Research Statement 2019

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I am a macroeconomist with a general interest in markets with frictions, and my main focus is the intersection of macroeconomics, finance, and monetary policy. During my work so far, I developed an innovative approach that leverages insights from search-and-matching theory to understand the way monetary policy interacts with financial frictions to affect the real economy. In five years since joining Simon Fraser University as an assistant professor, I have established a productive research program that has resulted in seven publications in prestigious refereed outlets, and which has attracted funding from one of Canada’s three federal granting agencies. Since September 2014 when I started at SFU, I have presented my work 36 times at outside seminars, workshops, and conferences.

In this statement, I will first review my main line of research, which uses the New Monetarist paradigm [25] to gain new insights into asset liquidity and monetary policy. This is followed by my ongoing work in this area (page 3). Finally, I review my past and ongoing work in other areas (page 5): international trade and exchange rate determination, firm price setting under information frictions, individual decision making with an empirical application to speed dating, and an explanation for the famous “Elephant” pattern in the distribution of worldwide income growth.

Main line of research: asset liquidity and monetary policy

This line has three goals: to understand how characteristics of the financial economy shape the supply of liquidity; to describe how central banks can affect this supply by intervening in the financial sector through monetary policy or financial regulation; and to characterize the ways in which the supply of liquidity matters for the rest of the economy, such as firms and households.

The central theme of this work is the concept of indirect asset liquidity, which I developed jointly with Athanasios Geromichalos of UC Davis (first in “Monetary Policy, Asset Prices, and Liquidity in Over-the-Counter Markets” [10], then continued in [21]). In monetary theory, it is well-known that assets which serve as a medium of exchange can be priced for the liquidity services they provide, but only few assets are ever used as media of exchange. We showed that even an asset that was never used as a medium of exchange could be priced like one, indirectly, provided it could be exchanged for money easily enough. As a consequence, and in contrast to standard asset pricing theory, that assets are not only valued for their discounted dividend streams, but also for how easily they can be liquidated, and at what price. If such liquidation happens in frictional asset markets, then the market microstructure has a first-order effect on the substitutability between money and other assets, and on the broad supply of liquidity to the economy. In further papers, we refined the concept of indirect liquidity and applied it to
both classical and pressing macroeconomic questions: the preponderance of an upward sloping yield curve [14], the consequences of large-scale asset purchases (“quantitative easing”) of the kind pursued after the 2008 financial crisis [15], the implementation of monetary policy via intervention in frictional asset markets [18], the implications of competition for the supply of liquid assets [11], and the relationship between safety and liquidity of assets [13].

These papers proved that the indirect liquidity concept contained important insights for a plethora of problems in the theory of money and macro-finance. But one of my goals over the last few years has been to integrate these insights, and the modeling tools that yielded them, with macroeconomics in general. Thus, again together with Geromichalos, I developed a framework that integrates liquidity with the main workhorse of modern macroeconomics, the neoclassical growth model; hence, titled the “Liquidity-Augmented Model of Macroeconomic Aggregates” [12]. This model is tractable, flexible, easy to extend, and using the modeling style most familiar to the majority of macroeconomists. Crucially, monetary policy in the model is implemented in the empirically relevant way: via intervention in secondary markets for liquid asset. (This is how all central banks do it – but it is captured in very few macroeconomic models, none of which so far have found wide application because they are complex, hard to solve, and hard to extend.) Exploration of the framework is ongoing (see below), but it has already yielded insights into classic macroeconomic questions: the relationship between interest rates and inflation (the Fisher effect versus the liquidity effect), the relationship between interest rates, inflation, and investment (Friedman’s real balance channel versus Mundell’s and Tobin’s asset substitution channel), and the existence and persistence of a liquidity trap where interest rates are zero but inflation is positive [12].

One of the big contributions of the Liquidity-Augmented Model is to break the tight theoretical link between interest rates and inflation that has vexed economists for decades because it is anything but tight in the data. The key idea is to recognize that almost all real-world assets are liquid in at least some way. For example, assets that are commonly tradable or pledgeable as collateral are indirect substitutes to money – as shown in my papers above and in others – thus their prices reflect their moneyness as much as their dividends. (Especially so for the kinds of assets used to implement monetary policy.) But if the “interest rate” in a macroeconomic model does not just price a bond’s dividend, but its substitutability with money, the traditional equations governing this interest rate are simply wrong. In [19], I investigated this issue theoretically and empirically. On the theoretical side, I showed how the famous Euler equation – or its long-run counterpart, the Fisher equation – must fail in the data because it prices a bond that is short-term, perfectly safe, yet perfectly illiquid. Yet such a bond does not exist; real-world safe assets are highly liquid. Indeed, I estimate the return on a hypothetical illiquid bond and show that it behaves very differently from the return on safe and liquid assets. It turns out that this distinction helps resolve practically every puzzle ever associated with the Euler/Fisher equation, which constitutes powerful evidence supporting the Liquidity-Augmented approach.
Ongoing work on asset liquidity and monetary policy

Because the goal of paper [12] was to construct a model that was as simple and easily accessible to the macroeconomics community as possible, inevitably, many threads were left trailing. The purpose of one ongoing project (joint with Johannes Strobel of the University of Frankfurt) is to investigate them further. One thread connecting all my papers is that market frictions matter. This is true for goods and labour markets as much as it is true for secondary financial markets. In reality, agents do not trade by submitting general supply-demand schedules to an auctioneer; instead, they trade with other agents, generally in bilateral meetings, and often after spending time and effort to meet the right trading partner. But in order to gain tractability for [12], we abstracted away from many frictions (e.g., using the competitive pricing protocol in every market). In the ongoing project, we go back and re-introduce frictions into three key markets: the labour market, the retail goods market, and the secondary asset market. Each uses the canonical model of frictions for the respective market: the model of Diamond, Mortensen, & Pissarides for the labour market [31, 2]; the model of Burdett & Judd [3] for the retail goods market; and the model of Duffie et al. [8] for the asset market. The other contribution of this project, after constructing the richer model, is to estimate it as a medium-scale dynamic stochastic general-equilibrium model. Our goal is to compare the performance of the enriched LAMMA with state-of-the-art business cycle models based on the New-Keynesian and Real-Business-Cycle paradigms, quantify the importance of the various market frictions and shocks, and draw out the possible implications for the optimal conduct of monetary policy in practice.

My second big ongoing project is concerned with the same themes – the optimal conduct of monetary policy in an economy with realistic frictions – but breaks new methodological ground. Jointly with my current PhD advisee Zijian Wang (who started at SFU and is now at the University of Western Ontario, where I have continued advising him), I have been building a computational model of liquidity in the macroeconomy, and analyzing it using simulation methods. Thus, while the model shares much with the models discussed above in terms of timing, shocks, and sets of assets, the methodological approach is new. Our computational model is a hybrid of explicit optimization, a machine learning algorithm to discover ‘good’ decision making in cases where ‘perfect’ decisions are unattainable, and an agent-based simulation. No other paper in recent monetary theory has made use of agent-based simulation and machine learning, although there is some related computational work with heterogeneous agents [30, 6, 33, 24]. These papers stick to the ‘standard’ solution method of rational-expectations equilibrium, in which agents have common knowledge of the structure of the economy and the distribution of any possible shocks. This limits the real-world applicability of the model, where not all agents are fully rational, many shocks are unforeseen, and nobody knows the structure of the economy exactly. Fortunately, the tools available to model beliefs and learning in a realistic yet computationally feasible way have evolved considerably in recent years.
[32, 23, 28, 1, 35], and given the potential these methods have for expanding the set of questions we can study (among them financial fragility, errors or delays in decision making, heterogeneity in knowledge), this is fertile ground for research. Finally, with a decision-making algorithm that is capable of learning, researchers can ask how an economy would respond to a completely unanticipated change, something no other type of model can answer.

My third ongoing project applies the insights developed in my work to cryptoassets such as Bitcoin and Ether. The explosion of interest and trade in cryptoassets in recent years, together with a host of open questions, have turned this into an important field of research that is closely watched by central banks [4]. Cryptoassets are often marketed as “digital currencies”, because like traditional paper currency, they have zero dividends and derive their value purely from the fact that they can be resold later. Somewhat ironically, however, given that Bitcoin in particular was invented as a way to make payments without relying on a trusted third party, cryptoassets are now heavily intermediated by third-party platforms, exchanges, and derivatives markets. As Investopedia correctly observes, “institutional finance…at this point is as much a part of Bitcoin as regular users are.” Furthermore, in two important ways cryptoassets are very different from traditional currencies. First, most cryptoassets are held by ‘investors’ for speculative purchases rather than by prospective retail buyers for payments [4]. (Despite this, most of the recent research in monetary theory on cryptoassets focuses on their role as currencies, competing with fiat money as means of payment [9, 5, 34, 7].) The second striking feature is the amazing volatility of cryptoasset prices, exceeding even the volatility of stock markets. This fact has led many economists to conclude that “the volatile price of cryptoassets makes them a very poor means of payment” [4].

I propose that the indirect liquidity concept developed in [10, 21] resolves this puzzle: one does not need to hold an asset for any length of time in order to use it as a medium of exchange, as long as the asset is easily turned into another via trade in financial markets. Indeed, this is exactly what happens with most cryptoassets! If both parties in a Bitcoin retail transaction are connected to an exchange, neither of them needs to hold the Bitcoin for longer than an hour; thus, neither of them is exposed to Bitcoin price volatility. This establishes the missing link between monetary theory (which emphasizes the medium of exchange role) and the facts of how cryptoassets are actually used in the world. What remains, of course, is to flesh out this simple story, formalize it, and use the formal model to answer the big questions surrounding cryptoassets and payments. How much volatility is too much? Is Bitcoin’s value assured in the long run, or is there a chance of collapse? Is it important to know what proportion of trades will be settled in cryptoassets versus fiat, in the long run, as [29] emphasizes, or is that irrelevant? What can and should central banks do about it?

Due to the broad scope of these three projects, I expect them to form the cornerstones of my research agenda over the next decade, each yielding multiple papers as I explore their most promising extensions and variations.
Other areas of research: information and trading frictions

All my work to date has been connected by a common thread: the effects of market frictions (impediments to trade and/or information) on economic decisions and outcomes. My earliest project explored this in the context of international macroeconomics. In [16], I developed a model of international trade in goods that was subject to search frictions, specifically the noisy-search model by Burdett and Judd [3]. Search frictions give firms market power, but consumers can mitigate this market power by spending more effort on search. I show that consumers will do more of this the higher the inflation rate is. Thus, through its choice of an inflation rate, monetary policy can manipulate goods market outcomes, and in a way that affects other countries in addition to one’s own. Thus, while the benefits of higher inflation accrue just to the central bank causing it (more inflation tax revenue), the costs are borne both by domestic agents and by foreign exporters. As a result, inflation is a beggar-thy-neighbour policy; if chosen strategically by a central bank that does not coordinate with its neighbours, it will tend to be higher than socially optimal.

Two more of my papers focus more on individual decision making under search and information frictions, and could thus be considered to fall somewhere in between microeconomics and macroeconomics. In “Instability of Endogenous Price Dispersion Equilibria: A Simulation” [17], I asked how a finite number of price-setters would act in a competitive environment where no pure strategy solutions exist, and which is therefore almost always analyzed in terms of a continuum of price-setters. I approached this question by simulating the environment using a variety of myopic price improvement rules that competitors may use, and found that as the number of competitors becomes large, the average outcome of the simulation begins to resemble the continuum benchmark for some rules, but not for others. And in “Smart-Dating in Speed-Dating” (an international collaboration with Xiaoyu Xia, Paul Eastwick, and Chin-Ming Hui; [22]), we studied how preferences inform matching decisions and outcomes in the controlled environment of speed-dating. We constructed a new search model where people’s preferences are part-consensus and part-subjective, and people could choose to reject or match with potential partners subject to a capacity constraint. We then estimated the model using data from a speed-dating study, using both directly stated preferences over potential partners as well as preferences inferred by fitting our model to people’s eventual decisions. The two methods agreed on the results: participants disagree wildly on which partners are worth matching with (a third or less of attraction is “vertical”, the rest is “horizontal”), but people are more likely to like someone subjectively who also likes them back. The estimated model fits extremely well; a simulation reveals that even the variation in the data is almost fully consistent with sampling variation. We take this as consistent with the hypothesis that participants in the study had a sophisticated understanding of the environment, of their own status, and of other participants’ decision rules, and were making their own decisions accordingly.
And the one project that does not fit neatly

Finally, I am excited to talk about my one project so far [20] that does not involve search-and-matching, or even market frictions broadly considered. The idea for this project came to me in early 2019, when I was reviewing lecture notes for my intermediate macroeconomics course (Econ 305); specifically, the famous “Elephant curve” of global income growth.

In the last few decades, worldwide incomes have grown enormously. But how has this growth been distributed? According to data collected for 1988-2008, the percentiles in the middle and at the top of the world income distribution have grown the fastest, while percentiles at the bottom and around 80 (the global upper middle class) have stagnated [26, 27]. This striking pattern was dubbed the “Elephant curve” and, in media coverage, commonly interpreted as follows: globalization has redistributed incomes from all but the richest people in rich countries towards the fast-growing middle classes in emerging economies, especially China, and this pattern of global redistribution may explain populist resentment in rich countries.

However, I propose that a simpler, statistical, explanation may be behind the Elephant pattern: random growth affecting individuals whose initial incomes follow a bimodal distribution. If we add a third force, modest convergence (average income growth is highest for people near the bottom of the global distribution and lowest for people near the top), then the simulated growth incidence curve is almost exactly the same as the one observed in the data. Thus, while this exercise alone cannot be conclusive proof of what happened – for that, one would need data that so far simply does not exist – it does suggest a hypothesis that should be investigated carefully. The Elephant curve might be a statistical artifact of a historically unique situation: a bimodal world income distribution in the 1980s, followed by convergent but very noisy growth.

References


