Vimal Balasubramaniam

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Teaching and Research Fields

Household Finance, Behavioural Finance and Asset Pricing

Education

2012 –	Doctor of Philosophy in Financial Economics, University of Oxford Thesis Title: Essays in Household Finance Supervisors: Profs. Tarun Ramadorai and Peter Tufano Expected Completion Date: July 2017
2009	Masters in Public Policy, National University of Singapore
2007	Bachelor of Arts in Economics, University of Madras

Employment and Research Affiliations

2012 –	Oxford-Man Institute of Quantitative Finance *Student Associate*
2009 – 2012	National Institute of Public Finance and Policy, New Delhi. *Consultant*

Research Papers

The Effect of Subjective Life Expectancy on Financial Decisions

Job Market Paper, (2016)

Presentations: CEPR Workshop in Household Finance, 2016; Saïd Business School, 2016, Oxford-Man Institute of Quantitative Finance, 2016.

Endowment Effects in the Field: Evidence from India's IPO Lotteries

with Santosh Anagol and Tarun Ramadorai (2016)

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2702555

Presentations: NBER Behavioural Finance Workshop, Boston 2016; Advances in Field Experiments Conference, Chicago 2016; AFA Annual Meetings, San Francisco 2016; University of Bocconi, Milan 2016; Imperial College Business School, London 2016; Institute for Fiscal Studies, London 2016; Goethe University, Frankfurt 2016; London School of Economics, London 2016; London Business School, London 2016; Wharton School, Philadelphia 2016 and Saïd Business School, Oxford 2016.

The Effects of Experience on Investor Behavior: Evidence from India's IPO Lotteries

with Santosh Anagol and Tarun Ramadorai (2015)

https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2568748

Presentations: Saïd Business School, 2015; IGIDR Emerging Markets Finance conference, Mumbai 2014; Federal Reserve Board, Cleveland 2015; NBER Household Finance conference, Boston 2015.

Published papers:

The Indian Household Finance Landscape
with Cristian Badarinza and Tarun Ramadorai (2016)
Forthcoming, India Policy Forum Vol. 16
https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2797680

The Exchange Rate Regime in Asia: From Crisis to Crisis
with Ila Patnaik, Ajay Shah and Anmol Sethy (2011)
International Review of Economics and Finance
http://www.sciencedirect.com/science/article/pii/S105905601000047X

Teaching

2015 - 2016	Asset Pricing. *Teaching Assistant*, Prof. Mungo Wilson MSc Program in Financial Economics, Saïd Business School
2014 - 2015	Asset Pricing. *Teaching Assistant*, Prof. Tarun Ramadorai MSc Program in Financial Economics, Saïd Business School
2014 - 2015	Behavioural Finance. *Teaching Assistant*, Prof. Tarun Ramadorai MBA and MSc Program in Financial Economics, Saïd Business School

Policy Work

2016 –	Reserve Bank of India Committee on Household Finance. *Member, Research Sub-committee*
2010 – 2012	Financial Sector Legislative Reforms Commission, Government of India. *Member, Research Team*
2010 – 2012	Financial Stability and Development Council, Government of India. *Member, Research Team*
2009 – 2010	Working Group on Foreign Investment, Ministry of Finance, India. *Member, Research Team*

Awards

AFA Student Travel Grant, American Finance Association (2016).

Oxford-Man Institute Studentship Award, University of Oxford (2012 - 2017).

Fidelity-Oxford Scholarship, University of Oxford (2012 – 2017).

Graduate Student Scholarship, National University of Singapore (2007 – 2009).

Gold Medalist - Economics, University of Madras.

Peace Scholarship - Semester abroad program, Griffith University, Australia (2006).

Merit Scholarship - Economics, University of Madras, Loyola College (2004 – 2007).

Media coverage

"To have and to hold: The endowment effect among stockmarket investors", The Economist, *20 August 2016*.

"Endowment effects in the field: Evidence from IPO lotteries in India", VOXeu.org , *17 July 2016*.

"Chips of the block: Currencies around Asia are more flexible than you think", The Economist, *03 June 2010*.

"Poor dollar standard: Has the downgrade shaken loyalty to the greenback?", The Economist, *13 August 2010*.

Computing Skills

Computation / Econometrics softwares: R, Stata, Matlab

Programming: C, C++, Python

Web design: HTML, PHP

References

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Peter Moores Dean & Professor of Finance
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Twilight Hour: Diwali Experience and Future Investor Activity

Research Proposal

Vimal Balasubramaniam
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December 2016

Project Summary

This project will test the effect of Diwali trading on future investor activity in the Indian stock market. It will make use of a unique Indian setting, i.e., *muhurat* or the auspicious trading hour declared by the Indian stock exchanges, after regular working hours, during Diwali. In this hour, nearly all investors in the Indian stock market, including professional traders and individual investors, are framed by religious beliefs and driven to book profits to start the religious calendar year on an auspicious note. In this setting, beliefs in the market are broadly known *ex-ante*, i.e., investors who trade in this hour have common beliefs, however irrational, with little disagreement.

This setting is ideal to understand how aggregate beliefs, centered around inflated expectations of market-wide returns, affect individual investors' future investment activity in stock markets. Further, how do experiences within this hour shape individual investor behavior with respect to specific stocks? Does it merely affect return expectations or also influence risk perceptions?

Background

Finance theory posits that the market beta is an important determinant of risk premia. Most empirical studies do not find any direct relation between market beta and average excess returns across stocks.[1] However, recent studies such as Savor and Wilson (2014) and Lucca and Moench (2015) find that the relationship is economically and statistically significant for a subset of important trading days when prescheduled announcements about the macroeconomy are released and argue that a potential explanation is that announcement-day returns provide a clear signal of aggregate risk and expected future market returns. A "micro" level explanation to this phenomena is that these are instances when market

[1] See early works such as Jensen et al. (1972); Black (1972, 1993); Fama and French (1992) and more recently Polk et al. (2006).

participants are appropriately incentivized to become newly-minted rational arbitrageurs, providing for precisely known beliefs and common knowledge, thus proliferating the number of arbitrageurs and reducing noise traders in the market (Fama, 1965). In this setting, where many seek to do the right thing and most traders "buy low and sell high" (as opposed to buy-high, sell-low noise traders as in De Long et al., 1990), most of the risk-premia ought to be explained by fundamental risk.[2]

If this explanation were to be true, one should see such a relationship also hold in instances where a there is a sharp, *ex-ante* market-wide motive to be rational and profit-maximizing, where common knowledge is well established. That is, instances where changes in sentiment is *ex-ante* known to veer towards a profit-maximizing agenda, and is pre-scheduled (so that those who become arbitrageurs know what to expect and there is common knowledge). India provides a sharply identified environment to ask this question, through its unique *muhurat* trading hour that happens during Diwali, every year. *Muhurat* trading is a traditional religious ritual to mark the beginning of the new year for many communities[3] in India who believe and aspire to trade in the stock market with an explicit motive to start the year on a positive note in order to remain prosperous and wealthy. These communities also dominate the stock broking community and retail investor base in modern India.[4]

Data Requirements

The question asked here inherently requires high-frequency, intra-day stock market information as *muhurat* trading happens only for an hour, and in most instances on a weekday, after the markets have closed for the day. These are real trades with real stakes and settlement. Any measure of daily stock returns that captures this trading period is only an approximate proxy for this setting to be explored. Furthermore, in order to determine the micro-foundations of this hypothesis, it is important to establish that market participants on the diwali hour (or on that day) behave differently from other hours / days, and their behaviour is more "rational" than otherwise observed in the market. This requires daily holdings data, of all market participants, preferably anonymized at a PAN/TIN level[5] for a period before and after Diwali. More preferably, the order-book for a period before and after all Diwali hours in the market will allow for detailed investigation of pre-diwali and post-diwali trends, especially in understanding trading volume, and serial correlation, thus identifying the micro-foundations in the spirit of Campbell et al. (1992). Data for this project will be accessed from the Finance Research Group at the Indira Gandhi Institute of Development Research (IGIDR) in Mumbai, India. However, I will also continue to try with the National Stock Exchange of India could provide a more fine-grained classification of investor

[2]This argument holds only under the assumption that the limits to arbitrage (Shleifer and Vishny, 1997) are not binding.

[3]Historically, these communities form the trading communities in the socio-economic system since ancient times in India. For more details, see `https://goo.gl/2Q4glc`.

[4]For some more information on muhurat trading, see `http://goo.gl/UXz8jn`.

[5]PAN is the Tax ID number for retail participants and TIN is the Tax Information Number for firms and financial intermediaries.

types with order level data, this project will immensly benefit from it.

Preliminary Evidence

In order to do some preliminary exploration with existing sources of data, a reasonably good proxy to start with at the daily frequency is the day after Diwali.[6] As preliminary evidence, Figure 1 (a) plots average realized excess returns for each market-beta sorted portfolio[7] against full-sample portfolio betas separately for the day after Diwali (circle points) and other days (triangle points). Similarly, Figure 1 (b) presents the relationship with the market beta, controlling for the traditional Fama-French factors for size and value. The average excess returns experienced by the beta sorted portfolios are extraordinarily high - this calls for further exploration. However, the relationship between the average excess returns and beta is positive, statistically and economically significant.[8] This preliminary evidence suggests that there is a similar pattern as documented in Savor and Wilson (2014) and Lucca and Moench (2015) for announcement days with other uninformative, but sharply identified days where investors have common knowledge about beliefs held by others in the market. There is sufficient preliminary evidence to suggest that further exploration with higher frequency data to address the questions posed in this proposal will be insightful, especially about household behaviour into the future after their experience during the auspicious hour in the stock market.

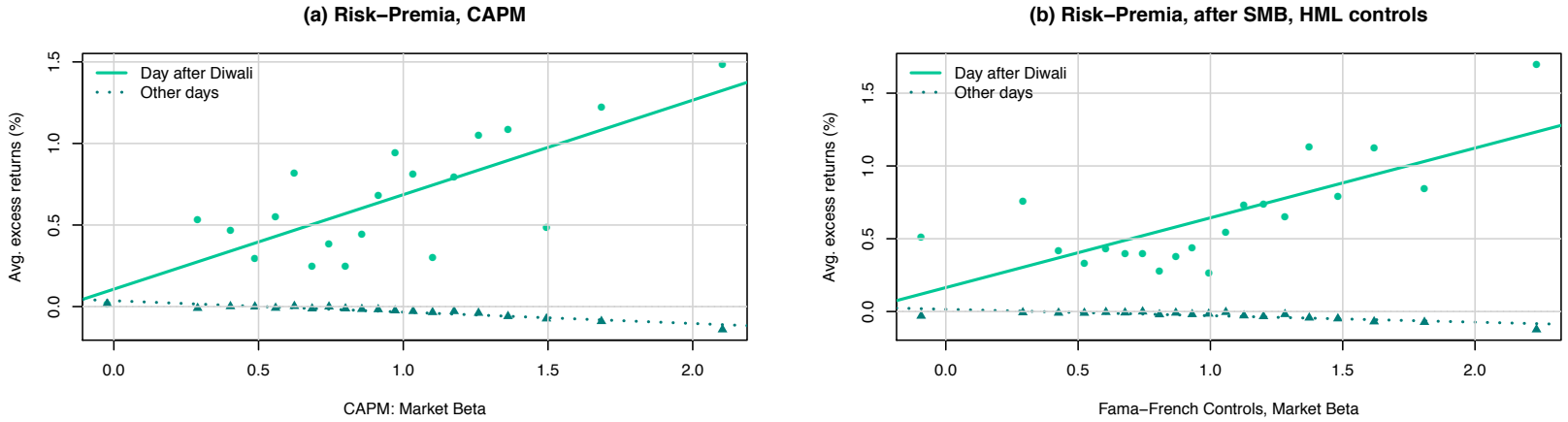
[6]The *muhurat* hour is the auspicious hour, and the trading day after the hour is the closest proxy to the period after the "event" at a daily frequency. All Diwalis where there has been a pre-scheduled announcements in India, and from the Federal Open Markets Committee have been dropped. In future work, firms that have any earnings announcements, and other prescheduled announcements will also be identified and dropped.

I find that that preliminary evidence presented here are robust when a mean of the day before, day after and on the day of Diwali is used, although a work on pre-diwali trends, and post-diwali trends are a subject matter of further research.

[7]These portfolios are formed sorting stocks by their stock market beta, by estimating stock market betas for all stocks using rolling windows of 6 months daily returns from January 2000 to December 2015.

[8]For reasons of brevity and page constraints, the regression analysis has not been presented here.

Figure 1: Market Risk is priced on these days with newly minted arbitrageurs



References

Baker, M. and J. Wurgler (2006). Investor sentiment and the cross-section of stock returns. *The Journal of Finance 61*(4), 1645–1680.

Black, F. (1972). Capital market equilibrium with restricted borrowing. *Journal of business*, 444–455.

Black, F. (1993). Estimating expected return. *Financial Analysts Journal 49*(5), 36–38.

Campbell, J. Y., S. J. Grossman, and J. Wang (1992). Trading volume and serial correlation in stock returns. Technical report, National Bureau of Economic Research.

De Long, J. B., A. Shleifer, L. H. Summers, and R. J. Waldmann (1990). Noise trader risk in financial markets. *Journal of political Economy*, 703–738.

Fama, E. F. (1965). The behavior of stock-market prices. *Journal of business*, 34–105.

Fama, E. F. and K. R. French (1992). The cross-section of expected stock returns. *the Journal of Finance 47*(2), 427–465.

Jensen, M. C., F. Black, and M. S. Scholes (1972). The capital asset pricing model: Some empirical tests.

Lucca, D. O. and E. Moench (2015). The pre-fomc announcement drift. *The Journal of Finance 70*(1), 329–371.

Polk, C., S. Thompson, and T. Vuolteenaho (2006). Cross-sectional forecasts of the equity premium. *Journal of Financial Economics 81*(1), 101–141.

Savor, P. and M. Wilson (2014). Asset pricing: A tale of two days. *Journal of Financial Economics 113*(2), 171–201.

Shleifer, A. and R. W. Vishny (1997). The limits of arbitrage. *The Journal of Finance 52*(1), 35–55.

Stambaugh, R. F., J. Yu, and Y. Yuan (2012). The short of it: Investor sentiment and anomalies. *Journal of Financial Economics 104*(2), 288–302.

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November 11, 2016

To the junior recruiting committee:

I am writing to recommend **Vimal Balasubramaniam** for a position in your department. Vimal is a PhD student at the Saïd Business School at Oxford; while I am not one of his dissertation advisors, I have come to know him well through his work supporting a Sloan Foundation grant, awarded jointly to Tarun Ramadorai (then at Oxford) and myself at Harvard respectively. I have carefully read Vimal's job market paper and his joint papers with Tarun and Santosh Anagol. I have also seen Vimal in action during the early stages of a joint project we are pursuing on local bias of Indian equity investors.

All these observations convince me that Vimal is a talented empirical researcher with an excellent ability to extract meaningful information from large data sets. He is interested in understanding the determinants of investor behavior using micro data, which puts him at the intersection of empirical asset pricing and household finance. While Vimal is not comparable to the best students coming out of Harvard, I think he is as good as Harvard students I have advised who have placed in US finance departments outside the top ten, and leading finance departments in Europe and Asia. I strongly recommend him to any department looking for talent in this area that is not able to hire from the very top of the market.

Vimal's job market paper is an intriguing contribution to the literature on how experiences influence beliefs and financial decisions. Vimal cleverly isolates traumatic experiences with no implications for rational economic forecasting, namely natural disasters and mass shootings. These experiences have stronger local than national impact, so they create geographical variation in the exposure of investors.

Vimal starts by showing that these events alter subjective life expectancy. It is already known, as emphasized in a recent paper by Heimer, Myrseth, and Schoenle, that middle-aged people tend to underestimate their life expectancy while older people tend to overestimate it. Using data on over-50 individuals in the Health and Retirement Study, Vimal shows that the experience of disasters moderates life-expectancy optimism among optimists, but has no significant effect on pessimists.

Vimal next looks at the propensity of surveyed individuals to hold risky assets, and finds that the risky asset share also declines with exposure to natural disasters (consistent with findings already reported by Bharath and Cho), but – and this is an important new finding – only among life-expectancy optimists.

These two findings suggest that some individuals are more prone than others to alter their beliefs and behavior in response to traumatic experiences, and that life-expectancy optimism is a good proxy for such susceptibility. However, they do not show whether adjustments to subjective life expectancy are the mechanism that alters financial risktaking, or whether some other change in beliefs must be responsible. To get at this question, Vimal specifies and calibrates a lifecycle model that allows for irrational beliefs about both life expectancy and financial returns. In the model, beliefs about life expectancy affect risktaking indirectly by altering the accumulation of financial assets and hence the ratio of financial wealth to human capital. Vimal argues that such effects are unlikely to be responsible for the observed impact of disasters on risktaking, and hence that disasters must affect optimism about more than just life expectancy.

Vimal has also written two papers with Santosh Anagol and Tarun Ramadorai exploiting a quirk of the Indian stock market, under which certain applicants to participate in IPOs are either assigned shares or not as the result of a random lottery. Their first paper reports that lottery winners are much more likely to hold the IPO stock for many months afterwards than lottery losers are. This is unlikely to be merely the result of transactions costs that inhibit portfolio turnover, as the effect shows up even among investors who trade actively in the same industry as the IPO stock. Vimal, Santosh, and Tarun argue that this is an example of an endowment effect showing up in the field. I recently saw this paper presented at the NBER Behavioral Finance meeting, with a positive discussant and many interested comments. The second paper extends the analysis to look at trading behavior in other stocks, again finding profound effects that are surprising given the small scale of the original lottery shock.

In person, Vimal is extremely enthusiastic and responds quickly and effectively to comments. He is not a naturally gifted writer, and he has had to learn how to write a well crafted job market paper. However, he has made much progress in this area, has developed good oral presentation skills, and I have every expectation that he will be a productive researcher, a successful teacher, and a stimulating colleague in any department interested in the determinants of investor behavior.

Sincerely,



John Y. Campbell

Professor Peter Tufano
Peter Moores Dean

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Dear Recruitment Committee,

I am writing to strongly recommend Vimal Balasubramaniam for your consideration at your School. I have known Vimal for the last four years as his doctoral co-supervisor (with Tarun Ramadorai) as well as interacting with him as the Dean and a Professor of Finance at Oxford's Saïd Business School. Previously, I was on the faculty at Harvard Business School for 23 years, and was an active researcher in the household finance field, as well as the co-founder of the NBER Household Finance Working Group.

I would judge Vimal as among the best doctoral students whom I have supervised, reviewed, or hired at both Harvard and Oxford. This is strong praise, but warranted. I will briefly discuss his research, his likely teaching, and his personal characteristics, which suggest that he will be a tremendous addition to your faculty. My observations reflect both my vantage point as a researcher and teacher in his field as well as a Dean.

On the research front, Vimal is an extraordinarily well-trained, careful, tenacious, yet creative researcher. The three papers in his thesis all look at the various ways in which beliefs and preferences are shaped by experience. In each case, he (and in two cases, his coauthors) exploit novel natural experiments to tease out how experiences (winning the Indian IPO lottery, experiencing a natural disaster, experiencing a mass shooting) affect household preferences and decisions. While there is a long history on Bayesian updating and a more recent literature (well cited by Vimal) on impacts of events like the Depression on decision making, he makes real contributions to demonstrating the plasticity of preferences and beliefs.

All three of the papers in Vimal's thesis are all likely to be published in top finance and economics journals, and each has been accepted on major conferences already. In each, Vimal assembles unique databases, develops theoretical models to predict nuanced results, turns those models into rigorous tests to be able to reject alternative hypotheses, carefully interprets the data, and presents the results in a compelling way. We learn that the random act of winning or losing an Indian IPO lottery affects the propensity to continue to hold (or buy) not only the IPO stock, but of other stocks as well. This effect is widespread, but there are meaningful cross-sectional differences related to investor experience. This effect is economically substantial and long-lived.

My former colleague, fellow doctoral advisor, and Vimal's coauthor on two papers can speak in more detail about the two papers that they have written together and Vimal's contribution to these projects. I will spend more time

discussing Vimal's solo-authored job market paper, "The Effect of Subjective Life Expectancy on Financial Decisions."

To be clear, this entire project has been conceived and executed by Vimal himself. While Tarun and I provided support and guidance, the work itself reflects the imagination, creativity, careful framing, and solid empirical approach of this young scholar. Vimal investigated a number of different possible projects before pursuing this one. Rather than choosing an easier project, where data collection would be straightforward, he selected a research setting that would stretch him in many ways: he would have to secure access to proprietary US data, augment it with geo-coded additional information on natural disasters and mass shootings, and learn new methods to analyze the data. Neither of his supervisors was an expert in life expectancy, nor the specific factors he was studying, so he had to master the subject himself. He then had to frame, write up and present the project to make it accessible to a wide audience of scholars from household finance, or more broadly from finance or economics.

In my judgment, the work is excellent. Experiencing natural disasters or mass shootings makes people more pessimistic about their own life expectancy, largely by reducing the beliefs of lifespan optimists. These exogenous events reduce the share of equities and corporate bonds in the portfolios of lifespan optimists. The paper goes beyond these simple empirical results, and examines the channel though which the risky share might be affected by exposure to these shocks. Vimal develops a model in which individuals can be lifespan pessimists (have low estimates for their expected lifespan) or dispositional pessimists (also have low estimate for future returns). Predictions about the direction and magnitude of the reduction in the risky share, as well as the pattern as one nears retirement, are theoretically different for these different types. The empirical results are more consistent with the latter (e.g., Eeyores from Winnie the Pooh.) These are carefully crafted and nuanced tests, reflecting a mature thinker. While Vimal doesn't speculate on the broader implications of this work, it wouldn't be a large leap to begin to structure research on how events like the killings related to Black Lives Matter or the election of Donald Trump affect life expectancy predictions and other decisions.

While I have not seen Vimal teach in a classroom, I have observed his teaching skills in two other contexts. I have watched him develop as a seminar presenter and am impressed with the way that he quietly and confidently communicates his work, while carefully listening to his audience and engaging them. I have also seen him teach in small group settings, where he calmly and respectfully engages his students, and is very effective. I suspect that he will be a very effective and widely admired teacher.

I have been both a Department Chair in Finance and now a Dean. Individuals in these roles realize that when we select assistant professors, we are hiring a person and not a paper. While we have high promotion standards, we hope that the candidate will succeed and become the next generation of leaders for our field and our schools. In this forecasting, we look for evidence that the new hire will be able to independently produce high quality research. Vimal has amply demonstrated that. We look for evidence that the candidate will be able to handle the demands of teaching. As I report above, he is a promising teacher.

Going beyond teaching and research capabilities, we need to attract and retain young people who can build a stronger and more collaborative culture. These are young people who like to engage with others on ideas, but who are also engaging on a personal level. They are the builders who not only can produce papers and courses, but also make others better. I am confident that Vimal is one of these colleagues. In ten or fifteen years, he will have made strong research contributions, been acclaimed as an excellent teacher, and will sit at the core of community made stronger by his participation.

In some letters, this kind of statement is used to excuse less-than stellar performance on other dimensions. Please do not interpret my praise of his character in this way. When he will ultimately be evaluated for tenure on research, teaching and colleagueship dimensions, I think that he will be a triple threat.

I would judge that Vimal is comparable to the best doctoral students to emerge from Harvard in my time there, and is the best doctoral student whom I have come to know at Oxford. If he were to contemplate staying at Oxford (he is not), I would support hiring him. I believe that his research trajectory is strong. He would be an effective teacher in household finance, asset pricing, or behavioural finance, but could easily teach core finance topics. He will strengthen the research community of the institution lucky enough to hire him. In short, I strongly recommend Vimal for your School.

If you have any questions, please feel free to contact me.

Sincerely,



Professor Peter Tufano

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Santosh Anagol, Ph.D.
Assistant Professor

Dear Colleague:

I am pleased to offer this letter in support of Vimal Balasubraniam's application for a position at your institution. I have interacted with him actively over the past four years as an advisor and co-author on two completed working papers.

Vimal is keenly interested in household finance, asset pricing, and behavioral finance. Over the time that I have known him, Vimal has developed an impressive research toolkit including the ability to find interesting natural experiments to identify causal effects, as well as the theoretical skills to use sophisticated economic models to understand mechanisms. I think he would be an excellent addition to any department looking to hire in these areas.

Vimal's job market paper focuses on a fundamental prediction of the life-cycle model of portfolio choice: an agent's mortality expectations should influence household allocations to risky versus non-risky assets. Despite the theoretical importance of this relationship, we have, to date, almost no solid empirical evidence on the relationship between household mortality expectations and their risk-taking in savings. Establishing this relationship empirically is important for giving us a quantitative sense of the canonical life-cycle model of savings and investment. At a broad level, understanding this relationship is also extremely policy relevant, given the large scale improvements in lifespans we are observing in countries throughout the world.

Vimal's analysis begins by showing, in the raw data, a strong positive relationship between mortality expectation deviations (i.e. deviations in individual's beliefs about mortality from life-table predictions) and the share of household assets investment in risky-assets. This correlation suggests that mortality expectations are important for understanding risk-taking, and is nice prima facie evidence of this relationship. To establish causality, Vimal then carefully shows that experiencing a local natural disaster or mass-shooting causes households to lower their mortality expectations much more than would be suggested by Bayes rule alone. Strikingly, he also documents that experiencing the local shock reduces households' share of investments in risky assets. These results are interesting because they give us the first quantitative sense of the reduced-form relationship between mortality beliefs and risk-taking by households in a setting.

Vimal then sets up a life-cycle model of savings behavior to understand more clearly the potential theoretical mechanisms driving his empirical results. One possibility is that the local shock *only* affects risk-taking through households' mortality expectations. Yet, in a calibrated life-cycle model Vimal finds that if this were the only mechanism at play then we should expect only very marginal changes in risk-taking. On the one hand the reduced lifespan reduces savings for the future; however, conditional on lower savings the risky-share of assets marginally increases because the present value of income is lower. Overall, the empirical results are not consistent with mortality beliefs alone driving the relationship between the local shocks and risk-taking.

The second possibility is that experiencing these local shocks causes a broader pessimism, not just about mortality, but about prospects for the economy and risky asset returns as well. A model with this type of "dispositional" pessimism can deliver Vimal's empirical results. This is interesting because it points to previously unstudied interactions between mortality expectations, financial return expectations, and savings behavior. I believe that this type of interaction, which Vimal introduced in his job market paper, will be very influential. For example, this type of dispositional pessimism could be quite important in the context of the economic impacts of climate-change.

What impresses me most about Vimal's job market paper is the wide set of tools and ideas he brings to bear on the issue of mortality expectations and risk-taking in investment decisions. He first identifies a natural experiment that delivers exogenous variation in subjective mortality expectations, and carefully identifies their impact on mortality expectations and risk-taking. This part of the paper demonstrates the ability to do careful, modern econometrics with an excellent research design. Yet, as is often the case with design based empirical research, it can only take us so far regarding theoretical mechanisms. Vimal takes this challenge head on by using theoretical and calibration tools to explain the empirical results. Each part of the paper is strong on its own, but the combination makes a particularly compelling story.

Vimal has also two completed working papers, joint with Tarun and I, which we are very excited about. The first, "Endowment Effects in the Field…" exploits a unique institutional setting to test for endowment effects in a major market outside the laboratory. Due to regulatory requirements, companies going public in India must use lotteries to determine which applicants receive shares in the case when the IPO is over-subscribed. Winners of these lotteries are able to purchase the IPO stock at the issue price, while losers can purchase the stock when it lists on the market. Nevertheless, once the stock starts trading, standard economic theory predicts that both winners and losers should hold the stock at similar rates. Despite the ex-ante similarities of lottery winners and losers, we find that lottery winners are substantially more likely to own the stock for months beyond the lottery. The results provide the first evidence outside of the laboratory consistent with active, experienced traders demonstrating an endowment effect.

In “The Effects of Experience on Investor Behavior” we utilize the same research design to study how experiences in specific stocks spill over to trading behavior throughout the portfolio. We find that investors that win the IPO lottery, and experience a gain on the IPO stock, do not overall invest more money in the stock market, and are only marginally more likely to invest in future IPOs. The main change we observe in investor behavior is that winners are more likely to trade in their portfolios. The total value of trading, including purchases and sales, increases by seven percent amongst lottery winners, suggesting that positive performance in other securities may translate to greater trading volume overall.

Vimal has been instrumentally involved in every part of the research process regarding these papers. He was there at the very earliest stages, when we visited the companies that collect the data on IPO applications to inquire about getting data access to the lottery sample. He independently developed the skills to manage datasets of millions of investor portfolios. He has contributed fundamental ideas that have helped us to distinguish theoretical explanations for our results. For the endowment effects paper, he helped developed a series of theoretical models to explain our findings. Finally, he is an excellent communicator and has presented our joint work at multiple conferences. Overall, I view Vimal as a “more than equal” contributor to these projects, and I am greatly impressed with his overall output as a graduate student.

I recommend Vimal with enthusiasm, and I believe he will be a productive and energetic researcher. Please do not hesitate to get in touch with me if you have any questions.



Santosh Anagol

Assistant Professor, Business Economics and Public Policy, Wharton

Imperial College Business School

Imperial means Intelligent Business

November 2016

Dear Recruiting Committee,

I am very pleased to write this letter in support of Vimal Balasubramaniam's application for a position at your institution. Vimal is currently a PhD student in Financial Economics at Oxford, where I have interacted with him closely as his principal supervisor prior to and following my recent move to Imperial. I also have two current academic working papers co-authored with Vimal and Santosh Anagol at Wharton (who is also writing him a letter).

I should summarize my view of Vimal here before I go into more detail. He would be a great addition to any department with an interest in household finance, behavioural finance, and empirical asset pricing. He has an impressive set of research tools, including a keen eye for innovative causal identification strategies, as well as the ability to comprehend and use theoretical models to better understand the mechanisms driving empirical results. He also has significant prowess in using high-performance computing to tame and draw inferences from large datasets, a skill that is only going to become more important in the days to come. I forecast that he will be prolific and innovative in these areas, and I urge all departments searching in these areas to interview him.

Vimal's job market paper is a good demonstration of his skills. The paper is situated in the important and fast-growing area of the impact of personal experiences on economic decisions. Perhaps the best-known empirical work in this area is by Ulrike Malmendier and Stefan Nagel, on the effects of experiencing the Great Depression on household portfolio choice, and of the effect of historical inflation experiences on mortgage and liability choice.

A gap in this literature is that there are many possible channels through which experiences can affect financial decisions, with preferences (think risk aversion) being one obvious possibility, and beliefs (say about the distribution of future risky asset returns) being another, though there are possibly others as well. The literature would

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benefit from better identification of the precise mechanisms through which experience effects work.

Vimal focuses on the effect of experiences on agents' expectations about *their own lifespans*, and argues that this is a channel that hasn't been emphasized in the literature. Lifespan expectations are important, given that longevity risk is a significant issue for both pensions and insurance. If agents aren't calibrated appropriately about their lifespans, this potentially holds implications for the financial system through agents' decisions about savings for retirement, for example.

An important challenge is to credibly identify that experiences do indeed affect agent's subjective lifespan expectations. Vimal proceeds as follows: First, he searches for plausibly exogenous variation in experiences that could affect lifespan expectations, and picks natural disasters and mass shootings as two good candidates. Second, he links geographical variation in these experiences with the Health and Retirement Survey location identifiers. Third, he assesses the extent to which these experiences are correlated with deviations between agents' self-reported lifespans and "objective" lifespans which are computed by actuaries (lifetable estimates). He finds significant evidence that individuals substantially revise their lifespan expectations downwards in response to these experiences, in a way that is very difficult to explain using Bayes' rule. Finally, he conducts a number of useful robustness checks to convince us that the effect is really there. One important one is that when the sample is split into lifespan "optimists" (i.e., those who think that they will live longer than their lifetable estimates indicate), and lifespan "pessimists" (i.e., those who are convinced they will die earlier than lifetable estimates), experience effects manifest themselves only in the set of lifespan optimists, which seems very intuitively plausible.

Once Vimal identifies that agents "learn" about their lifespans from potentially life-changing experiences in an imperfectly rational fashion, he goes on to verify that these experiences also cause agents' share of risky assets to fall, thus linking back to his main question of the effects of experiences on agents' financial decision making.

The issue that Vimal then confronts is the precise channels through which the experience effects on the lifespan deviation (subjective-objective) could affect the risky share. He suggests two possibilities. The first is that the lifespan deviation is the only variable affected by the experience, meaning that agents believe that their terminal optimization date T has now been brought forward. He calls this mechanism "lifespan

pessimism," and he contrasts this with the possibility that agents become generally pessimistic after their brush with near-death experiences, i.e. "dispositional pessimism," which he models as affecting both *T* as well as by downwardly revising the expected return on the risky asset. He takes these two possibilities into a modified lifecycle portfolio choice model (Cocco, Gomes, Maenhout, 2005), and finds that dispositional pessimism is a far better fit with the empirical evidence. This evidence only becomes stronger when Vimal adds a bequest motive into the model.

Vimal's paper nicely showcases his set of skills. In the paper, he cleverly identifies exogenous variation which permits causal identification, uncovers a startling fact about human behaviour which has important implications for household finance, and then works hard to reconcile his empirical findings using a model. The finished product is interesting, plausible, and well-executed, and I suspect it will eventually do well, especially after additional feedback from the market.

It is also worth briefly discussing the other two papers in Vimal's packet. These are both with Santosh Anagol and myself, and we are very enthusiastic about this work. In both papers, we study a natural experiment in the Indian stock market, in which IPO stocks are randomly assigned to 1.5 million market participants. Standard economic models would predict rapid convergence in ownership between these groups, but in the first paper, "Endowment Effects in the Field…," we find that winners of these IPO lotteries rarely sell their randomly assigned stocks, while losers in the lotteries hardly ever buy them, despite initially applying in the same fashion as the winners. After considering a broad variety of other explanations, we conclude that the willingness to accept of winners is higher than the willingness to pay of losers, meaning that these results constitute the first large-scale non-laboratory evidence of experienced traders exhibiting an endowment effect.

The other paper, "The Effects of Experience on Investor…" uses the same natural experiment, and finds that lottery winners also behave very differently from losers following the random endowment of the IPO stock, in the other stocks in their portfolios. In particular, winners trade substantially more than losers, as well as tilting their portfolios towards the sector of the IPO stock, despite the fact that the endowment was completely random. We argue that it is difficult to conclude that stock investors rationally learn to trade, when a purely random shock can have such profound effects on their portfolios.

Vimal has been a full contributor to this research agenda. He has done so in a number of ways, including helping to work through and identify issues with several of the theoretical models developed in the endowment paper, developing new skills that the team has needed to conduct empirical work on what is clearly a "big data" problem, and helping in discussions with data providers. He has also presented the paper independently at a number of different conferences.

Overall, I think it would be well worth your while to speak with Vimal at the meetings. In addition to his significant research potential and his already impressive level of output, he's also a genuinely nice person who throws off a set of positive externalities, which would make him an excellent colleague.

Please don't hesitate to contact me if I can help to answer any further questions about Vimal or his work.

Best,



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