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SUBMISSION TO THE FINANCIAL SYSTEM INQUIRY

The goal of this Submission is to recommend the introduction of *evidence-based regulation* of the Australian financial system. The evidence-based approach is to be contrasted with the model-based tradition of financial regulation, the predominant approach to financial regulation at present.

Model-based financial regulation

In a model-based approach, the regulator designs rules based on a stylised representation of reality. The model is constructed from basic principles (axioms) about how a financial system works (for example, absence of arbitrage, risk aversion, selfish reaction to incentives) and rules are designed to obtain certain goals in a way that is consistent with the model. Many past regulatory initiatives in Australia – and elsewhere – were model-based. We provide three recent examples.

Example 1. Extension of the choice set of investment options for superannuation accounts. Over the past few years, superannuation funds in Australia have significantly extended the set of investment options available to their members. Extension of the choice set of investment options in superannuation accounts is thought to improve welfare because individuals can better tailor outcomes to their personal situation. The evidence, however, suggests that a greater number of investment options available is associated with lower participation rates (Sethi-Iyengar, Huberman, & Jiang, 2004). Moreover, an increase in the number of investment options is related to a reduction in participation in the equity market, with potentially detrimental impacts on long-term welfare (Botti & Iyengar, 2006; Iyengar & Kamenica, 2010).

Example 2. Policy initiatives to reduce the extent and prevalence of pathological gambling. One of the tenets of mainstream economic theory is that an increase in the price of a good will lead to a reduction of its consumption. Evidence shows, however, that increases in the price of gambles in electronic gaming machines in Australia led to an increase in consumption (Productivity Commission, 1999; Wooley, Livingstone, Harrigan, & Rintoul, forthcoming), suggesting that the demand of gambling is insensitive to price changes. More recently, public policy measures have been implemented to reduce the extent of pathological gambling that are based on behavioural extensions of mainstream economic theory. These measures are based on the concept of self-commitment. Gamblers are provided with a technology that allows them limit the amount of spending in a given time period. Evidence, however, suggests that

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participation rates in pre-commitment systems and use of their features are very low (Productivity Commission, 2010).

Example 3. Centralisation of trading in financial markets. A third example is the recent tendency of regulators across the world to eliminate trade in over-the-counter financial markets (Dodd-Frank Act, MiFID II). This policy is based on the assumption that exchange can be efficient only if everyone trades through a centralised system where all participants can see orders and transaction prices. Yet evidence from controlled experiments shows that this assumption is wrong (Sunder, 1992). Worse, experimentation has also shown that centralised markets reduce incentives for participants to spend effort to collect and verify information about the quality of the securities traded (Asparouhova & Bossaerts, 2013). Everyone trades passively, and prices become increasingly meaningless.

Inadequate retirement savings, pathological gambling and inefficient financial markets are just three examples of major economic, financial, social and political problems Australia is facing, with major public and private costs associated with them, and we are lacking efficacious interventions to address these problems. This is in part due to a significant mismatch between the mainstream economic model and empirical evidence, suggesting that our knowledge of the problems and their underlying causes are incomplete.

Returning to the example of retirement savings, evidence suggests that behaviour differs significantly between individuals. For example, there is enormous cross-sectional variation in accumulated wealth at retirement age, even among those with relatively similar estimated lifetime incomes (Bernheim, Skinner, & Weinberg, 2001; Browning & Lusardi, 1996), which cannot be explained by mainstream economic models. Standard economic models assume that individuals save money to smooth consumption over the life cycle, for precautionary reasons or to make a bequest. These models account for variation in savings behaviour between individuals with heterogeneity in preferences (Browning & Lusardi, 1996). Heterogeneity in preferences (Barsky, Juster, Kimball, & Shapiro, 1997; Harrison, Lau, & Williams, 2002), however, can only partly explain savings behaviour (Bernheim et al., 2001). Other sources of variation appear to be socio-economic (Venti & Wise, 1998) and psychological factors, such as the capacity for planning and cognitive ability (Ameriks, Caplin, & Leahy, 2003), will-power and self-control (Thaler & Shefrin, 1981), cognitive biases (Benartzi & Thaler, 2007) and financial illiteracy (Lusardi & Mitchell, 2011). Moreover, the negative consequences of an increase in the number of choice options in retirement savings accounts has recently been linked to basic properties of the human neural system (Webb, Glimcher, & Louie, 2014). The variety of explanations already suggests that a great number of inter-related factors from different domains seem to be affecting savings behaviour, many of which are not taken into account by the mainstream economic model. Importantly, many of the factors that seem to be contributing to the variation in savings behaviour are being studied separately by academic disciplines other than economics.

A similar picture emerges from evidence on pathological gambling. A large part of gambling losses are incurred by a very small number of heavy players, so-called *problem gamblers* (Productivity Commission, 2010). Many heavy gamblers meet diagnostic criteria for *gambling disorder*, a psychiatric disorder, although only a small fraction seek treatment (Productivity Commission,

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2010). Evidence from the US suggests that about the vast majority of people with gambling disorder suffer from at least one other psychiatric disorder, mostly depression and anxiety, a personality disorder or substance-use disorder (Kessler et al., 2008). Crucially, in most of those cases, the other psychiatric disorder(s) was diagnosed before gambling (Kessler et al., 2008). This and other data suggests that there is a close relation between problem gambling and other psychiatric disorders. However, to date major policy measures have been based on the mainstream economic model or slight variations which do not take into account the medical aspects of problem gambling. These policy measures, such as price increases of gambles and self-commitment technology (Productivity Commission, 2010; Wooley et al., forthcoming), have failed to contain problem gambling. At the same time, there is emerging evidence that gambling is sometimes attenuated by pharmacological interventions (Grant, Kim, & Hartman, 2008; Grant, Kim, & Odlaug, 2007; Kim & Grant, 2001; Kim, Grant, Adson, & Shin, 2001; Modesto-Lowe & Van Kirk, 2002; van Holst, van den Brink, Veltman, & Goudriaan, 2010) – including medication used for treatment of attention-deficit hyperactivity disorder as well as depression and anxiety – as well as by neuro-cognitive training (Field & Eastwood, 2005; van Holst et al., 2010), suggesting, if anything, the need for a more comprehensive approach to research and public policy, taking into account the full nature of problem gambling.

In our opinion, financial regulation today is too much based on the premise that the knowledge (of how to do things right) already exists, and that existing knowledge is sufficient to effectively develop efficacious solutions to society's financial challenges. In fields such as medicine and aerospace engineering, such a presumption that all is already known does not exist. These fields start with acknowledging the complexity of the problems being addressed, the incompleteness of existing knowledge as well as the fact that there are many bright ideas out there, but that one needs the right incentive structure for them to be brought forward, and the infrastructure to ensure that ideas are tested properly before being implemented widely – because many ideas will turn out to have unpredicted and unintended consequences. In the case of, say, algorithmic trading, it is doubtful that solutions already exist to contain any issues it may cause. As a matter of fact, hardly any controlled experimentation has been done with robots in markets; all our knowledge is based from observation of field markets. Yet, these markets are too complex to even come to a beginning of understanding of the impact of algorithmic trading.

To summarise, we do not have an accurate model of financial behaviour, neither at the level of the individual nor at the level of markets, as indicated by the three examples above. We draw two important conclusions: (1) the current economic model does not capture the large variation observed in behaviour and markets at least some of which seems to be driven by factors hitherto only studied by disciplines other than economics; and (2) we do not currently have a good understanding of *causal* relations between the various factors that have been identified, and financial behaviour or market outcomes. The former suggests an urgent need for a more comprehensive model of financial behaviour and markets, whereas the latter suggests the need for greater use of experimental techniques in research on financial behaviour and markets as well as in the design and testing of interventions. Both are necessary for effective development of more efficacious public policy.

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Evidence-based financial regulation

Based on the considerations above, we advocate the use of evidence-based regulation. This means that one starts from an analysis of data from the field. If not available, controlled experimentation is used to generate data. The data will allow the decision maker to formulate the right hypotheses, which can then be tested with controlled experiments – either in the laboratory or in the field. This approach is widely used in other fields.

A good, recent example against which financial industry regulation can be put into perspective is regulation of private drones (so called *unmanned aircraft systems*). Drones are flying robots steered by humans. The analogy in financial markets is algorithmic trading. The U.S. Federal Aviation Authority (FAA) has recently decided to formulate rules of engagement for drones. For lack of a working model of interaction of drones, the FAA decided to first collect data, based on controlled experiments in a number of test sites, which can be regarded as laboratories (see http://www.faa.gov/about/initiatives/uas/ for a description of the testing program). The aim is to gather valuable information before even starting to determine what the right questions are that one can ask. Contrast this to regulation of algorithmic trading in financial markets. There is no systematic initiative to collect data about how robots (algorithmic traders) interact with humans in financial markets. The general prediction is that in a number of years, 100 per cent of trade will be done by robots. It is unclear what this prediction is based on – except maybe on a model of robots as emulating the rational agents of traditional financial economics. (This ignores of course the obvious fact that it is humans that ultimately code the robots and switch them on and off.) Only recently have finance researchers (among others at The University of Melbourne) begun to study robot-human interaction in financial markets in a controlled setting, a necessary step towards better policy regulation, and an approach that parallels the one in areas such as drone regulation.

Another example is the regulation of treatments and medication in the health sector. In Australia, medicines and medical devices are regulated by the Therapeutic Goods Administration (TGA), which is part of the Department of Health. Regulated goods include products like sunscreen through to prescription medicines, vaccines and implants. Essentially, every product that claims to have therapeutic effects must be registered with the TGA before it can be marketed in Australia. Regulation includes both pre-market assessments as well as post-market monitoring and enforcement of standards. An important part of the approval process of new therapeutic goods is the mandatory use of clinical trials to test these goods for quality, safety and efficacy. These trials have to adhere to a set of highly regulated protocols and procedures, outlined in the *Australian Clinical Trial Handbook* issued by the TGA (Therapeutic Goods Administration, 2006). The documentation of a clinical trial needs to include, among others, a summary of known and potential risks and benefits of the good to be approved; a description and justification for the route of administration, dosage, dosage regiment and treatment periods; a description of the population to be studied; trial design; selection of trial participants; description of treatment; an assessment of efficacy; an assessment of safety; and a description of statistical procedures used in data analysis. Importantly, every clinical trial needs to be registered with the TGA and approved by a human ethics committee. Moreover, all investigators in and sponsors of the clinical trial must be disclosed. Clinical trials, by assessing benefits and risks of medicines and medical devices, are an absolutely integral part of the regulation of the health sector.

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Regulation of medications, through the use of clinical trials and other scientific procedures, has a long-standing tradition in the evidence-based approach, with the aim to protect patient welfare. Regulators of financial markets do not rely on similar procedures. And yet the problems regulators of the health system on the one hand and the financial system on the other, face have many commonalities. Just like we do not understand financial behaviour and markets in depth, the precise workings of medicines is often poorly understood. If there are any models of medicines, they are incomplete, just like our models of financial behaviour and markets. Fundamental research based on controlled experimentation is used to improve models of diseases and their treatments and randomised controlled trials are used to test interventions before they are deployed. In finance, however, controlled experimentation is unfortunately still in its infancy (for examples of such research see Bossaerts, 2004, 2009a, 2009b).

A concrete example is retirement savings. Recent evidence has shown that Australian retirement savings are inadequate (for example, Burnett, Davis, Murawski, Wilkins, & Wilkinson, 2013, 2014). But why? To answer this question, an extensive analysis of the available data needs to be implemented. It could be that the savings rate is too low, for instance, but it could also be that investment quality is low – which would raise the issue of whether the financial industry has the right incentives or whether the individual is to be blamed. Only extensive data gathering can resolve these issues and provide a basis on which to begin building improved policy. Research is needed that determines the *causal* factors behind inadequate retirement savings.

Curiously, academic finance has paid little attention to adequacy of retirement savings. When studying investment quality, academic finance focuses on a model of consumption smoothing, which is inappropriate to study retirement savings. The reason why the consumption-smoothing model is popular in academic finance is that one is interested in explaining the historical evolution of prices of securities in the aggregate, and in particular the equity premium (the difference in return of risky securities relative to government obligations). Policy makers, unfortunately, have different problems to worry about. As such, academic finance appears to not be problem-focused, but instead pays attention to issues that have traditionally occupied them. It is not that academic finance does not have the tools. Instead, the tools are applied to issues that are of little relevance to the regulator.

Another concrete example is regulation of over-the-counter markets. As mentioned before, regulators (in particular in the European Union, but also in the U.S.) may have jumped too quickly to the conclusion that all trade should be moved to centralised trading platforms (see for example http://europa.eu/rapid/press-release_MEMO-14-15_en.htm). This could have serious consequences for the quality of pricing, because centralised exchanges do not provide sufficient incentives for participants to certify security valuation. Even commodities trading, hitherto mainly done through over-the-counter markets, is slowly but surely shifting to centralised exchanges such as the Intercontinental Exchange. Controlled experimentation should tell us when, how and why over-the-counter markets would be preferred over centralised exchange. There is an opportunity here for the country that does regulation right. If indeed over-the-counter markets provide huge value added, the one country that is bold enough to continue to allow them under the right conditions, against 'common sense,' will benefit hugely.

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Recommendations

Based on the considerations above, we recommend the establishment of formal protocols and institutions to guide welfare-enhancing innovation in the financial industry that take their inspiration from policy making in other fields such as medicine and aerospace engineering. Specifically, we advocate the use of randomised controlled trials to ensure that regulation stands up to the standards of rigorous scientific testing, analogous to clinical trials in medicine. Approval of any new financial product in Australia would be based on an evaluation of benefits and risks of the product, which would be assessed using mandatory, randomised controlled trials. These trials should be conducted at similar levels of rigour and transparency as trials in other fields such as the ones mentioned above, and should be governed by a standard framework similar to the framework described in the *Australian Clinical Trial Handbook* for clinical trials in medicine. Approved products would be registered in a central register, which would also hold trial data, both of which would be accessible to the public. Following initial approval of the product, ongoing monitoring would be conducted that can respond to any re-evaluations of the product's benefits and risks as new information becomes available, for example from trials of other products.

Administration of randomised controlled trials and, more generally, product approval and monitoring could be conducted by an existing regulatory entity, in particular the Australian Securities and Investment Commission (ASIC), or a new entity set up to administer this particular aspect of financial regulation, similar to the TGA in health.

In addition, we recommend the encouragement and stimulation of fundamental research based on experimentation to identify causal factors underlying financial behaviour and market outcomes. Experimental research has already significantly improved our understanding of individual financial behaviour as well as of financial markets over the past few years, often in unexpected ways (for reviews of such research see for example Bossaerts, 2009a, 2009b). We believe that such research is critical for the development of comprehensive models of financial behaviour and markets. Moreover, such knowledge would not only support the design of interventions and regulation more generally; it would also enable greater financial innovation in Australia and strengthen Australia's financial system.

There is one major difference between the financial industry and other industries, however, such as health and aerospace engineering, in relation to the protection of intellectual property. Ideas in finance are hard to patent, and as such one cannot hope for the financial industry to take on itself the expense to do the requisite science to ensure that new ideas are implemented correctly. Instead, we envisage protocol that works more like the defence industry in the USA. The proposal is for the regulator to collect ideas and auction off research and development of those ideas to the lowest bidder, with the understanding that, once proven right, others can implement the idea too – albeit at a disadvantage because the financial company that tested the idea has first-mover advantage. Costs could be recuperated through usual licensing charges and fees. As a matter of fact, prominent economists working on improving the intellectual property rights system as we know it have been advocating exactly such a procedure (for example, Grootendorst, Hollis, Levine, Pogge, & Edwards, 2011).

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Financial innovation and more effective regulation increase the effectiveness of the financial sector and improve productivity growth, and we believe that our suggestions would help achieve those aims.

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