valuation, and reporting of intangible assets." (2003).

Liang, Hao, and Luc Renneboog. "On the foundations of corporate social responsibility. "*The Journal of Finance* 72, no. 2 (2017): 853-910.

Lintner, John. "Security prices, risk, and maximal gains from diversification." *The journal of finance* 20, no. 4 (1965): 587-615.

Lintner, John. "The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets." *The review of economics and statistics* (1965): 13-37.

Liu, Hong. "Portfolio insurance and underdiversification." In *AFA 2009 San Francisco Meetings Paper*. 2008.

Lobo, Gerald J., Minsup Song, and Mary Stanford. "Accruals quality and analyst coverage." *Journal of Banking & Finance* 36, no. 2 (2012): 497-508.

Lucas Jr, Robert E. "Asset prices in an exchange economy." *Econometrica: Journal of the Econometric Society* (1978): 1429-1445.

Luo, Xueming, and Chitra Bhanu Bhattacharya. "Corporate social responsibility, customer satisfaction, and market value." *Journal Of Marketing* 70, no. 4 (2006): 1-18.

Luo, Xueming, and Chitra Bhanu Bhattacharya. "The debate over doing good: Corporate social performance, strategic marketing levers, and firm-idiosyncratic risk." *Journal of Marketing* 73, no. 6 (2009): 198-213.

Magill, Michael JP, and George M. Constantinides. "Portfolio selection with transactions costs." *Journal of Economic Theory* 13, no. 2 (1976): 245-263.

Malagon, Juliana, David Moreno, and Rosa Rodriguez. "Idiosyncratic volatility, conditional liquidity, and stock returns." *International Review of Economics & Finance* 53 (2018): 118-132.

Malagon, Juliana, David Moreno, and Rosa Rodríguez. "The idiosyncratic volatility anomaly: Corporate investment or investor mispricing?." *Journal of Banking & Finance* 60 (2015): 224-238.

Malagon, Juliana, David Moreno, and Rosa Rodríguez. "Time horizon trading and the idiosyncratic risk puzzle." *Quantitative Finance* 15, no. 2 (2015): 327-343.

Malkiel, B., and Yexiao Xu. "Idiosyncratic Risk: Theory and Evidence." *Working Paper, Financial Research Center, Princeton University* (1999).

Malkiel, Burton G., and Yexiao Xu. "Idiosyncratic risk and security returns." *Working Paper University of Texas at Dallas* (2002).

Markowitz, Harry.M, "Portfolio selection." *The journal of finance* 7, no. 1 (1952): 77-91.

Markowitz, Harry.M, (1959). Portfolio Selection: Efficient Diversification of Investments,second ed. Wiley, Yale University Press, Basil Blackwell (1991).

McCarthy, Scott, Barry Oliver, and Sizhe Song. "Corporate social responsibility and CEO confidence." *Journal of Banking & Finance* 75 (2017): 280-291.

McNichols, Maureen F. "Discussion of the quality of accruals and earnings: The role of accrual estimation errors." *The accounting review* 77, no. s-1 (2002): 61-69.

Menicucci, Elisa. *Earnings quality: Definitions, measures, and financial reporting*. Springer Nature, 2019.

Merton, Robert C. "A simple model of capital market equilibrium with incomplete information." *The journal of Finance* 42, no. 3 (1987): 483-510.

Merton, Robert C. "A simple model of capital market equilibrium with incomplete information." (1987).

Min, Byoung-Kyu, and Tong Suk Kim. "Momentum and downside risk." *Journal of Banking & Finance* 72 (2016): S104-S118.

Mishra, S., and Modi, S. B. (2013). “Positive and negative corporate social responsibility, financial leverage, and idiosyncratic risk.” *Journal of Business Ethics*, 117(2), 431 448.

Morck, Randall, Bernard Yeung, and Wayne Yu. "The information content of stock markets: why do emerging markets have synchronous stock price movements?." *Journal of Financial Economics* 58, no. 1-2 (2000): 215-260.

Nam, Kiseok, Shahriar Khaksari, and Moonsoo Kang. "Trend in aggregate idiosyncratic volatility." *Review of Financial Economics* (2016).

Nartea, Gilbert V. , Bert D. Ward, and Lee J. Yao. "Idiosyncratic volatility and cross-sectional stock returns in Southeast Asian stock markets." *Accounting & Finance* 51.4 (2011): 1031-1054.

Nartea, Gilbert V. , Ji Wu, and Zhentao Liu. "Does idiosyncratic volatility matter in emerging markets? Evidence from China." *Journal of International Financial Markets, Institutions and Money* 27 (2013): 137-160.

Nelson, Daniel B. "Conditional heteroskedasticity in asset returns: A new approach." *Econometrica: Journal of the Econometric Society* (1991): 347-370.

Nguyen, Phuong-Anh, Ambrus Kecskés, and Sattar Mansi. "Does corporate social responsibility create shareholder value? The importance of long-term investors." *Journal of Banking & Finance* 112 (2020): 105217.

Nofsinger, J. and Varma, A., 2014. “Socially responsible funds and market crises.” *Journal* *of Banking & Finance*, 48, pp.180-193.

Odean, T. 1998. Volume, "volatility, price, and profit when all traders are above average." *Journal of Finance.* 53, 1887-1934.

Odean, T. 1999. “Do Investors Trade too Much?” *American Economic Review*. 89, 1279-1298.

Okuda, Shin’ya, Norio Kitagawa, « Relationship between earnings quality and idiosycnratic risk during period of accounting standard reform in Japan. » *Security Analysts Journal* 49 , no. 8 (2011). 91-100.

Pástor, Ľuboš, and Pietro Veronesi. "Was there a Nasdaq bubble in the late 1990s?." *Journal of Financial Economics* 81, no. 1 (2006): 61-100.

Patton, Andrew J., and Kevin Sheppard. "Good volatility, bad volatility: Signed jumps and the persistence of volatility." *Review of Economics and Statistics* 97, no. 3 (2015): 683-697.

Penman, Stephen H., and Xiao-Jun Zhang. "Accounting conservatism, the quality of earnings, and stock returns." *The accounting review* 77, no. 2 (2002): 237-264.

Pergola, Teresa M. "Management entrenchment: Can it negate the effectiveness of recently legislated governance reform." *Journal of American Academy of Business* 6, no. 2 (2005): 177-183.

Petersen, Mitchell A. "Estimating standard errors in finance panel data sets: Comparing approaches." *The Review of financial studies* 22, no. 1 (2009): 435-480.

Pontiff, Jeffrey. "Costly arbitrage and the myth of idiosyncratic risk." *Journal of Accounting and Economics* 42, no. 1-2 (2006): 35-52.

Preston, Lee E., and Douglas P. O’bannon. "The corporate social-financial performance relationship: A typology and analysis." *Business & Society* 36, no. 4 (1997): 419-429.

Rajgopal, Shiva, and Mohan Venkatachalam. "Financial reporting quality and idiosyncratic return volatility." *Journal of Accounting and Economics* 51, no. 1-2 (2011): 1-20.

Ramchander, Sanjay, Robert G. Schwebach, and K. I. M. Staking. "The informational relevance of corporate social responsibility: Evidence from DS400 index reconstitutions." *Strategic Management Journal* 33, no. 3 (2012): 303-314.

Richardson, Scott A., Richard G. Sloan, Mark T. Soliman, and Irem Tuna. "Accrual reliability, earnings persistence and stock prices." *Journal of accounting and economics* 39, no. 3 (2005): 437-485.

Robertson, James. "When the name of the game is changing, how do we keep the score?." *Accounting, Organizations and Society* 1, no. 1 (1976): 91-95.

Roll, Richard. "R-squared." *Journal of Finance* 43, no. 2 (1988): 541-566.

Routledge, Bryan R., and Stanley E. Zin. "Generalized disappointment aversion and asset prices." *The Journal of Finance* 65, no. 4 (2010): 1303-1332.

Rowland, Patrick F. "Transaction costs and international portfolio diversification." *Journal of International Economics* 49, no. 1 (1999): 145-170.

Roy, Andrew Donald. "Safety first and the holding of assets." *Econometrica: Journal of the econometric society* (1952): 431-449.

Schipper, Katherine, and Linda Vincent. "Earnings quality." *Accounting horizons* 17 (2003): 97-110.

Sharpe, William F. "Capital asset prices: A theory of market equilibrium under conditions of risk." *The journal of finance* 19, no. 3 (1964): 425-442.

Siegel, Joel G. "The “quality of earnings” concept—A survey." *Financial Analysts Journal* 38, no. 2 (1982): 60-68.

Spence, Michael. "Competitive and optimal responses to signals: An analysis of efficiency and distribution." *Journal of Economic theory* 7, no. 3 (1974): 296-332.

Spence, Michael. *Market signaling: Informational transfer in hiring and related screening processes*. No. 143. cambridge: harvard university press, 1974.

Stambaugh, Robert F., Jianfeng Yu, and Yu Yuan. "Arbitrage asymmetry and the idiosyncratic volatility puzzle." *The Journal of Finance* 70, no. 5 (2015): 1903-1948.

Stulz, René M. "A model of international asset pricing." *Journal of Financial Economics* 9, no. 4 (1981): 383-406.

Su, Lujun, Songshan Huang, Robert van der Veen, and Xiaohong Chen. "Corporate social responsibility, corporate reputation, customer emotions and behavioral intentions: A structural equation modeling analysis." Journal of China Tourism Research 10, no. 4 (2014) 511-529.

Su, Weichieh, Mike W. Peng, Weiqiang Tan, and Yan-Leung Cheung. "The signaling effect of corporate social responsibility in emerging economies." *Journal of business Ethics* 134, no. 3 (2016): 479-491.

Teets, Walter R. "Quality of earnings: An introduction to the issues in accounting education special issue." *Issues in Accounting Education* 17, no. 4 (2002): 355-361.

Trinks, Pieter Jan, and Bert Scholtens. "The opportunity cost of negative screening in socially responsible investing." Journal of Business Ethics 140, no. 2 (2017): 193-208.

UNEP, FI. "Principles for responsible banking." United Nations Environmental Programme Finance Initiative: Geneva, Switzerland (2019).

Uppal, Raman. "A general equilibrium model of international portfolio choice." *The Journal of Finance* 48, no. 2 (1993): 529-553.

Van der Meulen, Sofie, Ann Gaeremynck, and Marleen Willekens. "Attribute differences between US GAAP and IFRS earnings: An exploratory study." *The International Journal of Accounting* 42, no. 2 (2007): 123-142.

Van Horne, James C., Marshall E. Blume, and Irwin Friend. "The asset structure of individual portfolios and some implications for utility functions." *The Journal of Finance* 30, no. 2 (1975): 585-603.

Vidal-García, Javier, and Marta Vidal. "Seasonality and idiosyncratic risk in mutual fund performance." *European Journal of Operational Research* 233, no. 3 (2014): 613-624.

Viviani, Jean-Laurent, Christophe Revelli, and Malick Fall. "The Effects of CSR on Risk Dynamics and Risk Predictability: A Value- At-Risk Perspective" Vigeo-Eiris Working paper (2015).

Wang, Huijun, Jinghua Yan, and Jianfeng Yu. "Reference-dependent preferences and the risk–return trade-off." *Journal of Financial Economics*123, no. 2 (2017): 395-414.

Wei, Steven X., and Chu Zhang. "Idiosyncratic risk does not matter: A re-examination of the relationship between average returns and average volatilities." *Journal of Banking & Finance* 29, no. 3 (2005): 603-621.

Whitelaw, Robert F. "Time variations and covariations in the expectation and volatility of stock market returns." *The Journal of Finance* 49, no. 2 (1994): 515-541.

Xu, Yexiao, and Burton G. Malkiel. "Idiosyncratic risk and security returns." *Unpublished Working* (2004).

Xu, Yexiao, and Burton G. Malkiel. "Investigating the behavior of idiosyncratic volatility." *The Journal of Business* 76, no. 4 (2003): 613-645.

Zeghal, Daniel, Sonda M. Chtourou, and Yosra M. Fourati. "The effect of mandatory adoption of IFRS on earnings quality: Evidence from the European Union." *Journal of International Accounting Research* 11, no. 2 (2012): 1-25.

Zhong, Angel. "Idiosyncratic volatility in the Australian equity market." *Pacific-Basin Finance Journal* 50 (2018): 105-125.

**ANALYSE DE LA VOLATILITÉ IDIOSYNCRASIQUE EN EUROPE : Facteurs communs et Déterminants**

Dans cette étude, nous démontrons l'importance du risque idiosyncrasique en cherchant à vérifier l'existence d'un facteur commun de la volatilité idiosyncrasique en Europe qui pourrait avoir un effet sur les volatilités des portefeuilles des marchés européens et en démontrant une relation entre elle et les rentabilités des entreprises. Comme la volatilité idiosyncrasique reflète l'information spécifique à la firme, nous cherchons à identifier ses déterminants dans la responsabilité sociétale de l'entreprise (RSE), et dans la qualité des bénéfices. Dans un premier chapitre, nous soulignons l'importance de la volatilité idiosyncrasique en démontrant que son facteur commun au niveau européen affecte les volatilités des portefeuilles des marchés nationaux. Ensuite, nous montrons que sa relation avec les rentabilités des titres est positive et que la prime de risque idiosyncrasique est expliquée par les variables de la sous-diversification. Au sein du deuxième chapitre, nous apportons des preuves que l'effet de la performance RSE d'une entreprise sur la volatilité idiosyncrasique est négatif au niveau continental. Cependant, l'importance de l'impact dépend du pays et de la période. Nous détectons les composantes RSE dont l'effet est le plus fort. Dans notre troisième chapitre, nous documentons que la détérioration de la qualité des bénéfices augmente la volatilité idiosyncrasique. L'effet de cette détérioration est prononcé dans le cas de la volatilité des rendements idiosyncrasiques négatifs. Nous démontrons également que l'environnement informationnel renforce cet effet lorsqu'il est opaque et l'affaiblit lorsqu'il est sain.

**Mots clés:** gestion de risque; évaluation des actifs; volatility idiosyncrasique; volatilité de marché; responsabilité sociétale des entreprises; la qualité des bénéfices; l'environnement informationnel.

**ANALYSIS OF THE IDIOSYNCRATIC VOLATILITY IN EUROPE: common factors and determinants**

In this study, we demonstrate the importance of idiosyncratic risk by verifying the existence of a common factor of idiosyncratic volatility in Europe that could have an effect on market portfolio volatility and its relationship with stock returns. As idiosyncratic volatility reflects firm-specific information, we seek to identify its determinants in corporate social responsibility (CSR) and in earnings quality. In the first chapter, we discuss the importance of idiosyncratic volatility by demonstrating that its common factor at the European level affects volatilities of national markets' portfolios. In addition, we show that its relationship with stock returns is positive and that the idiosyncratic risk premium is explained by under-diversification proxies. In the second chapter, we provide evidence supporting that the effect of a firm's CSR performance on idiosyncratic volatility is negative at the continental level. However, the significance of the impact depends on the country and on the time period. We detect CSR components associated with the most pronounced effect. In our third chapter, we document that the deterioration of the earnings quality increases the idiosyncratic volatility. The effect of this deterioration is strong in the case of the volatility of negative idiosyncratic returns. We also demonstrate that the informational environment reinforces this effect when it is opaque, and weakens it when it is healthy.

**Keywords:** risk management; asset pricing; idiosyncratic volatility; market volatility; corporate social responsibility; earnings quality; information environment.