Applicant: **Smyth, William**
Organisation: **University of Ulster**
Funding Sought: **£129,941.32**

# WF23\230094

**Optimal sustainable investment outcomes for pensions and savings: An exploration of investment co-movement using statistical techniques**

The size of your pension pot determines the income you will receive in retirement. The aim is to develop novel investment algorithms delivering superior sustainably generated risk-reward outcomes for people's pensions and savings, thereby enhancing personal and collective financial well-being. The project will develop a rigorous, technically sound, and implementable investment tool, developing the new scholarly line of enquiry into co-movement in finance and applying these techniques to promote Socially Responsible Investment.

Portfolio optimization algorithms can promote equality and fairness to those who are less financially literate. Research into their sustainable use is poorly funded because financial institutions are focused on maximizing their own profitability. The wider provision of sustainable and efficient investment algorithms will improve financial health outcomes for the underbanked, making a tangible contribution to social financial inclusion and at the same time ensure capital is directed to projects that support more optimal social, environmental and governance outcomes.

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# WF23\230094

Optimal sustainable investment outcomes for pensions and savings: An exploration of investment co-movement using statistical techniques

## Section 1 - Research Proposal

**Subject Area**

Economics

**Subject Area Detail - Economics**

**Please select the detail(s) of your Subject Area:**

- ☑ Econometrics
- ☑ Financial Economics

**Title of Research Proposal**

**Please state the title of your proposed research:**

Optimal sustainable investment outcomes for pensions and savings: An exploration of investment co-movement using statistical techniques

**Abstract**

**Please provide a short abstract summarising your proposed research in terms suitable for an informed general audience, not one specialised in your field:**

The size of your pension pot determines the income you will receive in retirement. The aim is to develop novel investment algorithms delivering superior sustainably generated risk-reward outcomes for people's pensions and savings, thereby enhancing personal and collective financial well-being. The project will develop a rigorous, technically sound, and implementable investment tool, developing the new scholarly line of enquiry into co-movement in finance and applying these techniques to promote Socially Responsible Investment.

Portfolio optimization algorithms can promote equality and fairness to those who are less financially literate. Research into their sustainable use is poorly funded because financial institutions are focused on maximizing their own profitability. The wider provision of sustainable and efficient investment algorithms will improve financial health outcomes for the underbanked, making a tangible contribution to social financial inclusion and at the same time ensure capital is directed to projects that support more optimal social, environmental and governance outcomes.

**Proposed Research Programme**

**Please give a detailed description of the research programme, including methodology:**

**Applicants should be aware of the importance that assessors place on the viability, specificity and originality of the research programme and of its achievability within the timescale, which should be specified in the Plan of Action.**

The proposed programme is dependent on research funding as I currently have a teaching focused contract. To date our published research output constitutes two strands of a five-strand vision focused on publication in top tier finance journals. Our vision is to use our findings to improve investment performance in a way that will maximise social benefit, consistent with key sustainable development goals.

The various strands are described below and are presented in chronological order of proposed development. This scheme of research is timely in view of the fact that co-movement measures were only introduced into the literature this year. The programme will build on the strands which have already been developed and published in leading journals. Specifically, we have developed a

S1.novel robust co-movement statistic capable of cutting through the high levels of noise in financial markets to uncover the true statistical connection between assets [3].
S2.technique with which the risk-stability of portfolios can be monitored and assessed on an ongoing basis [2].

The project will focus on the development of a
S3.technique to assess and quantify the efficiency with which markets and portfolios absorb information pertinent to performance [1]. In this respect, I should emphasize how my mathematical skills are essential to the understanding and achievement of research output.
S4.machine-learning technique to build portfolios consisting of subsets (clusters) of sustainable financial assets taken from indices such as the S&P 500 which have greater risk-stability than the index as a whole. This will extend the work to investigate co-movement between stock pairs in the same industry but with divergent Socially Responsible Investment scores.
S5.mechanism to extend the traditional risk reward ratio (termed the Sharpe ratio) to incorporate SRI metrics against a benchmark, incorporating a co-movement divisor that will optimize the investment choice in favour of the optimal socially responsible portfolio.

The overall aim of the project will be to combine these elements to produce a high-stability minimum variance investment tool that, combined with the SRI element, delivers sufficient performance enhancement and cost efficiency that the benefits have real social impact through improving financial health by democratizing investment opportunity.

In the first strand we developed a co-movement statistic (a modified Gerber statistic) which has been demonstrated to mitigate against the noise associated with measuring aspects of asset co-movement better than existing alternatives [3]. In the second strand of research, we proposed a novel technique to monitor the stability of investment portfolios over time and alert analysts to the potential for instability [2]. In the remaining strands, we will develop ideas for assessing portfolio informational efficiency (S3) and incorporate the added dimensions of sustainability and socially responsible investment through clustering (S4) and a modified Sharpe ratio (S5).

Whilst at an early stage of development we recently submitted a paper on portfolio informational efficiency to the Financial Management Association Consortium on Asset Management, to be held at Cambridge Judge Business School, March 2023. If this article is selected as one of the papers to be presented at the conference this will provide an excellent platform through which to receive feedback for further development. In addition to recent publications we have several lines of enquiry which could all lead to successful theoretical breakthroughs.

The efficiency of financial markets, vis-à-vis the efficient market hypothesis, is one of the great unanswered questions in finance [9]. Whilst our work on informational efficiency is not premised on addressing this matter directly, the technique we are developing provides a framework within which the efficient market hypothesis may be considered. We have developed a novel approach which uses a modified Gerber co-movement statistic [3] to identify and quantify inefficiency in information absorption at a portfolio level. In doing so we define the concept of portfolio informational efficiency (PIE) [1]. Within an optimization context this manifests as a resonance frequency into which an analyst can tune. PIE combines the power of the Gerber-like statistic with the novel idea that informational efficiency can be assessed through allocating an age-related penalty to co-movement information. The use of PIE further cuts through noise which would otherwise obfuscate investment decisions. This project will refine and develop this idea to completion and address a gap in the literature on this important subject.

Another aspect which we believe can play a critical role in achieving the main aim of the research is the use of machine learning techniques to identify clusters of index constituents which are more stable than the index as a whole (S4). This has obvious performance connotations for long-term time horizon investment vehicles. We hope this may be extended to Socially Responsible Indices and paired stocks based on rating criteria.

In recent years we have witnessed an increasing literature on the clustering of financial assets [10,11]. Clustering, an unsupervised machine learning technique, may be employed to identify a subset of index assets through which the optimization of a particular investment objective can be achieved. We will develop a clustering technique for sustainable investments based on our modification to Gerber co-movement which has been shown to outperform conventional approaches to co-movement measurement. In doing so we shall combine the use of a similarity metric based on our co-movement statistic with PIE in order to develop a clustering algorithm which can identify high-performing clusters. High-performing in this context means that the resulting clusters will better achieve the objective of improving risk-stability.

Index investment is key to passive investment and this approach to investment has been shown to be on a performance-par with active investment. The essential difference between passive and active investment, within the all-important context of social benefit, is that passive investment can be made affordable to many, active investment cannot. Our techniques concentrate on index investment, seeking outperforming clusters within larger index portfolios. This means that performance outcomes can be enhanced for passive investment strategies.

Conventional investment improvements take the form of improved returns for a given level of risk or lower risk for a given target level of return. However, in order to translate these investment-oriented benefits into social benefits, a third element needs to be in place. That is affordability. Enhanced returns or reduced risk are only beneficial to people if they can actually get involved in the first place. The research we have published already constitutes tangible steps in this direction. Our work has clear societal benefits since the performance improvements implicit in our published results constitute enhanced investment efficiency. This facilitates a reduction in fees, further democratising investment and wealth creation opportunity. This gives ordinary people a potential foothold on the investment ladder.

The final and most exciting element of our research proposal is combining these strands into an investment tool which can be implemented in an intuitive and easy way. This will be effective in incorporating SRI into investment outcomes. The theoretical and practical validity and efficacy of the individual strands will have been assured via publication in appropriate leading finance journals. We anticipate publishing the output of this final stage in one of finance's flagship journals (see section on plans for publication and dissemination).

The impact and communication of our findings will be combined through the development of our tool. We hope that this will be adopted by the global investment industry. Interaction with industry practitioners suggests that the output of the first two strands is already attracting attention. We will develop an application programming interface that connects the pension and savings payments and directs them to an automated algorithm. That will drive portfolio construction and direct funds into a pooled investment vehicle.

At the technical level, things can often seem somewhat removed from the social benefits which motivate the research in the first instance. For instance, in our work to date [1&2], we develop techniques to improve the performance of portfolio optimisation. In [3] we build on the work of a team of leading US industry experts, and academics, including a Nobel prize winner [12]. Our research uses mathematical/statistical techniques to cut through the high levels of noise in financial markets. This facilitates enhanced identification of the underlying connections between assets which is central to the processes of diversification and risk management. We utilise cutting-edge data science and data engineering techniques facilitated by computing power on a scale which, until recent years, was available only to elite research facilities. We modify and adapt financial modelling techniques from the fields of finance, economics and financial economics [13-15].

This constitutes the technical work we have undertaken, and will continue to undertake, which manifests in an unseen layer of the output. Understanding and engaging with this aspect of the work requires highly specialised quantitative skills. The visible benefits of our work will manifest as the improvement of investment schemes, especially those for long-term investment horizons; pensions and savings. Improved performance combined with automation can lead to fees being reduced, increasing the accessibility of important investment vehicles to potentially millions of people nationally, and hundreds of millions of people globally. This aspect is the single greatest motivating factor in undertaking our research.

The engagement aspect of our proposal with provide a link between the invisible technical layer and the visible social benefit layer. The published research is necessarily technical because the theoretical robustness and empirical performance of our proposals must be validated by experts in the field through the rigorous academic peer review process. However, it is of critical importance that the benefits of this project are communicated to a broad range of potential stakeholders. Many will not have an explicit interest in the underlying technical aspects of our research but can play a critical role in communicating its societal benefits and raise awareness that an investment product capable of delivering such societal benefit has been developed and tested.

We plan a comprehensive package of collaboration and engagement activities to run in parallel with and complement the research development. A detailed account of this will be provided in the following sections. As I am not entitled to sabbatical leave, the funding would enable this research workload to commence, hence why I have the full support of the faculty in this application. Indeed, I would go so far as to say that receiving funding for this programme would have a life changing impact on my career.

SDGs
Our research proposal has the capacity to address issues surrounding the achievement of SDG 1, 8 & 10. The United Nations Sustainable Development Goals Report (2022) [8] says the following regarding these goals:

SDG 1 [No Poverty]: The Covid-19 pandemic has set progress against poverty back by four years. Global inflation and the invasion of Ukraine has further derailed progress.

SGD 8 [Decent Work and Economic Growth]: Global economic recovery is hampered by: new waves of Covid-19; rising inflation; supply-chain disruptions; policy uncertainty; labour market challenges.

SDG 10 [Reduced Inequalities]: The Covid-19 pandemic resulted in the first rise in between-country income inequality in a generation. Since the pandemic, almost six thousand migrants have lost their lives and the number of people displaced to somewhere other than their country of origin has increased by 44%.

There has arguably never been a greater need to be more efficient in the allocation of public funds and in the creation and use of wealth; public and private. This includes the democratisation of wealth opportunity, giving people of modest means a foothold on the investment ladder to protect against wealth erosion and diminished prospects. Our research is thus timely and important.

The efficiencies clearly demonstrated in our research to date, and which we intend to improve upon through this proposal, have the potential to add real value to the investment paradigm. They play a critical role in micro-investors gaining access to diminished cost-barriers to entry, and make improvements in risk stability and enhanced real returns. Our research proposal has the potential to have time-critical impact on scaling up global financial inclusion and financial health outcomes. This will directly and positively impact SDG 1, SDG 8 & SDG 10, as outlined above. This view is supported by the World Bank Report [7].

References [see section on Publications]

**Plan of Action**

**Please indicate here a clear timetable for your research programme:**

**Try to be as realistic as possible, but keep in mind that research programmes will develop over time and this plan of action is not something that is expected to account for every minute and is not unchangeable. But your chances of award will be affected by the assessors' perception of how viable and realistic this plan is.**

Based on a start date of 1st September 2023, the project will have four output-related milestones: the publication of (at least) three papers in leading peer review finance journals; and the production of a sustainable investment API to facilitate dissemination and implementation of the project's Socially Responsible Investment (financial inclusion enabling and financial health enhancing) goals. Centred on these milestones, the project's key research and engagement components may be categorised as: (a) Research focus; (b) Conference (attending and presenting); (c) Visiting Scholarship; (d) Dissemination focus; & other.

PERIOD 1: September 2023 to May 2024
(a) Research focus: fully develop Strand 3 [portfolio informational efficiency] and compile an action plan for addressing
Strand 4 [high-stability clusters]
(b) Conference 1: candidate conferences [provisionally aligned to Period 1]
(i) Annual Cambridge Conference on Alternative Finance - UK [2024]
(ii) London Business School Summer Finance Symposium - UK [2024]
(c) Visiting Scholarship 1: [2 weeks] Imperial College London
(i) opportunity to visit a world leading university and liaise with Professor Philip Ernst and other faculty in relation to successfully reaching milestone 1
(d) Dissemination focus:
(i) set up domain, website and blog
(e) network with Wolfson Fellows

Milestone 1: First paper [portfolio informational efficiency] submitted after nine months [by end of May 2024].

PERIOD 2: June 2024 to February 2025
(a) Research focus: develop Strand 4 [high-stability clusters]
(b) Conference 2: candidate conferences [provisionally aligned to Period 2]
(i) American Finance Association North Eastern University Finance Conference - US [2024]
(ii) Stanford Initiative on Business and Environmental Sustainability Research Conference Series - Finance and Environmental Sustainability stream - US [2024]
(iii) 4th CEFGroup Climate Finance Symposium - New Zealand [2024]
(c) Visiting Scholarship 2: [1 week] Fidelity Investments, Boston, US and [2 weeks] Rice University, Houston, Texas, US.
(i) Fidelity Investments: access to cutting edge financial machine learning expertise from one of the world's largest asset
managers and the opportunity to liaise with Dr Yinsen Miao
(ii) Rice University: opportunity to visit a leading US university and liaise with faculty who specialise in subject matter closely related to milestone 2
(d) Dissemination focus:
(i) blog continued
(ii) first round of production of public interest video tutorials on key inputs and aims of the project: post on University website and select social media
(iii) public lecture 1: Ulster University [Belfast campus]
(iv) first round of Schools outreach engagement [3 visits/sessions]
(e) network with Wolfson Fellows

Milestone 2: Second paper [high-stability clusters] submitted after 18 months [by end of February 2025].

PERIOD 3: March 2025 to February 2026
(a) Research focus: develop Strand 5 [assessment of SRI through co-movement]
(b) Conference 3: candidate conferences [provisionally aligned to Period 3]
(i) United Nations Principles on Responsible Investing Academic Network Week TBA [2025]
(ii) Chartered Financial Analyst Institute Conference TBA [2025]
(c) Visiting Scholarship 3: [2 weeks] Cambridge Judge Business School
(i) opportunity to visit a world leading business school and liaise with Mr Philip Rowan and other faculty in relation to successfully reaching milestone 3
(d) Dissemination focus:
(i) one-day transdisciplinary workshop: international speakers and attendees from industry and academia comprising stakeholders with a broad range of skills, experience and expertise. Expert presentations and roundtable session on how best to combine the outputs associated with milestones 1-3 in order to meet milestone 4.
(ii) blog continued
(e) network with Wolfson Fellows

Milestone 3: Third paper [modified Sharpe ratio to account for SRI through co-movement] submitted after 30 months [by end of February 2026].

PERIOD 4: March 2026 to August 2026
(a) Research focus: unifying all strands into an investment tool application programming interface (API)
(d) Dissemination focus:
(i) blog concluded
(ii) second round of production of public interest video tutorials on key outputs of the project and future proposed research and engagement: University website and select social media
(iii) public lecture 2: Ulster University [campus TBA]
(iv) second round of Schools outreach engagement [3 visits/sessions]
(e)
(i) software development of investment tool API
(ii) explore potential for future collaboration with Wolfson Fellows
(iii) Impact Case Study [outline]: this project will provide an excellent basis for an impact case study for the next Research Excellence Framework (REF)

Milestone 4: Release of product API [by end of August 2026].

**Plans for Publication and Dissemination**

We strive to be accepted at high impact journals and conferences. We plan to publish papers in peer-reviewed journals addressing co-movement from the perspective of sustainable financial markets, risk analysis, and market efficiency as well as in journals focusing on AI in Fintech. Examples of these journals are: Journal for Sustainable Finance and Investment; Financial Analysts Journal; European Journal of Operational Research and Risk Analysis; Quantitative Finance; Journal of Portfolio Management; Financial Management; European Journal of Finance; Journal of Financial and Quantitative Analysis; The Journal of Finance.

We will collaborate with existing industry and sustainable finance stakeholder networks. We will also engage through awareness presentations with the local societies of the CFA Institute. Knowledge sharing opportunities with risk analysts are offered through professional and learned societies, such as: Operational Research Society; Institute for Operational Research and Management Sciences; Decision Sciences Institute; Society of Risk Analysis.

Further, we will publicise research outcomes and gain feedback from relevant practitioner and academic communities through international conferences. This will include conferences in US and the UK, such as the

Financial Management Association, CFA Institute Research Conference, the American Finance Association (AFA), and others listed in the previous section.

Our datasets will be published on personal repositories such as GitHub, and at Ulster University, both of which guarantee public access. Also, research reports will be published on repositories that guarantee open access.

In addition, we plan to conduct a transdisciplinary mutual learning workshop at a key stage of the project. Participants will be academics as well as representatives of commercial fund and pension managers, financial application developers, financial industry representatives, and societal stakeholders. The goal of the workshop is to address research questions related to combining project strands S1-S5 into a rigorous, technically sound, sustainably responsible investment tool, and to disseminate results to stakeholders. In addition to contributing to knowledge about responsible investment in financial markets, we expect to create an impact on financial markets, savings product design, and the underbanked.

The project will generate a combination of finance and product application approaches resolving the research questions in a transdisciplinary way. As such, the methods applied in the research will facilitate the dissemination of techniques rooted in development and sustainability theories to overcome the limitations of disciplinary methods and offer a better understanding of the multi-faceted domain of investment in a portfolio context. The purpose of using transdisciplinary methods is to tackle the research in a coordinated, integrated and responsible fashion that contributes to both academic research and real-world problem solving.

**Project Start Date**

01 September 2023

**Project End Date**

31 August 2026

**Choice of mentor**

Professor Paul Humphreys, Associate Dean (Research & Innovation), Ulster University Business School.

Professor Humphreys provides leadership and mentorship in the Business School's pursuit of academic excellence in research and impact. He is a driving force at Ulster University in support of multidisciplinary research initiatives; locally, nationally, and internationally.

**Other Participants**

**Please give the names, appointments and institutional affiliation of any other participants in the proposed research. If detail is not known yet, please indicate numbers and status of people who might be involved:**

In addition to my mentor and colleague, Professor Paul Humphreys, Associate Dean (Research & Impact), Ulster University Business School, the project will have five other participants as outlined below:

1. Professor Daniel Broby, Chair and (Full) Professor of Financial Technology, Ulster University Business School.

2. Professor Philip A. Ernst, Chair and (Full) Professor of Statistics, Faculty of Natural Sciences, Imperial College London.

3. Dr Yinsen Miao, Senior Data Scientist, Fidelity Investments, Boston, Massachusetts, US.

4. Mr Philip Rowan, Regulatory Innovation Lead, Cambridge Centre for Alternative Finance, Cambridge Judge Business School.

5. Artificial Intelligence Research Centre (AIRC), Ulster University; in conjunction with NI-HPC (Northern Ireland High Performance Computing), a joint venture between Queen's University Belfast and Ulster University.

**Role of Other Participants**

**Please describe the contribution to the project to be made by other participants, citing any particular specialisms and expertise:**

1. Professor Broby is an internationally recognized late career academic in finance. Before joining Ulster University as a Professor, he was a senior figure in the fund management industry holding executive level positions in the Asset Management industry, including Chief Executive Officer, Chief Investment Officer, and Chief Portfolio Manager. He also held numerous board positions in regulated companies including a leading asset manager and a number of collective investment vehicles. He has board experience as a non-Executive at a large pension administrator and as an independent Director at the family office of an Ultra High Net Worth individual. Daniel holds a Ph.D. in Accounting and Finance, a MPhil in Economics, and a MSc in Investment Analysis. He is a Chartered Fellow of the CISI (Chartered Institute for Securities & Investment) which is the leading professional body for securities, investment, wealth and financial planning professionals, and a Fellow of CFA (Chartered Financial Analyst) UK which is a professional membership body representing 12,000 investment professionals in the UK. Daniel's research interests are centred on financial technology and its application in financial markets. He has written numerous books and peer reviewed papers which attract worldwide attention. Access to Daniel's extensive industry experience and expertise has already proven pivotal in the development of my early career finance research to date. He will continue to be a source of guidance and inspiration over the duration of this fellowship, and beyond, as well as a key active participant

2. I will also collaborate with Professor Ernst, a Royal Society Wolfson Fellow. Philip is a globally renowned and decorated academic with expertise in applied probability and stochastic processes; such processes underpin almost all attempts to quantitatively model the behaviour of financial markets. He is also a co-author on the Gerber et al. article (Gerber, 2022); the work we enhanced in my first finance publication [3]. Access to his technical expertise will prove highly beneficial in this fellowship. Philip holds a PhD and MA in Statistics from The Wharton School of the University of Pennsylvania and a BA (cum laude) in Statistics from Harvard University.

3. I will also collaborate with Dr Miao. Yinsen is a senior data scientist at Fidelity Investments, one of the largest asset managers in the world. He is also a co-author on the Gerber et al. article (Gerber, 2022). Access to his software engineering expertise will prove highly beneficial in this fellowship vis-à-vis development of the API. Yinsen holds a PhD and MA in Statistics from Rice University and a BS in Information and Computing Science from Minzu University of China.

4. I will also collaborate with Philip Rowan. Philip leads the Cambridge Centre for Alternative Finance's initiatives on regulatory innovation – regulatory responses to financial innovation. He works with financial regulators, central banks, governments and other development partners in their efforts to create informed regulatory environments for financial innovation. He has a particular focus on developing and emerging markets, and is a leading authority on regulatory sandboxes and Innovation Offices. Philip was previously a regulator specialising in Fintech, competition policy and financial inclusion, focusing on enabling supportive regulatory environments for development. In his capacity as the International Lead at the UK Financial Conduct Authority's Innovate initiative, he closely supported dozens of financial services regulators and governments in their efforts to promote innovation in financial services, including those in developing markets. A leading authority on regulatory sandboxes, Philip is regularly consulted by those seeking to promote innovation in regulation. Philip has successfully advocated for the implementation of pro-innovation and pro-competition regulatory policies with regulators and competition authorities to promote financial inclusion. Philip has also served at the UK's competition authority, the Competition and Markets Authority (CMA), where his work focused on improving competition in banking. Philip holds an MSc in Development Economics from the University of Oxford and a BSc in Economics from the University of Warwick. Access to Philip's expertise in matters of regulatory innovation and financial inclusion will prove critical in providing the link between the technical aspects of our research and its

associated societal benefits.

5. I will also collaborate with the AIRC on the development of the tool. This is an Ulster University Centre of Excellence with a mission to develop cutting-edge AI theories, algorithms and tools, and to create state of the art AI solutions for practical problems through engagement with stakeholders and users. They have several projects aimed at delivering sustainable AI to enable an intelligent and empowered society. The research proposed in this application aligns with one of the three AIRC research themes; learning, modelling and optimisation. To that end we will be able to gain access to the requisite expertise for optimising the algorithms we develop. This will enhance the computational efficacy and efficiency of our investment tool. Additionally, having access to Kelvin II, a new supercomputing facility from NI-HPC (a joint venture between Queen's University Belfast and Ulster University) will underpin the productivity of our research.

**Added Value of Collaboration**

**Please provide any comments you wish to make on the particular relevance, timeliness or other aspects of the collaboration, and the benefits envisaged:**

Collaboration is key in any substantive research endeavour. A research project which involves the development of a practical investment tool, alongside theoretical algorithms, with the intention of providing societal benefit is necessarily transdisciplinary. Producing something greater than the sum of its parts is the value-add of collaboration.

The team of collaborators on this project have the collective expertise to address all aspects of its completion. The project has five pillar components; industry appeal and feasibility [Daniel Broby]; mathematical and statistical modelling rigour [Philip Ernst]; API software development [Yinsen Miao]; regulatory innovation for financial inclusion [Philip Rowan]; computational efficacy, integrity, transparency and performance [AIRC/NI-HPC].

In Daniel Broby I have access to someone with exceptional industry experience and track record. The development of a financial technology investment tool will require insight into the key considerations of the finance and investment industry. Daniel will be able to provide the industry perspective; from the point of view of the financial analyst to the fund manager to the C-level executive Daniel will be able to provide direction on all relevant matters. This is a critically important aspect of the research.

In Philip Ernst I have access to one of the world's leading authorities on applied probability and stochastic processes. Such analytical and numerical techniques underpin almost all attempts to quantitatively model the behaviour of financial markets. The project will provide challenges in this regard and Professor Ernst's experience will prove invaluable in terms of providing advice, guidance and direction. This is a key aspect of the research.

In Yinsen Miao I have access to one of the top data scientists in the United States. One of the key outputs of the project will be the production of a sustainable investment API. Dr Miao’s software engineering expertise will prove invaluable in terms of providing advice, guidance and direction in developing the API. This is a key aspect of the research.

In Philip Rowan I have access to someone with globally recognised expertise in regulatory innovation and financial health initiatives. Philip has advised and provided an evidence-base for national governments, financial authorities and others in the development community, such as the World Bank, United Nations and regional development agencies. Philip will provide the requisite regulatory expertise to help take a financial investment tool from technical concept to implementable reality. A tool capable of providing financial inclusion and the associated financial health benefits, and ultimately societal benefit at a national, international and global level. The project could not succeed without access to this expertise.

In AIRC I have access to a centre of excellence team of AI researchers and computer scientists. AIRC will play a critical role in ensuring the computational efficiency and efficacy of the underpinning algorithms, and advise on best practice for transparency in AI-based tools. Engaging with AIRC will also ensure access to the NI-HPC Kelvin II supercomputing facility, greatly enhancing our research productivity. These are critical aspects of the research.

In addition to contributing world-class expertise the collaborators have extensive professional networks comprising industry, government and academic stakeholders. Not only will their contribution add tangible quality to the project output, they will be able to disseminate the outcomes to a distinguished and varied audience, ensuring the message reaches key stakeholders.

**Significance and Context**

**Please explain briefly the project's intended audience and explain what impact it has already made or its potential impact on the subject:**

**Please provide any examples of how material from the project, or scholarship derived from it, has permeated into outlets such as student or school textbooks, books aimed at a more general readership, or pieces in the media, or has otherwise contributed to popular culture. Does the project have any plans for publishing more popular accounts of its work, if none already exist? Is there material arising from the project that might be appropriate for such treatment?**

Our intended audience can be extrapolated from the strengths of the collaborating team. The team was selected to source the requisite experience and expertise to construct the five pillars of the project; industry appeal and feasibility; mathematical and statistical modelling rigour; API software development; regulatory innovation for financial inclusion; computational efficacy, integrity, transparency and performance. The pillars provide the support structure for the project aims and objectives listed in earlier sections. The audience therefore comprises: investment industry professionals; finance academics; policy makers and regulators; and the general public.

The project has already made an important contribution to the literature as evidenced by publication in one of the leading finance journals [3]. We introduced novel design principles for the construction of a co-movement statistic capable of out-performing existing alternatives. Whilst we applied these principles to effect the improvement of an existing co-movement statistic (the Gerber statistic), our innovative design principles constitute a new contribution to the field. Given the fundamental role co-movement plays in risk diversification and portfolio optimization it is clear that co-movement related performance improvements are going to be of interest to the entire investment community.

In [2] we introduced a novel approach to monitoring risk-stability of portfolios, evidenced by the fact that this publication is placed in yet another top finance journal. The proposed research will further reinforce this technique by incorporating our co-movement work into its design.

For decades, correlation theory has been the bedrock of portfolio optimization techniques in financial modelling and econometrics textbooks all across the world. More recently the technique of shrinkage was added as a method capable of outperforming the conventional correlation approach on occasion. Co-movement will surely begin to replace, or at least augment, traditional techniques in new editions and new textbooks over the next few years.

Indeed, the out-workings of this project will not only constitute a new direction in academic research in finance but will form the basis for a textbook on advances in modern portfolio theory. The original Gerber co-movement statistic together with the our enhancement (collectively the Gerber family of co-movement statistics) has the potential for further reach and applicability than either correlation or shrinkage. It can be applied to uncover the connection between pairs of statistical random variables in any discipline.

Our contribution to co-movement will reach potentially every undergraduate student of finance in the world.

Indeed, it has the potential to reach every student of statistical theory. From the social sciences, to the natural sciences, to engineering, to medicine the concept of correlation (more accurately co-movement) between measurement variables (observable and unobservable) is fundamental to a wide range of mathematical and statistical modelling approaches. For instance, co-movement is a key component of the algorithms embedded in recommender systems that underpin internet search engines, social media networks, and marketing promotional tools.

**Ethical Issues**

**Are there any special ethical issues arising from your proposal that are not covered by the relevant professional Code of Practice? You must answer yes or no:**

⦿ No

**Have you obtained, or will you obtain ethical approval from your employing institution or other relevant authority? You must answer yes or no:**

⦿ Yes

**If the answers are yes to special ethical issues and no to having obtained prior approval, please describe here the non-standard ethical issues arising from your research and how you will address them:**

**If the answer is no to special ethical issues please enter N/A**

N/A

**Future Collaboration(s)**

**Do you anticipate that the proposed engagement will form the basis for future collaborative activity? If so, please give brief details here:**

The overall aim of this research project is to develop and evaluate an investment decision support system (DSS) suitable for those who do not have access to highly paid investment advisors. This will have achieved the following:

1. understanding of the issues that generate benefits and risks in portfolio investment in relation to sustainable finance.
2. further development our statistical method and qualitative model to explain investment outcomes.
3. adaptation and development of investment approaches in the context of co-movement.
4. development of procedures that integrate technical and social considerations into the investment process.
5. development of a tool to deliver optimal investment goals and assess progress against sustainable finance goals and/or indicate when intervention is necessary

In addition to having answered key research questions, each of these points will generate important research questions to be answered in the future. We believe our research proposal will make a positive impact towards achieving social financial inclusion and delivering tangible financial health benefits. However, we are realistic in acknowledging inevitable room for improvement and the need for work to be done in the pursuit of sustainable equitable financial inclusion for many years to come.

The formal project output together with dissemination activities of the team, individually and collectively, will reach a wide range of stakeholders. Such stakeholders will be motivated to build on our ideas, implement them, and take our research further. The diversity in the collaborating team will ensure diversity in the stakeholder audience. This in turn will ensure the project benefits from the economies of scale inherent in a transdisciplinary approach. Some of the target audience will become our future collaborators, others will build their own teams

and networks, continuing the rich tradition of parallel and connected academic research endeavour. The common goal will be to find ways in which the brilliance and creativity that exists in the academic community can be used to good effect in generating interesting and exciting new avenues to explore; integrating technical and societal considerations to produce sustainable investment approaches for the benefit of all.

**Benefits UK - Context**

**Is the proposed activity likely to meet national challenges facing the UK? If so, briefly explain in what ways the UK more generally might benefit:**

Over the past few years, the UK has experienced constant economic and political change and uncertainty; Brexit; Covid-19; Ukraine; public funding shortfalls; energy supply security; national security; inflation; national pay disputes and strike action.

Increasingly, central and local government funded services are having to operate on reduced budgets. The pensions industry has experienced more uncertainty in recent years than at any time in its history. The long-term sustainability of State pension provision and the national health service are under question. This is exacerbated by a combination of an increasing aging population and emerging mental health crisis across all age cohorts. These issues are likely to persist for some time.

Coping with the present cost of living crisis makes planning for the future a precarious scenario for millions of people. Thus, it is more critical than ever to provide people with the means to invest in savings and pensions schemes in order to mitigate against an erosion of real wealth, to guard against diminishing long-term employment prospects and reduced government service provision.

The tool we propose developing through this research has the potential to help millions of people. It will provide access to affordable investment schemes and advice, and an enhanced risk-return profile enabled by the technical modelling improvements we have already developed and will further develop.

This could have important cascade effects for the economy as a whole. Providing individuals with an opportunity to financially plan for their future, and for the future of their loved ones will deliver important benefits in other aspects of their lives. It is known that financial wellness is linked to mental wellness. There are fintech start-ups in the UK which focus on delivering financial wellness; the financial services sector as whole would welcome a tool that can positively impact financial wellness.

The financial services sector contributed £173.6 billion to the UK economy in 2021. This represents 8.3% of total economic output. The UK financial services sector is also fourth largest in the OECD. There were 1.08 million financial services jobs in the UK in Q1 2022, 3.0% of all jobs. The UK is still seen as a world leader in financial services. The leading academics in Finance are, however, largely US-based. We believe our work can help redress this.

By leading the way in this new direction of research we can contribute to bolstering the profile of UK finance research community. Also, as indicated in an earlier section, the novel approach of our research has implications for the quantitative aspects of third-level finance education going forward. The output of the project will form the basis for learning and teaching resources at university level. Obviously, our desire is that such material should benefit all finance students no matter where they are in the world. However, having the authorship as British in origin enhances the reputation of the UK as a leading contributor to financial innovation whether that be in research, industry or education.

**Benefits - International Context**

**Is the proposed engagement likely to meet international challenges facing society? If so, briefly explain in what ways the benefits more generally might be spread to other countries:**

Many of the challenges identified in the previous section, presented in a UK context, are not specific to the UK: Covid-19 was a global pandemic; the invasion of Ukraine presents global consequences for both national security and supply chains for food, fuel and medicines; energy supply security and price stability is global; as is inflation.

Whilst the challenges for the UK are real, the UK remains one of the world's most stable and robust economies. It is better placed to mange the issues identified than many other countries. The cost of living crisis is more acute in less robust economies and countries with more volatile political situations. The prospects for economic growth, financial security, jobs, health and mental wellbeing provision are more severely impacted in such regions of the world.

The argument that our research output and the associated investment tool can contribute to social financial inclusion is potentially even more relevant on a international scale. The UK has established and fully functioning social and financial infrastructure and is an early adopter of financial technology. This provides a layer of protection and opportunity for its citizens. Such strength-in-depth provision is not in place globally.

A financial technology solution such as we propose is the most effective and fastest way for citizens across the world to access opportunity for savings and investment; it can be accessed from a smartphone. According to Statistica [16], 83% of the world's population has access to a smartphone. This surpasses the equivalent statistic for access to a bank account which is 69% according to the World Bank [17]. The latter statistic evidences significant progress in financial inclusion over the past decade or so since in 2010 the figure was less than 50%. Thus between bank account access and smartphone access the infrastructure exists to facilitate access to a tool such as we propose. We note that the primary value-add in our proposed tool is not in its existence as a connective technology solution but the that underpinning financial investment technology is superior.

In the previous section we identified the reputational value-add to the UK finance research community of this research taking place in the UK. However, the benefits of the research output as well as the proposed educational material will obviously be available to academics and educators across the world.

As part of the main project proposal section we identified that our proposal can help address SDG 1 [No Poverty]: end poverty in all its forms everywhere; SGD 8 [Decent Work and Economic Growth]: promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all; SDG 10 [Reduced Inequalities]: reduced inequalities within and among countries increase global financial inclusion. It is only through an international collective effort that the UN sustainable development goals can be met. The context of truly global perspective is the primary motivating factor for this research.

**Multidisciplinary Proposal**

**If the proposed engagement is especially multidisciplinary in its approach, please explain in more detail here:**

The development of a practical and practicable tool alongside a theoretical algorithm is multidisciplinary in nature as indicated in earlier sections. Adopting the following key for members of the project collaboration team [(a) Smyth, (b) Broby, (c) Ernst, (d) Miao, (e) Rowan, (f) ARIC/NI-HPC], we indicate below the area(s) to which each collaborator has the requisite expertise to contribute. (a) is not explicitly listed since the project owner will contribute to all aspects.

The main complexities that demand multidisciplinary input are:

1. Variety and content of data sources: Investment portfolio construction uses many data sources in order to deliver optimal outcomes [(b), (c), (d), (e)]

2. Complexity and computational efficiency of the inferential algorithms [(c), (d), (f)].

3. Failure to account for environmental, social, and governance (ESG) criteria in investment approaches [(b), (e)].

4. Systemicity of risk: Risk in an investment portfolio has traditionally been seen as a mathematical relationship, failing to recognize unpriced risk. [(b)]

5. Real-time risk assessment: Financial markets move in real time, as such, they co-move in real time, making the need for our measure more relevant [(b), (c)].

6. Regulatory innovation and robustness. Regulation pertaining to any financial technology tool needs to be sufficiently robust to ensure the validity and integrity of its application and use, but simultaneously needs to be sufficiently engaging so as to not stifle innovation and creativity [(b), (e)].

7. Transparency in the design and application of AI-based investment tools [(b), (d), (f)].

8. API software development [(d)].

## Section 2 - Eligibility

**Primary Subject**

**Please indicate the subject most relevant to your research:**

Economics

**Primary Subject Detail - Economics**

**Please select the detail(s) of your primary subject:**

- ☑ Econometrics
- ☑ Financial Economics

**Secondary Subject**

**If your application is more interdisciplinary, you may choose to indicate a secondary subject to which your application might also be relevant:**

*No Response*

Time Period

**Please select your time period(s) from the list below:**

- ☑ Contemporary

Regional Interests

**Please select your regional interest(s) from the list below:**

- ☑ Unspecified Region

Audiences

**Please select your audience(s) from the list below:**

- ☑ Policymakers at national level (e.g. working with Government departments, participating in public in
- ☑ Business partners
- ☑ General Public

### GMS ORGANISATION

| Type | Deactivated Institution |
|---|---|
| **Name** | University of Ulster |
| **Phone** | 028 7012 4622 |
| **Email (Work)** | ulster-submission@ulster.ac.uk |
| **Address** | Ulster University<br>Cromore Road<br>Coleraine<br>Co. Londonderry<br>BT52 1SA<br>United Kingdom of Great Britain and Northern Ireland (the) |

## Section 3 - Lead Applicant Details

### PRIMARY APPLICANT DETAILS

| | |
|---|---|
| **Title** | Dr |
| **Name** | William |
| **Surname** | Smyth |
| **Organisation** | Ulster University |
| **Tel (Work)** | 07921104073 |
| **Email (Work)** | w.smyth@ulster.ac.uk |
| **Address** | Ulster University<br>York Street<br>Belfast<br>Antrim<br>BT15 1ED<br>United Kingdom of Great Britain and Northern Ireland (the) |

### CONTRIBUTOR DETAILS

| Role | Research Administrator |
|---|---|
| **Title** | Mrs |
| **Name** | Vivienne |
| **Surname** | Nash |
| **Tel (Work)** | 028 71675116 |
| **Email (Work)** | v.nash@ulster.ac.uk |
| **Address** | Ulster University<br>Cromore Road<br>Coleraine<br>Co. Londonderry<br>BT52 1SA<br>United Kingdom of Great Britain and Northern Ireland (the) |

| Role | Head of Department |
|---|---|
| **Title** | Mrs |
| **Name** | Danielle |
| **Surname** | McWall |
| **Organisation** | Ulster University |
| **Tel (Work)** | +44(0) 28 95365805 |
| **Email (Work)** | dm.mcwall@ulster.ac.uk |
| **Address** | Belfast campus<br>York Street<br>Belfast<br>Antrim<br>BT15 1ED<br>United Kingdom of Great Britain and Northern Ireland (the) |

| Role | Lead Applicant Referee |
|---|---|
| **Title** | Professor |
| **Name** | Gareth |
| **Surname** | Campbell |
| **Organisation** | Queen's University Belfast |
| **Tel (Work)** | 02890974821 |
| **Email (Work)** | gareth.campbell@qub.ac.uk |
| **Address** | Queen's Management School<br>185 Stranmillis Road<br>Belfast<br>N.Ireland<br>BT9 5EE<br>United Kingdom of Great Britain and Northern Ireland (the) |

**Nationality: You must select one but you may select up to three if applicable.**

**Please state your nationality:**

British

**Nationality: You must select one but you may select up to three if applicable.**

**Please state your nationality:**

*No Response*

**Nationality: You must select one but you may select up to three if applicable.**

**Please state your nationality:**

*No Response*

## Section 4 - Lead Applicant Career Summary

**Statement of Qualifications and Career**

**Please give details of your academic qualifications and career.**

| Qualification: | Date: |
|---|---|
| FHEA Fellow of The Higher Education Academy [Advance HE] | 20 June 2020 |
| PGCE (FE) Postgraduate Certificate in Education (FE) Ulster University | 15 June 2000 |
| PhD in Theoretical and Computational Physics, Queen's University Belfast | 20 April 1996 |
| BSc (Hons 2:1) in Mathematics, Queen's University Belfast | 10 June 1992 |

**PhD Confirmation**

⦿ Yes

**PhD Awarded Date**

20 April 1996

**Present Appointment**

**Please state your present appointment.**

Lecturer in Financial Services

**Present Employing Institution**

**Please state the institution at which you are currently employed.**

Ulster University

**Present Department**

**Please indicate the Department or Faculty (or equivalent) in which you are based.**

Ulster University Business School

**Personal Statement**

**Please enter your personal statement:**

I made a very promising start to an academic research career during the period 1993-1998. I completed a PhD and a two-year EPSRC Postdoctoral Research Fellowship at [Russell Group] Queen's University Belfast, publishing eight articles in peer review journals (seven at 4* and one at 3* [see Publications]).

I had a career-stopping decision to make then because of caring responsibilities for my grandmother who had brought me up since early childhood. I left academia and secured a teaching post at a FE college in my rural homeland. I remained there for 17 years before availing of a voluntary exit scheme. In 2019 I returned to HE to pursue my passion for research, securing a post at Ulster University. In February 2022, I got involved in academic research again, the first involvement since December 1998 [see next section**].

Eligibility provisionally confirmed: email [ 14/11/22] by Robert Rogers from The British Academy.

**Other Academic Experience**

(1). Jun 2019-present, Ulster University.

**The combination of developing two new degree courses, BSc (Hons) Financial Technology, online MSc FinTech Management, and the Covid-19 pandemic meant I had no involvement in research before February 2022.

Member of finance teaching team placed top 20 in UK by Times/Guardian leagues tables (2023) for teaching in Accounting & Finance.

Member of course committee who developed the first undergraduate HLA Fintech degree course [BSc (Hons) in Financial Technology] in the UK [2019/20]. Extensive engagement with sector employers during and since development. As Year 1 Course Tutor I regularly liaise with employers with regard to student support and progress. I served as Course Director during academic year 2019-2020 to cover maternity leave. I am currently involved in developing an online MSc in FinTech Management; a collaboration between Ulster University and Pearson Education in a global online initiative.

Created, developed, delivered, assessed, and revised modules in finance and financial technology. At undergraduate level: Financial Mathematics and Statistics (level 4); Financial Modelling in Python (level 5); FinTech and Disruptive Technology (level 6). At postgraduate level (all level 7): Mathematics of Risk Management; Financial Econometric Modelling in Python; FinTech and Data Science. All these modules were delivered fully online during the academic years 2019-2021.

Have talked extensively at Careers Fairs, UCAS events, School visits, and other public engagements to promote fintech careers. Always focussing on 'fintech for good'.

Member of the FinTech NI Association planning committee to set up the first UK FinTech Symposium conference to take place in Belfast (May 2022). I also contributed to the NI government report into fintech development in Northern Ireland (2020). I have participated in UK FinTech Week annual conference [2020-2022]; discussant in sessions on fintech skills development in the UK. I am also a consultant for The Fintech Corridor, Ireland’s industry body for fintech. I have sat on several of their online discussion panels.

I created an extensive set of video tutorials for public consumption on the history, development, technology and business models of financial technology. This collection of videos was also made available to Innovate Finance, the independent UK industry body for fintech, as part of their FinTech for Schools initiative.

Recipient of UU Professional Practice Innovation Award (2022) for a bespoke resource I created to deliver Python programming in finance in an arbitrarily tunable blended fashion.

UU Early Career Researcher Award (2023) finalist for my 4* publication in Finance Research Letters enhancing the work of a Nobel prize laureate. Competition is ongoing.

I feature in SyncNI’s October 2022 edition [Northern Ireland’s leading technology publication], based on above research output.

(2). Jan 1993-Dec 1998, QUB

Contributed/presented papers at international conferences [see CV].

Research Student [best presentation] Awards: (i) Erasmus Summer School for Quantum Optics, Crete (1993); (ii) Department of Applied Mathematics, QUB (1994).

Joint supervisor for PhD student [Dr Martin Scott].

From 1994-1998 I delivered weekly seminar sessions for a range of mathematics modules.

I believe the items listed above collectively demonstrate clear potential for leadership in research and engagement.

**Publications**

**Please list your principal and/or relevant publications in reverse chronological order, to a maximum of six:**

Starring based on SCImago[Scopus] journal ranking [4* = Q1 SJR]. To date my work has received 181 citations and my h-index is 7 on PURE.

A. Publications arising from research undertaken since February 2022. From January 1999 until January 2022, I had no involvement [formal or informal] in academic research [see personal statement and eligibility sections].

1. Smyth, W., & Broby, D. [submitted November 2022] A measure of portfolio informational efficiency based on the dynamics of equity co-movement. Financial Management Association Consortium on Asset Management, University of Cambridge [March 2023] [4*]

2. Smyth, W., & Broby, D. [accepted November 2022] An Eigenvalue distribution derived "Stability Measure" for evaluating Minimum Variance Portfolios. Quantitative Finance [4*]

3. Smyth, W., & Broby, D. (2022) An enhanced Gerber statistic for portfolio optimization. Finance Research Letters 49 103229. [4*]

CAREER BREAK FOR CARING ROLE

B. Publications arising from research undertaken during PhD [1992-1996] and two-year postdoctoral position [1996-1998].

The publications below are in the field of theoretical physics, where I developed the quantitative skills [mathematical, statistical and computational] I am using and further developing in my current research in finance.

4. Smyth, W. S., & Swain, S. (1999). Complete quenching of fluorescence from a two-level atom driven by a weak, narrow-band, nonclassical light field. Physical Review A. https://doi.org/10.1103/PhysRevA.59.R2579 [4* Rapid Communication]

5. Smyth, W. S., Swain, S., Ficek, Z., & Scott, M. (1998). Anomalous resonance fluorescence and dressed-state inversion by squeezed light in a Fabry-Pérot microcavity. Physical Review A. https://doi.org/10.1103/PhysRevA.57.585 [4*]

6. Smyth, W. S., & Swain, S. (1996). Anomalous resonance fluorescence from an atom in a cavity with injected squeezed vacuum. Physical Review A. https://doi.org/10.1103/PhysRevA.53.2846 [4*]

6.a. Ficek, Z., Smyth, W. S., & Swain, S. (1995). Asymmetric probe-absorption spectrum and amplification without population inversion in a squeezed vacuum. Physical Review A. https://doi.org/10.1103/PhysRevA.52.4126 [4*]

6.b. Smyth, W. S., & Swain, S. (1994). Dressed states and resonance fluorescence of a two-level atom in a squeezed vacuum. Optics Communications. https://doi.org/10.1016/0030-4018(94)90085-X [4*]

*6.a and 6.b have been included to ensure six fully published articles have been listed

C. Publications referenced in other sections

7. World Bank Digital Financial Services Report [April 2020] https://pubdocs.worldbank.org/en/230281588169110691/Digital-Financial-Services.pdf [accessed November 2022]

8. United Nations Sustainable Development Goals Report [2022] https://unstats.un.org/sdgs/report/2022 [accessed November 2022]

9. Fama, E. F. (1970). Efficient Capital Markets: A Review of Theory and Empirical Work. The Journal of Finance, 25, 2, 383–417

10. Lopez de Prado, M. (2016). Building Diversified Portfolios that Outperform Out of Sample, The Journal of Portfolio Management, 42(4) 59-69

11. Tang, W., Xu, Xiao., Zhou, X, Asset Selection via Correlation Blockmodel Clustering (June 26, 2022). Available at SSRN: https://ssrn.com/abstract=3813247 or http://dx.doi.org/10.2139/ssrn.3813247

12. Gerber, S., Markowitz, H.M., Ernst, P. A., Miao, Y., Javid, B., Sargen, P. (2022) The Gerber Statistic: A Robust Co-Movement Measure for Portfolio Optimization. The Journal of Portfolio Management, 48 (3) 87-102

13. Markowitz, H.M. (1952). Portfolio Selection. The Journal of Finance. 7(1), 77–91.

14. Sharpe, W. F. (1966). Mutual Fund Performance. Journal of Business, January, 119-138

15. Higham, N. (2002) .Computing the nearest correlation matrix—a problem from finance. IMA Journal of Numerical Analysis 22, 329–343

16. [Statista] Forecast number of mobile devices worldwide. https://www.statista.com/statistics/245501/multiple-mobile-device-ownership-worldwide/ [accessed 20/11/22]

17. [World Bank] Financial Inclusion on the rise, but paps remain. https://www.worldbank.org/en/news/press-release/2018/04/19/financial-inclusion-on-the-rise-but-gaps-remain-global-findex-database-shows [accessed 20/11/22]

**Curriculum Vitae Upload**

**Please upload your CV below:**

WSmyth CV
21/11/2022
10:29:45
pdf 174.03 KB

**Previous Support Dates**

**Please give details of any research application submitted to the British Academy within the last five years:**

**Please note that only one British Academy research grant may be held, or applied for, at any one time.**

Not applicable.

**Previous Support Description**

**Please give the title of any previous research application submitted to the British Academy within the last five years, and the amount awarded (if any):**

| Title | Amount Awarded |
|---|---|
| *No Response* | £0.00 |
| *No Response* | £0.00 |
| *No Response* | £0.00 |
| *No Response* | £0.00 |
| *No Response* | £0.00 |

**Where did you hear of this scheme?**

**Please indicate where you heard about this scheme:**

UUBS Research Director.

## Section 5 - Financial Details

| Budget heading | | Year 1 | Year 2 | Year 3 | Total |
|---|---|---|---|---|---|
| ***Travel Costs*** | | | | | |
| Travel Costs | Proposed Cost | £5,050.00 | £10,070.00 | £9,320.00 | £24,440.00 |
| | Latest Proposed Cost | £5,050.00 | £10,070.00 | £9,320.00 | £24,440.00 |
| ***Travel Costs Total*** | ***Proposed Cost*** | ***£5,050.00*** | ***£10,070.00*** | ***£9,320.00*** | **£24,440.00** |
| | ***Latest Proposed Cost*** | ***£5,050.00*** | ***£10,070.00*** | ***£9,320.00*** | **£24,440.00** |
| ***Public Engagement /Dissemination Costs*** | | | | | |
| Public Engagement/Dissemination Costs | Proposed Cost | £200.00 | £700.00 | £2,300.00 | £3,200.00 |
| | Latest Proposed Cost | £200.00 | £700.00 | £2,300.00 | £3,200.00 |
| ***Public Engagement /Dissemination Costs Total*** | ***Proposed Cost*** | ***£200.00*** | ***£700.00*** | ***£2,300.00*** | **£3,200.00** |
| | ***Latest Proposed Cost*** | ***£200.00*** | ***£700.00*** | ***£2,300.00*** | **£3,200.00** |
| ***Research or Other Expenses*** | | | | | |
| Research or Other Expenses | Proposed Cost | £0.00 | £0.00 | £2,500.00 | £2,500.00 |
| | Latest Proposed Cost | £0.00 | £0.00 | £2,500.00 | £2,500.00 |
| ***Research or Other Expenses Total*** | ***Proposed Cost*** | ***£0.00*** | ***£0.00*** | ***£2,500.00*** | **£2,500.00** |
| | ***Latest Proposed Cost*** | ***£0.00*** | ***£0.00*** | ***£2,500.00*** | **£2,500.00** |

| Budget heading | | Year 1 | Year 2 | Year 3 | Total |
|---|---|---|---|---|---|
| ***Consumables*** | | | | | |
| Consumables | Proposed Cost | £0.00 | £300.00 | £300.00 | £600.00 |
| | Latest Proposed Cost | £0.00 | £300.00 | £300.00 | £600.00 |
| ***Consumables Total*** | ***Proposed Cost*** | ***£0.00*** | ***£300.00*** | ***£300.00*** | **£600.00** |
| | ***Latest Proposed Cost*** | ***£0.00*** | ***£300.00*** | ***£300.00*** | **£600.00** |
| ***Directly Incurred Salary*** | | | | | |
| Directly Incurred Salary | Proposed Cost | £31,095.83 | £33,027.24 | £35,078.25 | £99,201.32 |
| | Latest Proposed Cost | £31,095.83 | £33,027.24 | £35,078.25 | £99,201.32 |
| ***Directly Incurred Salary Total*** | ***Proposed Cost*** | ***£31,095.83*** | ***£33,027.24*** | ***£35,078.25*** | **£99,201.32** |
| | ***Latest Proposed Cost*** | ***£31,095.83*** | ***£33,027.24*** | ***£35,078.25*** | **£99,201.32** |
| **Grand Total** | **Proposed Cost** | **£36,345.83** | **£44,097.24** | **£49,498.25** | **£129,941.32** |
| | **Latest Proposed Cost** | **£36,345.83** | **£44,097.24** | **£49,498.25** | **£129,941.32** |

**Justification**

**Please refer to the scheme guidance notes for full details of eligible costs.**

**Please provide details of funding related to the relevant fields set out in the financial details table above.**

**Applicants should prepare accurate costings for the proposed research expenses, and should be particularly careful not to overestimate the resources required. Costs should be clearly itemised and justified in terms of the research programme for this application.**

Breakdown of costs identified in above table: see Plan of Action for additional detail on rationale and timing of cost elements.

1. Conference [attendance and presentation]
(a) Two International conferences 2 x £2,000 = £4,000
(b) One UK conference = £750
Sub-Total = £4,750

2. Visiting Scholarship
(a) Fidelity Investments, Boston (1 week) and Rice University, Texas (2 weeks):
Flights Dublin to Boston (R) £1,000, Boston to Houston (R) = £500; Accommodation - £190 x 21 nights = £3,990; Subsistence £90 x 22 days = £1,980
Sub-Total = £7,470
(b) Cambridge Judge Business School (2 weeks):

Flights Belfast to London (R) £300, Travel - London to Cambridge (R)= £100; Accommodation - £190 x 14 nights = £2,660; Subsistence £90 x 14 days = £1,260
Sub-Total = £4,320
(c) Imperial College London (2 weeks):
Flights Belfast to London (R) £300, Travel across London (R)= £80; Accommodation - £190 x 14 nights = £2,660; Subsistence £90 x 14 days = £1,260
Sub-Total = £4,300

3. Transdisciplinary Workshop [one-day] at Ulster University [Belfast]
Guest speaker costs (four guest speakers – two national, two international): National [per speaker]: fees = £100, travel/accommodation = £200, subsistence = £100
International [per speaker]: fees = £100, travel/accommodation = £750, subsistence = £150
Catering = 50 x £20 =£1000
Printed workshop materials £200,
Sub-Total = £4000

4. Schools Outreach Programme (x6)
Travel and subsistence for presenter £200 x 6 = £1,200;
production of materials £100 x 6 = £600
Sub-Total = £1,800

5. Public Outreach Programme
purchase domain, create website and maintain blog = £200
creation of educational video tutorial collection to raise public awareness = £400
public lecture (x 2): venue hire (2 x £400) and printed materials (2 x £100)
Sub-Total = £1600

6. Software Development Services
API software development = £2,500
Sub-Total = £2,500

7. Directly Incurred Salary
Teaching Relief/Buyout is calculated at a Lecturer Post, Grade 7, Spine Point 32.
This is the recommended lowest starting point that Ulster University recruit a lecturer post.
Sub-Total = £99,201.31

Grand Total = £129,941.31

**Applications to Other Funding Bodies**

**Have you made any other applications in connection with this project? If so, with what results:**

I have not made any other applications in connection with this project. No other applications are planned prior to 28th February 2023, by which time the results of this process will have been announced.

**Value of Academy's Support**

**Please state briefly, in a sentence or two, the value of the Academy's continuing support for the project:**

The British Academy is the national academy for the humanities and social sciences. The Academy has, through the Wolfson Fellowships and Early Career Researcher network, demonstrated its commitment to provide critical support to early career scholars of SHAPE disciplines all across the UK.

Through this fellowship award I could avail of the financial support necessary to free up time from most non-

research duties. This is a critical enabling factor in realizing my full academic potential and to undertake research of the standard and quality befitting the award, and my abilities. The award would provide a unique opportunity to collaborate intersectorally. This would facilitate sharing the benefits of my strong natural sciences background with other early career researchers in the network. Similarly, I would benefit immensely from those whose subject background and learning journey has followed a different path to mine. This will be value-adding for all parties concerned. The richness of this kind of cross-fertilization of knowledge and ideas is what will truly enhance the interaction, deepening our appreciation of the problems facing humanity and help us frame insightful, feasible and practically implementable solutions to such problems.

Becoming part of a network of future research leaders truly has the potential to be career-changing. I am passionate about highlighting and enhancing awareness of the fundamental role which research in the humanities and social sciences has to play for the betterment of modern society. Our disciplines have never been more relevant; we can impact the future direction of sustainability policy and that will be the single greatest determinant in affecting long-term outcomes. In symbiosis, our disciplines can also be shaped by the implementation of this policy, by the nature of the problems faced as they are brought more acutely into focus, and by the subsequent and consequent direction of societal travel.

My academic career commenced in the natural sciences and I was trained to think in terms that the most critical problems facing mankind can be distilled in terms of scientific principles. And solutions purposed from these. Life experience has taught me that this view has considerable shortcomings and is now rendered empirically redundant. The future trajectory of the planet and the concomitant distinction in outcomes vis-à-vis whether mankind continues to thrive, or merely survive, will not be determined by science. The science and technology required to save the planet and safeguard our future, and the future of all the species with whom we share this planet, already exists. Climate change, its consequences, and our capacity to mitigate and adapt to those consequences will be determined by society, policy and politics.

I would argue that this is why it has never been more critical to build research paradigms premised on the axioms of social science. The Wolfson Fellowship from the British Academy is a visionary initiative to that end. I would dearly value being an integral part of that vision and to build upon it, not alone through this fellowship but as part of a growing network of like-minded, energized and mobilized, exceptional individuals.

## Section 6 - Equal Opportunities

**Gender**

Man

**Gender**

*No Response*

**Age**

**Please indicate to which age group you belong.**

50-54

**Ethnic Origin**

White/White British - Northern Irish

**Ethnic Origin**

*No Response*

**A person is disabled under the Equality Act 2010 if they have a physical or mental impairment that has a "substantial" and "long-term" (12 months or more) negative effect on their ability to do normal daily activities. Do you consider you are disabled under the Equality Act 2010?**

No

**If you wish to do so, please specify the nature of your disability:**

*No Response*