6 The HILDA survey: What’s in it for finance researchers and practitioners?
ROGER WILKINS

Papers from the Melbourne Money & Finance Conference 2016: Fintech and financial innovation

15 The rise of fintech opportunities and challenges
IAN POLLARI F Fin

22 150 years of fintech: An evolutionary analysis
DOUGLAS W ARNER, JÁNOS BARBERIS and ROSS P BUCKLEY

30 Distributed ledger technology in securities clearing and settlement: Some issues
MARK MANNING, MAXWELL SUTTON and JUSTIN ZHU

37 Peer-to-peer lending: Structures, risks and regulation
KEVIN DAVIS SF Fin and JACOB MURPHY

45 The paradigm shift in consumer credit data
STEVE JOHNSON and LISA SCHUTZ

52 Prediction markets on crowdsourcing platforms: Potential gains for corporate governance and current case studies
KARL MATTINGLY and ANNE-LOUISE PONSObY
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Caroline Falshaw A Fin
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The HILDA survey: What’s in it for finance researchers and practitioners?
ROGER WILKINS
The HILDA Survey is a nationally representative longitudinal study of Australian households, which provides household wealth and other financial data. It represents a rich resource for empirical household finance researchers and many empirical studies in recent years have used the HILDA wealth data to examine household financial decision making and outcomes. However, there remain significant unexploited opportunities to use this longitudinal data to explore the causal pathways to wealth accumulation.

15
The rise of fintech opportunities and challenges
IAN POLLARI F Fin
Financial technology (fintech) is experiencing rapid growth internationally. This paper examines the key drivers of the growth of fintech, its role in redefining the financial services industry, and the likely impact on industry business models. The paper also analyses the trends in fintech investment in global and regional markets and Australia’s alternative finance market, and highlights a series of strategic challenges and opportunities for incumbent financial institutions.

22
150 years of fintech:
An evolutionary analysis
DOUGLAS W ARNER, JÁNOS BARBERIS and ROSS P BUCKLEY
Now in its third major era, the fintech sector is attracting growing interest from regulators as it evolves, both in developed markets and developing countries. The regulatory challenge lies in resolving the tension between a forward-looking framework that promotes innovation, and a sufficiently rigorous framework that maintains market confidence. We argue that more experimentation and innovation in regulatory approaches is needed, and that it is too early yet to seek international regulatory harmonisation in this space.

30
Distributed ledger technology in securities clearing and settlement: Some issues
MARK MANNING, MAXWELL SUTTON and JUSTIN ZHU
This paper explores the potential role of distributed ledger technology (DLT) in securities markets, using the equity market as an example. The paper discusses potential benefits and costs, drawing out limitations and challenges in the adoption of the new technology, as well as regulatory considerations. Despite the heightened interest in DLT, the paper concludes that the likely path is incremental adoption of the technology rather than wholesale replacement of the existing infrastructure.

37
Peer-to-peer lending: Structures, risks and regulation
KEVIN DAVIS SF Fin and JACOB MURPHY
In this paper we outline the key characteristics of peer-to-peer (P2P) lending, the risks involved and alternative approaches to regulating P2P platforms. We argue that P2P lending is an example of how modern technology enables the integration of a range of economic functions, including market operator, financial services provider and credit broker. This removes the basis for separate legislative treatment of financial products and credit, and existing regulatory distinctions between different types of financial service providers. Arguably, a new approach to market regulation is warranted which is more consistent with emerging institutional arrangements.
The paradigm shift in consumer credit data
STEVE JOHNSON and LISA SCHUTZ
In Australia, National Consumer Credit Protection (NCCP) and Consumer Credit Reporting (CCR) legislation have attempted to ensure better use of credit data in the financial services industry, and address the issues of willingness and capacity. However, the legislation has not solved the problems identified without unintended consequences. This paper examines the challenges involved in managing the market for credit data. It proposes a new approach to data access and usage and a regulatory mandate which combines aspects of prudential, consumer and privacy regulation.

Prediction markets on crowdsourcing platforms: Potential gains for corporate governance and current case studies
KARL MATTINGLY and ANNE-LOUISE PONSOBY
Crowdsourcing platforms can enhance an organisation’s management decisions and governance, by harnessing the ‘wisdom of the crowds’. Prediction markets go one step further: to also provide an iterative summary signal of the crowd estimate back to participants. Evidence is accumulating that prediction markets can perform better than opinion experts, management consultants and surveys under specific conditions. Multinational and other companies are currently using prediction markets predominantly for improved information delivery, and adopting reward structures to induce informed participation by employees.
The third issue of JASSA for 2016 opens with a discussion of the importance of the HILDA Survey for finance professionals and empirical finance researchers. In an invited paper Roger Wilkins explains that the Household, Income and Labour Dynamics in Australia Survey, which is a study of individuals’ and households’ economic wellbeing, collects detailed information on household wealth every four years, creating Australia’s only nationally representative longitudinal household wealth data. Wilkins notes that many studies have used the HILDA wealth data in recent years as finance researchers have increasingly turned their attention to empirical analysis of household financial decision making and outcomes. He suggests, however, that many unexploited opportunities remain, and this will likely increase in coming years as the length of the HILDA panel grows.

With financial technology (fintech) experiencing rapid growth internationally, this issue of the journal also includes a special section containing papers from the July 2016 Melbourne Money and Finance Conference, which focused on fintech and financial innovation. These papers examine the critical strategic and policy implications of financial technology for the financial services industry. The conference was organised by the Australian Centre for Financial Studies and was sponsored by the Reserve Bank of Australia and the Australian Prudential Regulation Authority. While not subject to the usual double-blind process, each of these papers was considered by a member of the Editorial Board and by me prior to publication.

The first paper in this special section, by Ian Pollari F Fin, analyses the key trends in fintech investment in global and regional markets and Australia’s alternative finance market, and highlights a series of strategic challenges and opportunities for incumbent financial institutions. Pollari believes the financial services industry of the future will look very different, with the landscape likely to be more competitive, more efficient and provide more customer choice. He suggests that large multi-national technology giants may pose the biggest threat in terms of disruption to the financial services industry, given their dominant market positions (and user bases), access to data, strong brands, low-cost operations and platform-based business models. He also observes that the institutions that will thrive in this environment are those that are constantly striving to understand, influence and react to the transformational forces impacting the industry, and possess the ability to quickly make strategic corrections along the way.

Next, the paper by Douglas W Arner, János Barberis and Ross P Buckley provides an evolutionary analysis of 150 years of fintech. The authors note that the critical difference in the current fintech era is that in many markets, there has been a shift in the customer mindset as to who has the resources and legitimacy to provide financial services, combined with an entirely new speed of evolution, particularly in emerging markets. They note that, now in its third major era, the fintech sector is attracting growing interest from regulators as it evolves, both in developed markets and developing countries. They argue that more experimentation and innovation in regulatory approaches is needed, and that it is too early yet to seek international regulatory harmonisation in this space.

The paper by Mark Manning, Maxwell Sutton and Justin Zhu explores the potential role of distributed ledger technology (DLT) in securities markets, using the equity market as an example. The paper discusses potential benefits and costs, highlighting the limitations and challenges in the adoption of the new technology, as well as regulatory considerations. The authors’ assessment is that despite the heightened interest in DLT, the likely path is incremental adoption of the technology rather than wholesale replacement of the existing infrastructure. They argue that there are many challenges in the transition to its large-scale adoption, including the difficulty of unravelling the existing structure and firmly embedded business processes. However, economic incentives, including those arising from back-office savings and capital reduction, could nevertheless accelerate some aspects of the transition.
I have co-authored a paper with Jacob Murphy that outlines the key characteristics of peer-to-peer (P2P) lending, the risks involved and alternative approaches to regulating P2P platforms. We indicate that P2P lending is an example of how modern technology enables the integration of a range of economic functions, including market operator, financial services provider and credit broker. Additionally, we suggest that this removes the basis for separate legislative treatment of financial products and credit, and existing regulatory distinctions between different types of financial service providers. As a result, we argue that a new approach to market regulation is warranted which is more consistent with emerging institutional arrangements.

Turning to the paradigm shift underway in credit data, Steve Johnson and Lisa Schutz examine the challenges involved in managing this market. Johnson and Schutz note that in Australia, National Consumer Credit Protection (NCCP) and Consumer Credit Reporting (CCR) legislation have attempted to ensure better use of credit data in the financial services industry, and address the issues of willingness and capacity. They argue, however, that black letter law solutions haven’t been as successful as originally anticipated. They propose, instead, a new approach to data access and usage, and a regulatory mandate, which combines aspects of prudential, consumer and privacy regulation.

Finally, Karl Mattingly and Anne-Louise Ponsoby take a look at prediction markets on crowdsourcing platforms and the potential gains for corporate governance. Mattingly and Ponsoby suggest that crowdsourcing platforms can enhance an organisation’s management decisions and governance, by harnessing the ‘wisdom of the crowds’, but prediction markets can go one step further: also providing an iterative summary signal of the crowd estimate back to participants. They argue that evidence is accumulating that prediction markets can perform better than opinion experts, management consultants and surveys under specific conditions. They note that multinational and other companies are already using prediction markets, predominantly for improved information delivery to senior executives charged with corporate decision making, but their potential role in business is likely to grow.

As always, we encourage practitioners and researchers with interesting insights and analysis on important applied finance issues to contact us at membership@finsia.com about contributing to the journal. We would also be keen to hear from readers interested in providing a formal response to any of the papers we publish in the journal.
THE HILDA SURVEY: 
What’s in it for finance researchers and practitioners?

ROGER WILKINS, Professor, Melbourne Institute for Applied Economic and Social Research, University of Melbourne

The HILDA Survey is a nationally representative longitudinal study of Australian households, which provides household wealth and other financial data. It represents a rich resource for empirical household finance researchers and many empirical studies in recent years have used the HILDA wealth data to examine household financial decision making and outcomes. However, there remain significant unexploited opportunities to use this longitudinal data to explore the causal pathways to wealth accumulation.

In recent decades, finance researchers have increasingly turned their attention to empirical analysis of household financial decision making and outcomes. The growth in household finance research internationally has been greatly facilitated by the increasing availability of household micro data with relevant financial information, particularly household wealth data.

Campbell (2006) argues that the ideal data set for empirical analysis of household finance would have at least five characteristics: ‘First, it would cover a representative sample of the entire population. Second, for each household the data set would measure both total wealth and an exhaustive breakdown of wealth into relevant categories. Third, these categories would be sufficiently disaggregated to distinguish among asset classes. Fourth, the data would be reported with a high level of accuracy. Finally, the data set would follow households over time; that is, it would be a panel data set rather than a series of cross-sections.’

In Australia, nationally representative and comprehensive micro data on household wealth did not become available until the early 2000s, when the Household, Income and Labour Dynamics in Australia (HILDA) Survey began collecting wealth data. While by no means perfect, the HILDA Survey broadly addresses all of Campbell’s requirements. It is, by design, representative of the Australian population; it produces a comprehensive measure of each household’s wealth, in total and by component; and household wealth data has been collected from the same households every four years since 2002.

This detailed longitudinal wealth data, combined with rich data on incomes and other financial data, and indeed on numerous other topics, makes HILDA fertile ground for household finance researchers, including practitioners, industry associations and policy makers. The data can be used for a variety of purposes, including understanding how wealth is distributed, how wealth accumulates over time, the structure of household portfolios, the savings behaviour of households, and the retirement readiness of individuals approaching retirement age. Importantly, the rich household micro data on wealth allows investigation of the factors impacting on these household financial decisions and outcomes. For example, Connolly (2007) was able to use the HILDA data to examine the extent to which superannuation displaced other saving by households, while Cardak and Wilkins (2009) show that increased labour market risk, as measured by year-to-year volatility in earnings, is associated with lower holdings of risky financial assets.

In what follows, I describe the HILDA Survey, explain the nature of the wealth data available, and present some simple descriptive statistics based on the wealth data.
The HILDA Project

Commencing in 2001, the HILDA Survey is a nationally representative longitudinal study of Australian households. The study is designed to live forever, following not only the original sample members, but also all of their descendants. Annual re-interview rates (the proportion of respondents from one wave who are successfully interviewed in the next wave) are high, rising from 87 per cent in Wave 2 to over 95.5 per cent from Wave 5 onwards. In Wave 14, conducted in 2014, interviews were obtained with 17,325 individuals residing in 9,538 households.2

Central to the HILDA project’s purpose is the study of individuals’ and households’ economic wellbeing. As a consequence, the study collects detailed information on household wealth every four years — to date, wealth data has been collected in 2002, 2006, 2010 and 2014 — creating Australia’s only nationally representative longitudinal household wealth data.

Considerable other financial data is also collected, most of it annually. Each year, detailed income data is collected for each individual in the household aged 15 and over, which are used to produce measures of personal and household income, in total and by income source (supplied in the unit record data). Household expenditure data is also collected annually, although not all components of expenditure are measured, and the categories of expenditure captured have changed several times. Since Wave 11, expenditure on each of 20 categories of expenditure has been measured, accounting for approximately 70 per cent of total household expenditure.

Central to the HILDA project’s purpose is the study of individuals’ and households’ economic wellbeing. As a consequence, the study collects detailed information on household wealth every four years — to date, wealth data has been collected in 2002, 2006, 2010 and 2014 — creating Australia’s only nationally representative longitudinal household wealth data.

The study collects much other non-financial information relevant to understanding financial decision-making and outcomes. This includes demographic characteristics, educational attainment, labour market activity, job characteristics, retirement expectations, health and health behaviours, disability, subjective wellbeing, attitudes and values, experience of major life events, and cognitive functioning. Perhaps most importantly for finance researchers, measures of risk preference and time preference are also obtained in each wave.

The HILDA wealth data

The HILDA Survey wealth data is derived from a detailed set of questions about the financial assets, non-financial assets and debts of all household members. The questions have remained very similar over time, ensuring a high degree of longitudinal comparability. In addition to providing measures of each household’s total financial assets, non-financial assets, debts and net worth, the questions also produce separate values for six financial asset components, seven non-financial asset components and 12 debt components. Table 1 itemises these components.
**TABLE 1: Asset and debt components available in the HILDA Survey data**

<table>
<thead>
<tr>
<th>Assets</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Financial assets</strong></td>
<td></td>
</tr>
<tr>
<td>Bank accounts</td>
<td></td>
</tr>
<tr>
<td>Equity investments (shares, managed funds and property trusts)</td>
<td></td>
</tr>
<tr>
<td>Other investments (bonds, debentures, certificates of deposit and mortgage-backed securities)</td>
<td></td>
</tr>
<tr>
<td>Trust funds</td>
<td></td>
</tr>
<tr>
<td>Cash-in value of life insurance policies</td>
<td></td>
</tr>
<tr>
<td>Superannuation</td>
<td></td>
</tr>
<tr>
<td><strong>Non-financial assets</strong></td>
<td></td>
</tr>
<tr>
<td>Home</td>
<td></td>
</tr>
<tr>
<td>Other property (investment housing, holiday homes, other housing, vacant land, farms and commercial property)</td>
<td></td>
</tr>
<tr>
<td><strong>Businesses</strong></td>
<td></td>
</tr>
<tr>
<td>Motor vehicles (cars, vans, motorbikes, trucks and utilities)</td>
<td></td>
</tr>
<tr>
<td>Recreational vehicles (boats, caravans, campervans, jet skis, trail bikes and other recreational vehicles)</td>
<td></td>
</tr>
<tr>
<td>Other vehicles (tractors, planes, helicopters and other vehicles not captured above)</td>
<td></td>
</tr>
<tr>
<td>Collectibles (antiques, works of art, cemetery plots and other substantial assets)</td>
<td></td>
</tr>
<tr>
<td><strong>Debts</strong></td>
<td></td>
</tr>
<tr>
<td>Home debt</td>
<td></td>
</tr>
<tr>
<td>Other property debt</td>
<td></td>
</tr>
<tr>
<td>Business debt</td>
<td></td>
</tr>
<tr>
<td>Credit card debt</td>
<td></td>
</tr>
<tr>
<td>Student loan debt (including HECS and HELP)</td>
<td></td>
</tr>
<tr>
<td>Car loans(a)</td>
<td></td>
</tr>
<tr>
<td>Investment loans(a)</td>
<td></td>
</tr>
<tr>
<td>Hire-purchase loans(a)</td>
<td></td>
</tr>
<tr>
<td>Other personal loans from financial institutions(a)</td>
<td></td>
</tr>
<tr>
<td>Other personal loans from other types of lender, such as solicitors, pawnbrokers and welfare agencies(a)</td>
<td></td>
</tr>
<tr>
<td>Loans from friends or relatives (not living in the same household)(a)</td>
<td></td>
</tr>
<tr>
<td>Unpaid overdue bills(b)</td>
<td></td>
</tr>
</tbody>
</table>

Notes: (a) In Wave 2, car loans, investment loans, hire-purchase loans and other personal loans were obtained collectively and recorded as ‘other personal debt’; (b) Not collected in Wave 2.

As Table 1 indicates, the wealth data is quite comprehensive. The only significant component omitted from the HILDA Survey measure of household wealth is ‘dwelling contents’ (other than collectibles), such as furniture and appliances, and clothing and other personal items. Estimates from the Australian Bureau of Statistics (ABS) Survey of Income and Housing presented in ABS (2015) indicate that the mean value of household contents, including collectables, was $65,880 in 2013–14. The mean value of collectables in Wave 14 of the HILDA Survey was $3,667, implying dwelling contents not measured by the HILDA Survey in 2014 averaged $62,213 across all households. Note, however, that dwelling contents are notoriously difficult to value. The ABS use ‘insured value’ to measure the value of dwelling contents, but because most insurance policies on dwelling contents are on a ‘new for old’ basis, this leads to substantial overestimation of the true value of dwelling contents — possibly by a factor of two or more.

The exclusion of dwelling contents notwithstanding, the HILDA wealth data compares favourably with both National Accounts aggregates and ABS household wealth data (Bloxham and Betts 2009; Wilkins 2013). However, one limitation of the wealth data for finance researchers is that the financial asset categories are relatively broad. Most notably, the composition of equity holdings and the composition of superannuation holdings are not known. Thus, for example, it is not possible to ascertain the degree of diversification in equity portfolios, nor the risk profile of superannuation holdings.
Some descriptive statistics
To provide a brief overview of the HILDA Survey wealth data, Table 2 presents several summary measures of the distribution of household net wealth in Australia in 2002, 2006, 2010 and 2014. Over the full 2002 to 2014 period, there were large gains in the net wealth of Australian households. Mean wealth of households increased by 36.1 per cent in real terms to $742,209 in 2014, while median wealth increased by 37.1 per cent, to $407,765. However, all of the growth in the mean, and most of the growth in the median, occurred between 2002 and 2006. Between 2006 and 2014, the median increased by only 1.4 per cent, while the mean actually declined by 1.2 per cent.

Between 2002 and 2006, when mean wealth grew strongly, wealth inequality also grew, largely because the very wealthiest became much richer. This is indicated by the net wealth of the 99th percentile, which increased by 139.6 per cent between 2002 and 2006. Over this period, growth in net wealth was otherwise reasonably evenly distributed, with the 90th percentile, median and 10th percentile all growing by similar proportions.

The changes between 2006 and 2014 were quite different. Net wealth at the 99th percentile decreased by 9.3 per cent, the 90th percentile increased by 8.1 per cent and the median increased by 1.4 per cent, while the 10th percentile increased quite strongly, by 25.7 per cent. The net result was that wealth inequality, as measured by the Gini coefficient, decreased by 1.3 per cent. This was not enough, however, to completely undo the increase in inequality between 2002 and 2006.

Table 2 also presents estimates of total household wealth (exclusive of household contents) over the four years in which wealth data was collected. This is estimated to have been $6.5 trillion in 2014, up from $4 trillion in 2002. Aggregate household wealth experienced sustained growth between 2002 and 2014, with population growth more than offsetting the decline in mean wealth between 2006 and 2014.

**TABLE 2: Distribution of net wealth across households, 2002–14 (December 2014 prices)**

<table>
<thead>
<tr>
<th>Year</th>
<th>Mean ($K)</th>
<th>10th percentile ($K)</th>
<th>Median ($K)</th>
<th>90th percentile ($K)</th>
<th>99th percentile ($K)</th>
<th>Gini coefficient</th>
<th>Aggregate wealth ($ billion)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>545,534</td>
<td>6,148</td>
<td>297,488</td>
<td>1,246,597</td>
<td>3,905,912</td>
<td>0.624</td>
<td>4,014</td>
</tr>
<tr>
<td>2006</td>
<td>751,541</td>
<td>8,609</td>
<td>402,178</td>
<td>1,647,652</td>
<td>9,358,478</td>
<td>0.634</td>
<td>5,784</td>
</tr>
<tr>
<td>2010</td>
<td>734,208</td>
<td>9,040</td>
<td>421,760</td>
<td>1,654,670</td>
<td>8,358,055</td>
<td>0.623</td>
<td>6,091</td>
</tr>
<tr>
<td>2014</td>
<td>742,209</td>
<td>10,820</td>
<td>407,765</td>
<td>1,781,750</td>
<td>8,491,287</td>
<td>0.626</td>
<td>6,542</td>
</tr>
</tbody>
</table>

Percentage change 2002–14: 36.1% 76.0% 37.1% 42.9% 117.4% 0.4% 63.0%

Percentage change 2002–06: 37.8% 40.0% 35.2% 32.2% 139.6% 1.7% 44.1%

Percentage change 2006–14: -1.2% 25.7% 1.4% 8.1% -9.3% -1.3% 13.1%

A brief overview of the composition of household wealth is provided in Table 3, which presents the mean value across all households of each of the eight asset components and six debt components. The family home is clearly the most important asset component, and debt on the family home is clearly the most important debt component. The mean value of owner-occupied housing, evaluated over all households, was $281,781 in 2002, $377,453 in 2006, $408,218 in 2010 and $392,241 in 2014. Mean home debt among all households also rose in a sustained fashion. In 2014, mean home debt was, in real terms, nearly double its 2002 level.

Superannuation is now clearly the second most important asset class in households’ wealth portfolios. In 2014, the mean value across all households was $186,011, up from $112,114 in 2002. Nonetheless, the importance of housing as a component of household wealth is further reinforced by the large share of household wealth held in the form of investment housing and holiday homes. The mean value of other housing across all households rose dramatically between 2002 and 2006, from $66,130 to $161,388, but declined thereafter, to be $138,718 in 2014. In common with home debt, debt on other property rose in a sustained fashion between 2002 and 2014, with mean debt across all households rising from $15,529 in 2002 to $42,226 in 2014.
Equity investments are also a sizeable component of assets. Changes in the mean value of equities across all households largely reflect movements in share prices. The mean peaked in 2006 at $56,402, declined to $40,815 in 2010 and rose again to $44,166 in 2014.

The share of wealth in bank accounts has risen slightly since 2002. In 2002, bank accounts accounted for 6 per cent of net wealth, and in 2014 they accounted for 6.9 per cent of net wealth. The mean value of business wealth declined over this period, from $60,327 in 2006 to $39,807. Over this period, the mean value of business debt declined only slightly, from $10,847 in 2006 to $9,264 in 2014.

Between 2002 and 2010, the total value of household debt rose at a much faster rate than the value of household assets. The mean value of assets grew by 42 per cent over this period, while the mean value of debt grew by 87 per cent. Debt continued to grow at a faster pace than assets between 2010 and 2014, but at a much reduced rate, increasing by only 3.3 per cent over the four-year period. This translates to an annual growth rate of 0.8 per cent, compared with 8.1 per cent between 2002 and 2010.

### Table 3: Composition of household wealth, 2002–14 (mean values across all households, December 2014 prices)

<table>
<thead>
<tr>
<th>Assets</th>
<th>Home</th>
<th>Other property</th>
<th>Superannuation</th>
<th>Equities</th>
<th>Bank accounts</th>
<th>Business</th>
<th>Vehicles</th>
<th>Other assets</th>
<th>All assets</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>281,781</td>
<td>66,130</td>
<td>112,114</td>
<td>41,757</td>
<td>32,620</td>
<td>55,468</td>
<td>25,838</td>
<td>19,721</td>
<td>635,429</td>
</tr>
<tr>
<td>2014</td>
<td>392,241</td>
<td>138,718</td>
<td>186,011</td>
<td>44,166</td>
<td>51,118</td>
<td>39,807</td>
<td>27,051</td>
<td>36,936</td>
<td>916,048</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Debts</th>
<th>Home</th>
<th>Other property</th>
<th>Business</th>
<th>Credit cards</th>
<th>HECS/HELP</th>
<th>Other</th>
<th>All debts</th>
</tr>
</thead>
<tbody>
<tr>
<td>2002</td>
<td>51,881</td>
<td>15,529</td>
<td>8,678</td>
<td>1,471</td>
<td>2,022</td>
<td>10,314</td>
<td>89,895</td>
</tr>
<tr>
<td>2006</td>
<td>78,474</td>
<td>32,203</td>
<td>10,847</td>
<td>1,876</td>
<td>2,250</td>
<td>16,339</td>
<td>142,073</td>
</tr>
<tr>
<td>2010</td>
<td>96,280</td>
<td>38,895</td>
<td>10,056</td>
<td>2,211</td>
<td>3,123</td>
<td>17,553</td>
<td>168,249</td>
</tr>
<tr>
<td>2014</td>
<td>100,689</td>
<td>42,226</td>
<td>9,264</td>
<td>1,661</td>
<td>4,511</td>
<td>15,352</td>
<td>173,839</td>
</tr>
</tbody>
</table>

While Tables 2 and 3 present cross-sectional information on the distribution of household wealth, the unique contribution of the HILDA Survey data on Australian household wealth is that it permits examination of changes over time — or dynamics — of individuals’ household wealth.

Between 2002 and 2010, the total value of household debt rose at a much faster rate than the value of household assets. The mean value of assets grew by 42 per cent over this period, while the mean value of debt grew by 87 per cent. Debt continued to grow at a faster pace than assets between 2010 and 2014, but at a much reduced rate, increasing by only 3.3 per cent over the four-year period. This translates to an annual growth rate of 0.8 per cent, compared with 8.1 per cent between 2002 and 2010.

Table 4 examines the median changes in individuals’ household wealth over five timeframes: 2002 to 2006; 2006 to 2010; 2010 to 2014; 2006 to 2014; and 2002 to 2014. The individual is the ‘unit of analysis’, which means that while we are examining household wealth, we ‘follow’ individuals. This is more natural than attempting to follow households. If we take, for example, the case of a married couple who separate: a household-based analysis would either have to follow only one member of the couple, or treat the household as having ‘died’; an individual-based analysis allows us to follow both members of the couple — although household wealth of each member would, naturally, change as a result of the separation.
The table compares median net wealth changes across six age groups. Median wealth growth between 2002 and 2014 was highest for those aged 35–44 in 2002, although the median growth of those aged 45–54 in 2002 and those aged 25–34 in 2002 was not far behind. Growth was lowest for those aged 65 and over in 2002, and was also relatively low for those aged 55–64 in 2002, but was still positive for both age groups. This is perhaps somewhat surprising, particularly for those aged 65 and over in 2002, since most were retired over the 2002 to 2014 period and might have been expected to be ‘running down’ their wealth. However, all of the increase occurred between 2002 and 2006, when asset price growth was very strong.

**TABLE 4: Median household net wealth changes by initial age group ($, December 2014 prices)**

<table>
<thead>
<tr>
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<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 25</td>
<td>23,188</td>
<td>12,442</td>
<td>14,515</td>
<td>36,409</td>
<td>112,294</td>
</tr>
<tr>
<td>25–34</td>
<td>82,498</td>
<td>66,951</td>
<td>48,732</td>
<td>111,621</td>
<td>230,782</td>
</tr>
<tr>
<td>35–44</td>
<td>135,383</td>
<td>58,669</td>
<td>53,645</td>
<td>113,273</td>
<td>267,004</td>
</tr>
<tr>
<td>45–54</td>
<td>142,958</td>
<td>60,689</td>
<td>52,055</td>
<td>90,932</td>
<td>254,132</td>
</tr>
<tr>
<td>55–64</td>
<td>123,556</td>
<td>2,447</td>
<td>13,777</td>
<td>7,163</td>
<td>86,334</td>
</tr>
<tr>
<td>65 and over</td>
<td>58,784</td>
<td>-3,943</td>
<td>-8,267</td>
<td>-14,110</td>
<td>35,885</td>
</tr>
</tbody>
</table>

Figure 1 focuses on the most important financial asset, superannuation, showing the strong relationship between age and (personal) superannuation balance, which tends to peak in the age groups in which most people retire. It is also evident that women have much lower balances than men, reflecting the lower lifetime earnings of women. Mean superannuation balances of both men and women tended to grow between 2002 and 2014, although there are substantial differences across the age groups. Indeed, increases in mean superannuation balances were largely confined to older age groups. One consequence of this is that the age group at which the mean superannuation balance peaks increased between 2002 and 2014 for both men and women — for men from the 55–59 age group to the 65–69 age group, and for women from the 50–54 age group to the 60–64 age group.

**FIGURE 1: Mean superannuation balances by sex and age**
Concluding comments

The household wealth and other financial data available in the HILDA Survey data represents a rich resource for empirical household finance researchers. Indeed, a number of studies have already made use of the HILDA wealth data to examine household financial decision making and outcomes. These include studies of the distribution, dynamics and determinants of household wealth (Headey et al. 2005; Doiron and Guttmann 2009; Bauer et al. 2011; Dockery and Bawa 2015), the incidence of household debt (La Cava and Simon 2005; Wilkins and Wooden 2009), portfolio allocation decisions (Cardak and Wilkins 2009; Cobb-Clark and Hildebrand 2009, 2010, 2011; Stavrunova and Yerokhin 2012; Hulley et al. 2013; Marriott et al. 2015), and superannuation and retirement (Connolly 2007; Parr et al. 2007; Ong 2009; Keegan 2011; Barrett and Kecmanovic 2013; Burnett et al. 2013; Johnson et al. 2014, 2016; Feng 2015).

Despite the large number of studies that already exist, there remain many unexploited opportunities. For example, there is much that could be done to further investigate the implications of non-financial wealth, household circumstances, labour market activity and events, health and other factors for financial decisions and outcomes. In particular, the longitudinal structure of the data improves the potential for identification of causal pathways from these factors to wealth accumulation. This potential will likely increase as the length of the HILDA panel grows over coming years.

Acknowledgements

I would like to thank Kevin Davis for comments on an earlier version of this paper. This paper uses unit-record data from the Household, Income and Labour Dynamics in Australia (HILDA) Survey. The HILDA Project was initiated and is funded by the Australian Government Department of Social Services (DSS) and is managed by the Melbourne Institute of Applied Economic and Social Research (Melbourne Institute). The findings and views reported in this paper are those of the author and should not be attributed to either DSS or the Melbourne Institute.

Notes

1. Prior to 2002, the only Australian unit record wealth data was from a 1915 wealth survey and a 1966–68 study of consumer finances and expenditures. The ABS shortly followed the HILDA Survey’s lead, incorporating a wealth collection into its biennial household income survey for the first time in 2003–04. The ABS has since collected household wealth data in four of the five income surveys conducted since then.

2. As of the time of writing, 15 waves of data had been collected, with the Wave 15 data due to be released in December 2016. For more information about the study, including sample methods, sample sizes and response rates, see Summerfield et al. (2015), Watson and Wooden (2002) and Watson (2011).

References


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THE RISE OF FINTECH
opportunities and challenges

IAN POLLARI F Fin, Partner, Head of Banking, KPMG Australia & KPMG Global Co-Lead Fintech

Financial technology (fintech) is experiencing rapid growth internationally. This paper examines the key drivers of the growth of fintech, its role in redefining the financial services industry, and the likely impact on industry business models. The paper also analyses the trends in fintech investment in global and regional markets and Australia’s alternative finance market, and highlights a series of strategic challenges and opportunities for incumbent financial institutions. An earlier version of this paper was presented at the 21st Melbourne Money and Finance Conference.

A decade ago brands such as Wealthfront, OnDeck, Zopa, Square and even PayPal had not attracted significant attention within the financial services industry. Today, financial technology (fintech) is one of the fastest growing sectors in the industry, with global fintech investment rising from $US100 million in 2008 to over $US19 billion in 2015. The rapid rise of fintech embodies the transformation of the industry by digital means, with significant implications for consumers, businesses and government. Furthermore, this phenomenon has been fuelled by the rhetoric of business and government leaders stressing the importance of innovation to growth, and the challenges and opportunities provided by digital disruption and new business models.

Recent quotes from Australian bank CEOs include: ‘We are a fintech company ourselves. We have to have the mindset of a fintech company’; ‘We need to think and act like a 200-year-old start-up company’; and ‘If we don’t innovate we’re toast’. These remarks highlight three important strategic considerations for the industry. First, digital disruption is changing the competitive landscape, lowering entry barriers for new players and creating new business models. Second, investing in digital innovation is critical to meet increasingly demanding customer needs. And third, partnering with and sourcing capability from fintech companies will form an important part of the strategic response for established financial institutions.

Understanding fintech
KPMG defines fintech simply as technology-based businesses that compete against, enable and/or collaborate with financial institutions. This ranges from creating software to processes that enable financial institutions to enhance their customers’ experience and streamline their operations, or enable consumers to fulfil their financial needs (saving, investment, make payments). The sector includes: new start-ups and ventures (in fintech); the activities and investment in technology innovation from established financial services institutions, as well as ICT/technology providers; and collaboration between these parties or ‘disruptive innovation’ by any of them individually.

Fintech developments are affecting all sectors of the financial services industry, such as banking, capital markets, payments, insurance, wealth management and real estate, as well as industry platforms, systems and infrastructure. This agglomeration of technology and financial services is not new. The application of IT&T to financial services has been present for many decades and has typically focused industry innovation efforts on enhancing the efficiency of technology infrastructure and improving systems stability, resilience and security. These still remain of critical importance to the industry’s effective operation. However, a more contemporary application of fintech has emerged in the past 10 years, enabling the delivery of new and innovative services, through digital channels, redefining the customer experience and creating new business models.
We have seen (and will continue to see) the emergence of fintech companies that seek to directly compete with incumbent financial institutions, best described as ‘carnivores’. While these types of fintech companies gain a lot of market attention due to their potential to disrupt traditional value chains, this threat is often overstated. Many fintech companies are looking to partner with or sell their services to financial institutions (i.e. these fintech companies are the ‘herbivores’) and they are attracting a more significant share of investment into the fintech sector. More recently, as some fintech companies mature, we are seeing the rise of another type of fintech, the ‘omnivores’, i.e. those that are seeking to both disrupt incumbents in certain areas or markets and also collaborate (e.g. through white labelling arrangements) in others.

There are benefits for both parties in a collaborative model. For fintech start-ups, they gain access to a range of important growth levers: customers, distribution, data, capital, experience, licences, a trusted brand and an ability to scale much more quickly. For incumbents, this means gaining access to new ideas, solutions, capability, knowledge and potential investment opportunities in new players that are typically focused on a specific problem or opportunity and have significantly lower cost structures. It ultimately allows incumbents to be more agile, providing strategic optionality, by embracing the number of helpful fintech innovators.

**Drivers of fintech**

There are seven primary drivers of fintech.

1. **Changing consumer behaviour and preferences**

   Changing consumer behaviour and attitudes are playing a key role in the industry’s evolution, as a transition in power occurs from corporations to customers. In most cases, technology is facilitating this shift of control. Consumers are embracing new technology (at a rapid rate), seeking advice from alternative sources, and they are increasingly less loyal to their financial institutions and demanding greater levels of personalisation, convenience and immediacy.

   The rising tide of millennials, or Gen Y, will become increasingly important, with their share of financial assets increasing from around a third today to 70 per cent by 2030. This group is currently undergoing major life events such as starting full-time work, applying for credit cards and car loans, and applying for a mortgage for the first time. As a result, this group is likely to drive future trends and developments in the broader marketplace and their preferences are very different from other demographic groups. As evidence of this, the findings from the Millennial Disruption Index, a three-year US study of industry disruption at the hands of Gen Y, revealed that they believe the banking industry is most at risk of being disrupted, they are counting on tech start-ups to overhaul the way banks work; and would be more excited about a new offering in financial services from Google, Amazon, Apple, PayPal, or Square than from their own bank.

2. **Digital and mobile devices**

   A few years ago, people performed daily tasks in conventional ways. Today, ‘convention’ has shifted to digital platforms and mobile devices. Over the past decade, we have seen the proliferation and widespread adoption of mobile devices, with over 70 per cent of Australians now owning a smartphone. We have also seen an explosion in data, fuelled by social media platforms. And this revolution is set to continue over the medium term, facilitated by the adoption of new technology infrastructure in Australia, such as the National Broadband Network (NBN) and the transition to the New Payments Platform (NPP), which will go live in 2017. Furthermore, developments such as the Internet of Things (with some experts suggesting there will be 75 billion devices connected globally by 2020) and the maturing of artificial intelligence and robotics in the longer-term will have a significant impact on delivery of banking and financial services products and services, and redefine the customer experience.

3. **The accelerating pace of change**

   In many arenas, the pace of change is accelerating over time, with more players competing and barriers to entry falling. Technology adoption is occurring much more quickly. For example, it took five decades for the telephone to reach a penetration of 50 per cent of US households. Unbelievably, it took five years or less for mobile phones to accomplish the same penetration levels.
By extension, firms with competitive advantages in those areas will need to move faster to capture those opportunities that present themselves. To highlight the pace of innovation and the impact disruption can have, looking at the US as an example, corporations that were in the S&P 500 in 1937 remained in the index for 75 years on average. In 2011, the average tenure had shrunk to about 15 years. In around 10 years’ time (2025), it is projected to drop to five years. Therefore, in a world of increasing digital commerce, winners and losers will come and go much more quickly.

4. Declining levels of trust
A fundamental shift is underway, towards what author and collaborative economy expert Rachel Botsman calls ‘distributed power’, where we are moving away from a business and a society that places trust in top-down, centralised institutions and moving towards a world of distributed, connected communities. This shift is changing who has power, who we trust, our perceptions of brands and how we access products and services.

This decline in the levels of trust in major institutions is seeing the rise of trust between strangers. The lack of trust in financial institutions, and the prevalence of social media in millennials’ everyday life, has seen the emergence of a ‘review community’, whereby customers are more inclined to place their trust in the opinion of a stranger. These review communities are helping to shape customers’ opinions of financial institutions and their products and services, more than the information provided by an institution’s own website.

5. Barriers to entry for digital disruptors are falling
Another key driver is that the barriers to entry for digital disruption are falling quickly. It has never been cheaper or easier to commence a technology start-up, with the advent of open source software and low-cost development tools. Unsurprisingly, falling start-up costs are seeing a rapid increase in the number of start-up companies.

6. Attractive profit pools which are accessible
The technology is now in place to substantially transform financial services (e.g. cheap IT, widespread mobile penetration, regulation, such as the Financial Claims Scheme requiring Single Customer View and the move to real time payments). There is $A27 billion of current revenue at risk, with the areas of financial services most at risk of digital disruption being lending, payments and merchant acquiring.

In the near term, it is expected that shorter-tenure, high turnover products like credit cards, loans and payments will see the most digital transformation. Looking further ahead, bank accounts and mortgages, which together typically drive more than 50 per cent of many banks’ revenues and usually provide ‘sticky’ annuity streams, will be brought into the fray.

7. Supporting policy and regulatory environment
Policy makers and regulators are increasingly aware of the potential of the fintech sector in addressing issues of financial inclusion, affordability and literacy. They are investing to increase their own awareness and education of the sector and engaging more frequently with fintech companies, helping them to understand new technology developments and emerging practices in the industry. In turn, this will allow them to be more effective in balancing any actual or perceived increase in risk, with the benefits that consumers, investors and the economy more broadly stand to gain from new innovation and inform, what, if any, policy or regulatory response is appropriate.

Global fintech investment
Fintech is experiencing rapid growth internationally. 2015 marked a record high in the fintech sector, with total global investment in fintech companies exceeding $US19 billion and global funding to VC-backed fintech companies rising by 106 per cent from the previous year. In 2015, there was more than six times the level of funding deployed to VC-backed fintech companies as there was in 2011.
From a regional perspective, Asian fintech start-ups had a record year for investment activity in 2015, raising a total of $US 4.5 billion (more than the previous four years combined). Asia experienced the highest level of corporate involvement in fintech investment in 2015, rising to 47 per cent in the third quarter of 2015. Europe, in contrast, experienced the lowest level of corporate participation, falling below 15 per cent in four of the past five quarters.

From a sectoral standpoint, lending and payments continue to dominate the investment landscape, representing three quarters of deals in 2015. However, this is starting to diversify, with investment growing in insurtech, wealthtech and blockchain. Last year was a record year for funding to VC-backed blockchain and bitcoin startups, which jumped 59 per cent to $US 474 million.

**Fintech investment activity in Australia**

In Australia, the growth in fintech activity is starting to translate into larger investment deals and funding rounds, including fintech companies such as Tyro, Prospa, SocietyOne, Moula and MoneyMe.

The total volume of alternative finance (Alt-Fi) in Australia grew from $US 24 million in 2013, to over $US 48.37 million in 2015 with an average annual growth rate of 28.1 per cent between 2013 and 2015. On a per capita basis, Australia also ranks third in funding for Alt-Fi in 2015 ($US 14 million), with China in top place at $US 75 million and New Zealand in second place at $US 59 million.

**Figure 2: Australian alternative finance market by model**

*Source: Harnessing the Potential, KPMG International, Cambridge University, Sydney University and Tsinghua University, February, 2016.*
The largest share of Australia’s Alt-Fi market volume in 2015 was balance sheet business lending, accounting for over $US120 million. Invoice trading came in second at over $US105 million. Marketplace/peer-to-peer consumer lending, the next largest segment of Australia’s Alt-Fi market grew from $US2 million in loans in 2013 to $US9.5 million in 2014 and then to over $US43 million in 2015.

Fintech companies
Fintech is an increasingly global phenomenon and, as evidenced in the KPMG and H2 Ventures Fintech100 report, leading fintech ventures and start-ups are emerging across many international cities, in both developed and developing markets. In particular, with the rise of Asia as an emerging trend, fintech ventures from the region are now attracting substantial funding rounds. For example, Ant Financial Services Group, the financial services affiliate of e-commerce giant Alibaba Group closed the world’s largest private fundraising round for an Internet company at $US 4.5 billion in April. In addition, the scale of new fintech partnerships is also gaining momentum. A notable example of this is ZhongAn, a joint venture between Alibaba, TenCent and PingAn, which was established in 2013 and has quickly increased in scale to become the dominant online insurer in China, having sold more than 3.5 billion policies.

Business model transformation
Digitisation has had an impact on many industries, fragmenting traditional value chains and causing companies in those industries to reposition themselves and their business models. Invariably, disruption and the reconfiguration of established companies is centred upon platforms, leveraging network effects and underscoring the importance of collaborating with third-parties, such as fintech companies, to create ecosystems of value.

As the unbundling movement continues and influence shifts towards platform players, a natural conclusion is that to compete and maintain market share, financial services institutions must operate to some extent on a platform level, although ‘platform plays’ are not the answer for every situation. A recent article by Marshall Van Alstyne et al. in Harvard Business Review, (‘Pipelines, platforms and the new rules of strategy’) contended that the focus of organisational strategy in the future will require a number of key transitions: ‘from product to platforms, from controlling to orchestrating resources, and from increasing customer value to maximising ecosystem value’.

Large multinational technology giants may pose the biggest threat in terms of disruption to the financial services industry, given their dominant market positions (and user bases), access to data, strong brands, low-cost operations and platform-based business models. While traditional competitors and disruptive start-ups could cause significant challenges to incumbent organisations, corporates from other industries may pose the biggest threat: companies like Google, Apple and Amazon are already looking for ways to expand their reach into other industries. Regional players like Alibaba, Tencent (as presented in the ZhongAn example) and Baidu in Asia could also take market share from financial institutions that are unprepared.
Financial institutions respond

Clearly, the financial services industry is not standing still. Incumbent financial organisations are increasingly recognising that investments in and collaboration with early stage start-ups offer a broader range of new ideas and possibilities. Historically, a financial services firm may have relied on one or two IT vendors to deliver technology innovation to them as part of their contractual obligations. However, a different model is emerging whereby financial services firms are directly engaging with a range of fintech start-ups.

According to the Wharton Business School: ‘Disruptive innovations need not lead to an incumbent’s fall, despite prevailing academic theory arguing otherwise. Start-ups introducing disruptive technologies are more likely to end up licensing to incumbents, forming alliances or merging with market leaders rather than turning into rivals.’

Financial institutions globally are taking a wide range of approaches in trying to keep up with the wave of technology innovation, with fintech emerging as an enabler, and banks setting up their own accelerators, incubator programs or corporate VC funds. However, global leaders in this area tend to have a more holistic and integrated approach to innovation across their business. BBVA in Spain is a notable example. They are globally regarded as a digital leader in banking and recently restructured their business, creating units with responsibility for Open Innovation Centres which they use to engage local fintech communities, M&A for full acquisitions (e.g. Simple), and investing $US250 million in a newly established VC fund, Propel Venture Partners.

Financial services companies are also investing significantly in the fintech sector, with more than a quarter of 2015 fintech deals involving corporate investors, ranging from 40 per cent in Asia to 25 per cent in North America and 12 per cent in Europe. These numbers suggest that financial institutions are beginning to see fintech companies as enablers rather than competitors. Collaboration between incumbent institutions and fintech herbivores is an example of the philosophy espoused by Henry Chesbrough, the University of California, Berkeley academic, in his 2003 book *Open Innovation: The New Imperative for Creating and Profiting from Technology*. Chesbrough’s thesis is that there are many more smart people outside any company than inside it, however big that company happens to be. Therefore, advancement can’t happen by relying on internal thinking only; innovation requires tapping into external ideas and technologies.

A number of banks have set the pace when it comes to fintech investing. Over the past five years, Citigroup, through its VC arm Citi Ventures, has invested in 13 fintech companies, while Goldman Sachs has invested in 10 companies, including Square and Circle Internet Financial. JPMorgan Chase, Morgan Stanley, Wells Fargo and others have also made a number of fintech investments. Locally, Westpac, through its VC fund, Reinventure Group, has invested in a variety of companies over the past 18 months, in areas of financial services, such as payments and peer-to-peer lending, as well as big data and analytics.

In response to digital disruption, financial institutions can take two different approaches — defend and/or grow. Financial institutions may elect to use the defence approach when there is a high threat of disruption from fintech providers providing better services and new experiences. By comparison, an established financial institution may decide to approach new technological innovations by expanding their selection of services to meet adjacent customer needs or by repurposing their existing capabilities into new markets. This has the potential to generate new sources of value.
Conclusion
There is no doubt that the financial services industry of the future will look very different from what it does today. The landscape will be more competitive, more efficient and provide more customer choice. New products, services, distribution methods and business models will emerge and some will take hold very quickly (e.g. ZhongAn). Financial institutions will come under increasing competitive pressure unless they can leverage technology to slice costs closer to leaner new ‘fintech’ operators.

The institutions that will thrive in this environment are those that are constantly striving to understand, influence and respond to the transformational forces impacting the industry, and possess the ability to quickly make modifications in their strategies and approach to execution of their strategies along the way. Furthermore, the ‘agile incumbents’ that are efficient distributors or acquirers of leading fintech capability will outperform, while investing in the enablers/herbivores of the shift will also offer opportunities for financial institutions.

Note
1. See Knowledge at Wharton, August 2014.
150 YEARS OF FINTECH:
An evolutionary analysis

DOUGLAS W ARNER, Professor of Law, Co-Director, Duke-HKU Asia America Institute in Transnational Law, and Member, Board of Management, Asian Institute of International Financial Law, University of Hong Kong
JÁNOS BARBERIS, Senior Research Fellow, Asian Institute of International Financial Law, Faculty of Law, University of Hong Kong, Founder, FinTech HK and Co-Editor of The FINTECH Book
ROSS P BUCKLEY, CIFR King & Wood Mallesons Chair of International Financial Law, Scientia Professor, and Member, Centre for Law, Markets and Regulation, UNSW Australia and Honorary Fellow, Asian Institute of International Financial Law, University of Hong Kong

Now in its third major era, the fintech sector is attracting growing interest from regulators as it evolves, both in developed markets and developing countries. The regulatory challenge lies in resolving the tension between a forward-looking framework that promotes innovation, and a sufficiently rigorous framework that maintains market confidence. We argue that more experimentation and innovation in regulatory approaches is needed, and that it is too early yet to seek international regulatory harmonisation in this space. An earlier version of this paper was presented at the 21st Melbourne Money and Finance Conference.

"Financial technology", or 'fintech', refers to the use of technology to deliver financial solutions. The term can be traced to the early 1990s,1 and now refers to a very rapidly growing industry.2 However, it is only since 2014 that the sector has attracted the focused attention of regulators, industry participants, consumers, and academics.

Fintech 1.0 (1866–1967): New term for an old relationship
Fintech is not novel. The laying of the transatlantic telegraph cable in 1866 provided the fundamental infrastructure for the period of strong financial globalisation from 1866 to 1913.

It is important to distinguish three main eras of fintech evolution. From around 1866 to 1967, the financial services industry remained largely analogue, despite being heavily interlinked with technology; we characterise this period as Fintech 1.0. From 1967 to 2008, finance was increasingly digitalised due to the development of digital technology for communications and transactions; we characterise this period as Fintech 2.0. Since 2008, in the period we characterise as Fintech 3.0, new start-ups and established technology companies have begun to deliver financial products and services directly to businesses and the public, as well as to banks.3

Fintech 1.0: From analogue to digital
From their earliest stages, finance and technology have been interlinked and mutually reinforcing. Finance originated in the state administrative systems that were necessary to transition from hunter-gatherer groups to settled agricultural states. Money is a technology evidencing transferable values, and the emergence of early calculation technologies like the abacus greatly facilitated financial transactions. Finance evolved alongside trade, and double-entry accounting emerged from this in the late Middle Ages and Renaissance. Many historians share the view that the European financial revolution in the late 1600s involving joint stock companies, insurance, and banking — all based on double-entry accounting — was essential to the Industrial Revolution.4 Thus, the relationship between finance and technology laid the foundations for the modern period.

In the late 19th century, technologies such as the telegraph, railroads and steamships underpinned financial interconnections across borders. Then, post-World War I technological developments proceeded rapidly. By this time, a global telex network was in place, providing the communications foundation on which the next stage of fintech could develop.5
Fintech 2.0 (1967−2008): Digitalisation of traditional financial services

In the late 1960s and 1970s, electronic payment systems advanced rapidly. The Inter-Bank Computer Bureau was established in the UK in 1968, forming the basis of today’s Bankers’ Automated Clearing Services. The US Clearing House Interbank Payments System was established in 1970, and Fedwire became an electronic system in the early 1970s. Reflecting the need to interconnect domestic payments systems, the Society of Worldwide Interbank Financial Telecommunications was established in 1973, followed soon after by the collapse of Herstatt Bank in 1974, which highlighted the risks of increasing international financial interlinkages. This crisis triggered the first major regulatory focus on fintech, with the establishment of the Basel Committee on Banking Supervision of the Bank for International Settlements in 1975, leading to a series of international soft law agreements.6

In 1987, stock markets around the world crashed on ‘Black Monday’. The effects of the crash were a clear indicator that global markets were technologically interlinked.7 The reaction led to the introduction of ‘circuit breakers’ to control the speed of price changes, and led securities regulators worldwide to create mechanisms to support cooperation. In addition, the Single European Act 1986, the 1986 Big Bang financial liberalisation process in the UK, and the 1992 Maastricht Treaty set the baseline for the full interconnection of EU financial markets by the early 21st century.

The advances through the mid-1990s highlighted the initial risks in complex computerised risk management systems, with the collapse of Long-term Capital Management after the Asian and Russian financial crises of 1997−98.8 However, the next level of development began in 1995 when Wells Fargo began providing online consumer banking. By 2001, eight US banks had at least one million customers online. In the late 1990s, the internet provided the foundational change that made Fintech 3.0 possible a decade later. E-banking and all of the developments of Fintech 3.0 were a product of the new internet era.

The regulatory view during Fintech 2.0 was that while e-banking was a digital version of the traditional model, it created new risks. Technology removed the need for depositors to be physically present at a branch, and could thus indirectly facilitate electronic bank runs. In turn, instant withdrawal could increase the stress on a financial institution.9 Regulators also identified that online banking creates new credit risks.10 The expectation was also that e-banking providers would be authorised financial institutions, which are usually the only entities allowed to describe themselves as ‘banks’.11 However, Fintech 3.0 changed this.

Fintech 3.0 (2008–present) in developed countries

A number of factors came together around 2007 and 2008 to provide the impetus for Fintech 3.0 in developed countries.

At this time, the brand image of banks, especially in the UK and US, was severely shaken. A 2015 survey reported that Americans trust technology firms more than banks to handle their finances.12 The same phenomena appears to exist in China where over 2000 (peer-to-peer) P2P lending platforms operate outside a clear regulatory framework and yet this does not deter millions of lenders and borrowers, due to the cheaper cost, apparently better potential return and increased convenience.13

Post-crisis regulation increased banks’ compliance obligations and costs, and restricted credit. Ring-fencing obligations and increased regulatory capital for banks changed their incentive or capacity to originate low-value loans.14 The new requirements to prepare recovery and resolution plans and conduct stress tests further added to bank costs.15 The 2008 global financial crisis (‘GFC’) also saw many finance professionals made redundant, and subsequently seeking new outlets for their skills.

The critical difference in Fintech 3.0 lies in: first, who is providing financial services, with start-ups and technology firms supplanting banks in providing niche services to the public, business and the banks themselves; and second, the speed of development. In many markets, there has been a shift in customer mindset as to who has the resources and legitimacy to provide financial services, combined with an entirely new speed of evolution, particularly in emerging markets.
Furthermore, Fintech 3.0 would almost certainly not have flowed from the GFC had the crisis occurred five years earlier. Two technological developments needed to occur to deliver the consumer interface and the interoperability among applications and services, and these were the advent of the smartphone and the growth in sophistication of application programming interfaces (APIs).16

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**The fintech industry today in developed countries**
Fintech today comprises five major areas, explored below:

- **Finance and investment:** Fintech extends beyond alternative financing mechanisms like P2P lending to include the financing of technology itself (e.g. via crowdfunding) and the use of technology in financial transactions such as algorithmic trading. Fintech is also increasingly involved in areas such as robo-advisory services.17

- **Internal financial operations and risk management:** These have been core drivers of IT spending by financial institutions, as they have built better compliance systems. For example, engineers comprise around one-third of Goldman Sachs’ 33,000 staff.18

- **Payments and infrastructure:** Payments have been an area of great regulatory attention since the 1970s, resulting in the development of both domestic and cross-border electronic payment systems. Likewise, infrastructure for securities trading and settlement and OTC derivatives trading is central, and IT and telecommunications companies are seeking opportunities to disintermediate traditional institutions here.

- **Data security and monetisation:** The digitisation of the financial industry means it is particularly vulnerable to cybercrime and espionage. This will remain a major concern for governments, policy makers, regulators, industry participants and customers. Nonetheless, fintech innovation is clearly present in the use of ‘big data’ to enhance the efficiency and availability of financial services.

- **Consumer interface:** The consumer interface offers the greatest scope for competition with the traditional financial sector, as tech companies can leverage off their pre-existing customer bases to roll out new financial products. Interestingly, it may be in developing countries where this phenomenon is most evident.

**Fintech 3.5 in emerging markets: The examples of Asia and Africa**
In Asia and Africa, recent fintech developments have been primarily prompted by deliberate government policy choices in the pursuit of economic development. We characterise the era in these regions as Fintech 3.5.

The ‘reputational’ factors that encourage the perception that only banks can offer banking services are irrelevant in these regions for over 1.2 billion unbanked individuals, because to them, banking can be provided by any institution, whether regulated or not: ‘banking is necessary, banks are not’.19

**Africa: Greenfield opportunities for fintech**
Fintech in Africa emerged at the beginning of the 21st century largely on the back of two factors: the underdeveloped level of banking and financial services; and the rapid spread of mobile telephones.

At most, 20 per cent of African households have access to formal or semi-formal financial services compared to 60 per cent of Asian households.25 As a result, telecommunications companies have taken the lead in fintech developments. Mobile money — the provision of basic payment and savings services through e-money recorded on a mobile phone — has achieved its greatest success in Kenya and, more recently, Tanzania.21 Mobile money has significantly spurred economic development by providing customers with a means to save funds, remit money safely to their families, pay bills, and receive government payments securely. The most well-known success story in Africa is that of M-Pesa, launched in 2007.27 In under five years, payments made through M-Pesa surpassed 43 per cent of Kenya’s GDP.22
Fintech opportunities and limitations in the Asia-Pacific region

The growth of the APAC fintech market is attributable to various factors: slower IT spending by APAC traditional banks; public distrust of the state-owned banking system (due to corruption and inefficiency); limited branch network distribution; and very high mobile telephone penetration rates, particularly smartphones.

Numerous fintech accelerators for start-ups have been established in Hong Kong and Singapore, as well as Brisbane, Sydney and Melbourne, and are set to open in Korea. Most Asian regulators have also initiated a fintech strategy. For China, this trend is supported by its market reforms moving from a mono-banking model to a largely commercialised financial system. Since 2009, over 2000 P2P lending platforms have emerged in China, and we should not expect this growth to slow, especially with the government’s Internet Finance Guidelines issued in July 2015.

Fintech 3.5 is supported by a strong underlying rationale, including the following characteristics: (1) young digitally savvy populations equipped with mobile devices; (2) a fast-growing middle class; (3) inefficient financial and capital markets creating opportunities for informal alternatives; (4) a shortage of physical banking infrastructure; (5) a behavioural pre-disposition in favour of convenience over trust; (6) untapped market opportunities; and (7) less stringent data protection and competition. In addition, particularly in India and China, there are very large numbers of engineering and technology graduates.

While significant opportunities exist in the APAC region, these are tempered by specific challenges. Investors, networks and financial engineering in APAC are less sophisticated than in the EU and US, leading to information asymmetries and constraints for fintech companies. Financing is also not readily attainable, with high barriers to entry in retail banking. Furthermore, as companies increase scale, the fragmented regulatory regime puts business-to-consumer fintech companies at a disadvantage relative to business-to-business (B2B) companies, as B2B companies partially shift the compliance burden to their client. The fragmentation in APAC, consisting of 24 countries, is also apparent when compared to the harmonised European market.

China: Transitioning its financial market for the 21st century

In China, technology has already blurred customer perceptions of who can deliver a financial service. Alipay processes over one million transactions each day by means that resemble a traditional bank, without being a bank. Alibaba has also fulfilled two main government policy objectives by creating 2.87 million direct and indirect job opportunities, and providing over 400,000 SMEs with loans ranging from $3000 to $5000. In the interests of a level playing field, banks should be allowed to respond to the competitive challenges posed by less regulated companies that can gain significant market share by offering close substitutes for services.

There is a unique opportunity in China’s technology-driven financial transition. In addition to learning from Western regulatory mistakes, China could leapfrog financial regulation standards by establishing a regulatory framework that promotes and controls fintech and internet finance companies. In many ways China’s leadership in fintech is already manifest. For example, Alipay’s introduction of facial recognition payment in March 2015 was followed by MasterCard in July 2015. Similarly, SME lending by Alibaba in 2010 using alternative credit-scoring data is now used in the US and Japan, and by Amazon in Europe.

Certain characteristics of the Chinese market make it very fertile ground for fintech, particularly its limited physical banking infrastructure and high technology penetration. Over the past three years, there have been 111 million new internet banking customers, a 19 per cent increase in new personal bank accounts, and a 24 per cent increase in online payments. It is expected that by 2020 there will be 900 million digital banking customers, and by 2017 over 900 million Chinese will be credit-scored using alternative data points.

To support this digital transition, banks should be able to compete equally in terms of their regulatory burden with start-ups that offer close substitutes for regulated products. At the same time, start-ups should be able to operate within a regulatory framework that allows them to develop their business before becoming subject to expensive compliance costs. Thus, the way forward may lie in establishing threshold levels at which institutions must comply with regulation.
To support this digital transition, banks should be able to compete equally in terms of their regulatory burden with start-ups that offer close substitutes for regulated products. At the same time, start-ups should be able to operate within a regulatory framework that allows them to develop their business before becoming subject to expensive compliance costs. Thus, the way forward may lie in establishing threshold levels at which institutions must comply with regulation.

It seems that China’s current guidelines are pointing towards a two-tiered market, defined by transaction values. This is an imperfect solution because it caps the growth of internet finance providers, but it also may introduce some regulatory harmony between banks and start-ups.

**Regulatory innovation and the importance of regtech**

Established financial actors, technology companies, and regulators work well together to develop regulations through market consultation, however, new Fintech 3.0 players are entering the industry without a financial compliance culture, and with limited pre-existing interaction with financial regulators. Currently, in many countries, uncertainty abounds as to the laws and procedures applicable to new fintech companies.

Technology needs time to find its final use and applicability, and the market may need to settle before regulatory intervention: deciding when to regulate can be as important as deciding what to regulate. There may be a strong benefit in regulation not influencing market innovation, and remaining technology-neutral. In practice, this means regulators need to understand a technology’s applicability.

For example, fingerprint scanning raises issues of ‘biometric data theft’ where a fingerprint can be replicated using a high-resolution photograph. A case can thus be made against using fingerprints due to the security risk. However, the decision to allow or ban a technology is perhaps best not left to regulators, because until a technology becomes widely used, risks like this are limited. Instead, a wait-and-see approach allows the technology to evolve and the regulator to learn whether the technology will be adopted, and draw on historical data as to the risks.

An efficiency-based analysis highlights the benefits of supervising only large players, with money market funds (MMF) a key example of this. Three of the largest players in this sector are Vanguard, Fidelity, and Schwab, established in 1975, 1946, and 1963, respectively. In 2014, Alibaba started to offer an MMF that was fully online and available to its pre-existing customers. Within nine months, Yu’E Bao became the world’s fourth largest MMF, showing how a non-traditional financial institution can move quickly from ‘too-small-to-care’ to ‘too-big-to-fail.’ This exponential growth represents a direct challenge to gradual regulation, because it has skipped the ‘too-large-to-ignore’ phase when regulators would have started to request compliance.

**Figure 1: Regulatory threshold approaches compared to growth models**
If the correct approach is still primarily to regulate actors with a significant impact on financial markets, in extraordinary cases, the methods used to identify future systemically important actors need to change.

**Adapting regulatory methods in a digital age**

The differences between Fintech 2.0 and Fintech 3.0 players create distinct expectations and needs for industry supervision. For start-ups, the high cost of regulation is incompatible with their typically lean business model.\(^4^3\) They prefer the more flexible compliance obligations of a principle-based regulatory regime, under which the spirit of regulation is preferred to ‘box ticking.’ In contrast, rule-based regimes create clear rules and processes. However, the flexibility of a principle-based model creates some uncertainty as to compliance expectations, and the clearness of a rule-based model can limit the incentive to do more.

The solution may lie in going beyond an ‘either-or’ attitude to rule-based and principle-based regulatory approaches. Regulatory obligations should be dynamic in adapting to the size and activity of a business as it grows. In the case of start-ups, investors may prefer the regulatory certainty of the rule-based model.\(^4^4\) The higher compliance costs may then be balanced against the start-up being more attractive to investors. However, rule-based regulatory approaches are more likely to create a barrier to entry, and Fintech 3.0 thus needs a framework that is both balanced and dynamic.

**A case for the development of regtech**

The increased use of technology within the financial services industry gives regulatory bodies an opportunity to access a level of granularity in risk assessments that did not previously exist. Since 2007 there has been increased focus on using market data to better regulate financial markets.\(^4^5\)

Regulatory interest in the fintech sector represents a turning point. Regulators are forward-looking rather than retrospective, looking to support market developments while maintaining financial stability. There are benefits for a regulator to interact early with new fintech start-ups, even if not yet significant. For example, the UK’s Financial Conduct Authority initiated a consultation to understand the regulatory hurdles faced by Fintech 3.0 companies and created an innovation hub to support start-ups from a nascent stage.\(^4^6\) This awareness phase is also seen in Asia.\(^4^7\)

Both the increasingly data-driven aspects of Fintech 3.0 and the fact that young companies rely on new and transparent IT systems allow regulators to explore new compliance mechanisms.\(^4^8\) For example, real-time compliance systems could be requested as part of the licensing process. This would provide regulators and the company with a way to monitor, in quasi-real time, the actions of its staff and identify any non-compliant behaviour. Regulatory models where access to real-time data is traded off for regulatory capital could provide a more appropriate cost of market entry for new companies, as their level of regulatory scrutiny could gradually increase with their growth.

**Conclusion**

This article has illustrated the evolution of fintech through three major eras, culminating in today’s Fintech 3.0. In developed markets, this shift has emerged from the 2008 GFC and has been driven by public expectations, technology companies moving into the financial world, and political demands for a diversified banking system. In developing countries, Fintech 3.5 has been driven by inefficiencies in the existing financial system, deliberate government policy choices and the rapid introduction of new technology.

The fintech sector is attracting the interest of regulators in both developed markets and developing countries. The challenge lies in resolving the tension between a forward-looking framework that promotes innovation, and a sufficiently rigorous framework that maintains market confidence. A common international approach could potentially begin a new era in fintech. However, in our view, more experimentation and innovation is needed in both regulatory approaches and regtech before the time is right to seek their standardisation. It is too early yet to seek international regulatory harmonisation in this space.
The fintech sector is attracting the interest of regulators in both developed markets and developing countries. The challenge lies in resolving the tension between a forward-looking framework that promotes innovation, and a sufficiently rigorous framework that maintains market confidence. A common international approach could potentially begin a new era in fintech. However, in our view, more experimentation and innovation is needed in both regulatory approaches and regtech before the time is right to seek their standardisation. It is too early yet to seek international regulatory harmonisation in this space.

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Notes
1. Hochstein, M 2015, Fintech (the word, that is) evolves, American Banker.
5. The history of fax: from 1843 to present day, Fax Authority.
11. UK Government 2016, Incorporation and names.
12. Let’s Talk Payments 2015, Survey shows Americans trust technology firms more than banks and retailers.
16. We would like to thank David Link for making the point that sophisticated APIs were necessary to underpin much FinTech 3.0 activity, at the Melbourne Money & Finance Conference on 18 July 2016.
18. Marino, J 2015, Goldman Sachs is a tech company, Business Insider Australia, 13 April.
20. KPMG 2013, Financial Services in Africa.
22. Safaricom 2016, M-Pesa timeline.

27. OECD 2012, China and India to produce 40% of global graduates by 2020.


29. Foley, J 2014, Lend and pretend, Breaking Views.

30. Shrader, L and Duflos, E 2014, China: A New Paradigm in Branchless Banking?, Consultative Group to Assist the Poor 37, 42.


32. Smith, G 2015, Alibaba’s Jack Ma shows off new ‘pay with a selfie’ technology, Fortune, 17 March.

33. Pagliery, J 2015, MasterCard will approve purchases by scanning your face, CNN, 1 July.

34. Smith, O 2015, Looking for a UK business loan? Amazon might be the answer, The Memo.


39. Chan, N 2016, Risk based and technology neutral — The HKMA’s supervisory approach to financial technology, HKMA.

40. Alexander, D 2015, 5.6 million fingerprints stolen in US personnel data hack; government, Reuters.


42. Arner, DW and Barberis, J 2015, FinTech regulation recent developments and outlook, AIIFL.


44. Financial Conduct Authority 2014, Project Innovate: Call for input.

45. BBVA Digital Regulation Unit 2016, RegTech, The new magic word in FinTech.


47. Hong Kong Government News 2015, Steering Group on Fintech established, March; and J.D. Alois 2015, Malaysia is first ASEAN country with Crowdfunding laws, Crowdfund Insider.

DISTRIBUTED LEDGER TECHNOLOGY in securities clearing and settlement: Some issues

MARK MANNING, MAXWELL SUTTON and JUSTIN ZHU, Reserve Bank of Australia

This paper explores the potential role of DLT in securities markets, using the equity market as an example. The paper discusses potential benefits and costs, drawing out limitations and challenges in the adoption of the new technology, as well as regulatory considerations. Despite the heightened interest in DLT, the paper concludes that the likely path is incremental adoption of the technology rather than wholesale replacement of the existing infrastructure. An earlier version of this paper was presented at the 21st Melbourne Money and Finance Conference.

There is currently extensive interest in distributed ledger technology (DLT) and its potential application in financial markets. The industry is investing heavily in research and development, either independently or in consortia, to identify use cases and develop workable prototypes of the technology.

Securities markets are a particular area of focus, due to the scope for efficiency gains in existing practices that are often characterised by multiple layers of intermediation and reconciliation. It is anticipated that DLT could reduce back-office processing costs by facilitating anticipatory reconciliation, and potentially (near) real-time settlement.

Background on distributed ledger technology

A distributed ledger is a way of storing information, and recording changes to that information, in a distributed fashion rather than relying solely on a trusted central party. In practical terms, a distributed ledger aims to provide transparency of information to multiple parties in a way that preserves a high level of security and operational resilience. Key features of the technology are:

> **Distribution:** The ledger is ‘distributed’ since it is replicated at each node connected to the network. In an unrestricted application, each of the nodes would have an identical copy of the agreed latest version of the ledger and would be able to access the history of every transaction made through the network.

> **Blockchain:** The ledger comprises ‘blocks’ of information, linked together in chronological order to form a ‘blockchain’ that represents accumulated transactions at a particular point in time. Cryptography is used to underpin the integrity of the ledger and to ensure that it can be relied upon as a single source of truth. Parties that wish to conduct transactions could do so using a digital signature that authenticates a transaction, so that it can be recognised as valid by the network but cannot be used by another party without the cryptographic information.

> **Consensus:** A ‘consensus’ protocol or algorithm is applied to validate new transactions added to the ledger and to ensure the robustness of the ledger to any attempts to subvert the network.

Application of distributed ledger technology in clearing and settlement

The use of DLT in financial markets has emerged only relatively recently. In the past year, a small number of financial market infrastructure (FMI) providers and market operators have either launched applications of DLT or announced concrete proposals for its application. In October 2015, for instance, NASDAQ announced a new trading platform underpinned by a private distributed ledger, Linq, for the issuance of shares by private companies. The first issuance of shares on this platform was conducted in December. In Australia, ASX announced in
January 2016 that it would be working jointly with a technology vendor, Digital Asset Holdings, to develop a replacement for its equity clearing and settlement system based on DLT. And, in April, Computershare announced a joint venture with SETL to develop share ownership registries using DLT.

Beyond the various initiatives that have either been launched or announced, many other market participants are actively exploring a wide range of potential uses for the technology, including to support trading and post-trade functions. There are a number of drivers behind the growing interest in distributed ledger applications in financial markets. Some of the often-cited benefits of the technology include:

> **Data integrity:** Distributed ledgers allow the transfer of value between parties without the need for a central party to verify and facilitate each transaction. Potentially, this would enhance integrity since, unlike traditionally centralised records — which can be modified unilaterally by the central party — a distributed ledger with appropriate cryptographic protections cannot be changed without coordinated action from a sufficient number of colluding nodes. This would allow parties that do not necessarily trust each other to rely on the ledger without the need for a central party.

> **Access to information:** Since the distributed ledger acts as a single source of truth, it could provide users with timely and direct access to reliable information. Potentially, this could in turn: reduce reliance on intermediaries; streamline back-office processes (including reconciliation); minimise disputes and remediation; and improve institutions’ access to information for risk management and planning purposes. And, for regulators, the ledger could provide a consolidated audit trail, with detailed histories of transactions that could potentially also be analysed for supervisory purposes, compliance monitoring and systemic risk assessment, including in a crisis.

> **Settlement lags:** A widely discussed benefit of the technology for financial markets is the potential to reduce settlement timeframes, from several days to close to real time. The potential for increased settlement speed derives from the existence of an immutable record of securities ownership that can be accessed and maintained using DLT. Protocols could potentially be developed that would permit a transaction to proceed only once it has been confirmed (by interrogating the ledger) that the transacting parties have in place the securities and funds required to complete the transaction. The move to such a reduced settlement time could substantially shrink the role of central counterparties (CCPs) in the equities market and reduce capital committed to the settlement process.

> **Disintermediation:** For exchange-traded securities, there are a number of intermediaries in the existing post-trade environment, including CCPs, central securities depositories (CSDs), clearing and settlement participants, other agents such as brokers and custodians. Interactions among these intermediaries under the existing post-trade arrangement are complex (Appendix 1) and reconciliations between the intermediaries are required. Depending on how DLT is adopted within a market, disintermediation could occur, with some intermediaries displaced or their roles fundamentally transformed. There are, however, natural limits to the transformative impact of this technology. For instance, distributed ledgers do not currently have the capability to replace some of the functions of FMIs — particularly those requiring discretion or judgement; for example, it is unlikely that they could manage the replacement cost guarantee or default management functions of a CCP.

> **Operational resilience:** Implementation of DLT could enhance resilience to either a physical disruption or a cyber-attack. Depending on the extent to which write access to the ledger is distributed, multiple iterations of the ledger could offer improved redundancy; an outage at one node does not pose the same risks as an outage for a centralised system. Similarly, from the perspective of resilience to a cyber-attack, a distributed ledger would potentially be much harder to subvert, since an attacker would have to overwhelm a majority of the network, rather than just the central party that manages the network. However, the additional security may be lessened by the fact that a distributed ledger may have a larger attack surface, as it has more access points for potential subversion.
> Smart contracts: So-called smart contracts are contracts written in computer code rather than legal language, which are executed automatically when certain conditions are met. The use of distributed ledgers in conjunction with smart contracts could enable the automation of certain events in a contract’s life-cycle (e.g. payment of a dividend or delivery of collateral). Some applications of smart contracts may require human intervention, which could be handled by suspending execution and waiting for an adjudication. This ‘process orchestration’ could support a wide range of legal contracts, particularly if more routine legal contracts could be standardised. The use of smart contracts introduces new risks, as it may be impossible to ensure that all anticipated events are identified and dealt with. As the decentralised autonomous organisation (DAO) attack discussed below shows, smart contract code may also be taken advantage of in unforeseen ways.

Challenges in adoption
As noted, the application of DLT in financial markets could be transformative in many respects, including in its implications for the roles of financial intermediaries and FMI providers, the nature of financial contracts, and the execution of core back-office processes. The application of such technology could also require changes to underpinning regulation (see below).

There are, however, many challenges in the transition to a new market structure supported by DLT. For instance, DLT will need to interoperate with existing FMIs, at least during the transition period and address the risks and challenges associated with transforming intermediary functions and post-trade business processes that have evolved over many years. These risks are in addition to the technical challenges associated with applying the technology itself (ESMA 2016). It is therefore likely that the technology will be adopted only incrementally, and at least initially in a way that preserves many existing functions, processes and business models. This view is shared by Mainelli and Milne (2016), who conclude from an industry-wide survey that the initial applications of DLT will be ‘based on piecemeal developments’.

A possible adoption path for the technology is outlined below.

Ledgers are likely to be ‘permissioned’, with limited distribution
Trust is paramount in financial markets. Therefore, there may be a natural reticence among financial institutions to adopt an entirely identity-agnostic model, such as the model used in Bitcoin. Rather, many applications in financial markets will most likely involve private ‘permissioned’ ledgers, whereby access to the network is granted only subject to an institution meeting certain standards or criteria. A similar conclusion is reached by Pinna and Ruttenberg (2016) and Mainelli and Milne (2016).

Particularly in clearing and settlement, it is likely that the operators of the existing FMIs will maintain control of their functions and administration of their networks, and retain ownership of associated data in accordance with their rulebooks. An important implication of this is that the cryptographic protocols required to validate new entries to the ledger can be less resource-intensive than in a trustless public network. This may help to ensure that the technology can meet the demanding throughput capacity requirements of a wholesale financial market. Another implication is that the central entity controlling the network can remain a clear ‘focal point’ for regulation and supervision, with such activities potentially able to continue to occur within existing frameworks and according to existing processes.

One challenge with permissioned ledgers is to set access criteria that provide for effective competition on the one hand, while adhering to appropriate standards of safety and security on the other. Such a trade-off is, however, already addressed in existing regulatory standards for FMIs (CPSS–IOSCO 2012). The impact of permissioned ledgers on competition in the provision of clearing and settlement services will also need to be considered.
Applications are likely to work ‘with’ rather than ‘against’ the prevailing operating environment

The current network of intermediaries involved in the existing post-trade network has evolved over many years. These institutions and their roles and functions are well established and firmly embedded in existing post-trade processes. Unravelling, transforming or replacing this structure would therefore be a substantial challenge. The promise of compelling benefits would be necessary to justify the cost of effecting such changes. Furthermore, the distribution of costs and benefits will be uneven, which may result in vested interests seeking to slow the pace of change (DTCC 2016). However, economic incentives such as back-office savings and potential capital reduction could accelerate some aspects of the transition.

Similar challenges have been observed in other market-change contexts. For instance, a study commissioned by the DTCC on shortening the settlement cycle identified such difficulties and also concluded that regulators would need to play an important role in facilitating and supporting any such change (BCG 2012). In addition, the study noted that a seamless transition would require testing by individual institutions and on an industry-wide basis.

Even if the introduction of DLT did succeed in fundamentally reshaping the post-trade structure, full disintermediation would seem unlikely. The barriers of cost, risk and technical expertise requirements may provide a disincentive for end investors to operate their own ledgers. Instead, they would most likely rely on ledger service providers, who would provide the service to multiple users to achieve economies of scale. Therefore, intermediary roles would be transformed rather than eliminated.

Another factor potentially slowing the pace of change is some parties’ reluctance to adopt the new technology before an industry standard protocol has been agreed. While there are opposing views, a number of parties have argued in favour of either a single global protocol or interoperable protocols. In rolling out the technology, parties operating different technologies are likely to need to consider the merits of interoperability so as to avoid fragmentation. While this can potentially slow the pace of innovation, it can avoid remediation ex post to reconfigure to a common standard. Central infrastructure providers can also help to promote a common standard ex ante. Currently, there are a number of industry standard setting initiatives underway.

A full transition to real-time settlement is unlikely in the near term

As noted, DLT offers the potential for a substantially shorter settlement cycle. However, a number of challenges may need to be overcome in the transition to a near real-time settlement model:

- **Industry-wide coordination/changes in market practice:** Imposing changes in market practice often presents a significant barrier to the adoption of new practices or technologies. Many markets, including Australia, have only recently shortened the settlement cycle to T+2, or will shortly do so. This process required a long lead time and significant industry consultation and coordination, for each market. In light of this experience, further progress in shortening the settlement cycle is more likely to occur incrementally, rather than via a single disruptive change. One possible path may initially be to offer market participants a choice between alternative settlement cycles. Since differential pricing of trades settling on different timeframes would be undesirable, it may be preferable for any such choice to be exercised only after trade execution, rather than at the point of trade. This would, however, require securities borrowing and lending to meet delivery requirements if an institution did not have the securities in place to meet a shorter settlement timeframe (see below).
Liquidity impact: Close consideration would need to be given to the liquidity impact of near real-time settlement. Batch settlement processes in many securities settlement facilities, whereby sales and purchases are settled simultaneously at the end of the settlement cycle, generate significant netting and liquidity efficiencies. Depending on the particular settlement model applied, the liquidity required to support settlement under such arrangements is often a very small fraction of the gross obligations. Near real-time settlement would require participants to meet the gross obligations of their activity as each trade is settled, ensuring also that liquidity was available at the point of trade. Liquidity would of course continue to be recycled — an institution could fund securities purchases with funds received from its securities sales — but for a given institution the liquidity efficiency of the settlement process will depend on the particular timing and sequence of its securities purchases and sales.

Availability of securities and cash at the time of trade: Ensuring that securities and cash are in place at the time of trade may present a challenge, especially for market makers and investors using overseas custodians. A move to real-time settlement may therefore require changes and enhancements to the functioning of the securities lending market. A report on shortening the settlement cycle in the US identified similar issues, suggesting that such a move could increase the incidence of failed trades (PricewaterhouseCoopers 2015). Trade management processes might therefore need to be re-evaluated and possibly automated to minimise failed trades and adequately handle failures in this new environment.

Policy considerations

Current regulatory standards for FMIs are designed to be technology agnostic. However, since the application of DLT could introduce significant changes to the way markets operate, regulators will have to assess whether any aspects of the current regulatory framework need to be changed.

More incremental adoption of the new technology in market practices would be less likely to require material regulatory changes. With more transformative change, consideration might need to be given to matters such as the definition of particular clearing and settlement activities, roles of intermediaries, access and privacy. For instance, questions would need to be addressed about the participants’ rights of access to data held on distributed ledgers and their ability to develop new products and revenue streams based on these data.

Given the systemic importance of FMIs, a core focus of regulation, supervision and oversight is stability. Widespread adoption of the technology would require careful consideration of certain aspects including:

Security and consensus: Appropriate governance and risk management of all nodes participating in the ledger are critical. In some consensus models, certain nodes would play a role as validators of transactions. To preserve trust in the system, such nodes would need to be subject to appropriate oversight. Indeed, without such oversight and other controls and incentives, there could be potential for fraudulent activity.

Settlement arrangements: Since any transaction written to the ledger is immutable, there would need to be clarity as to the point after which payments or transfer instructions cannot be revoked, and after which any erroneous transactions would need to be reversed by offsetting transfer instructions. Another important aspect is how the cash leg of a settlement would be supported in a distributed ledger system. While most of the focus on DLT has been on the securities leg of transactions, the cash leg is just as important and would require work to ensure linking of the two parts (Pinna and Ruttenberg 2016).

Operational performance and resilience: A settlement system based on DLT would need to meet established performance standards around throughput capacity, scalability and availability. Furthermore, in transitioning from a centralised system to a distributed system, there may be changes in a FMI’s vulnerability to either physical or cyber disruptions, which would need to be understood and potentially addressed through revisions to relevant physical and information security policies and governance arrangements (ESMA 2016).

Smart contracts: The potential self-executing nature of smart contracts could be a source of financial stability risk, particularly if hard coded algorithms were to replace human judgement in unusual or volatile market conditions. Proponents of smart contracts assert that such risks could be managed within the algorithm, for example by programming in thresholds beyond
which execution requires manual intervention. Furthermore, in the clearing and settlement context, it is currently expected that the application of smart contracts would be restricted to the execution of non-discretionary actions already provided for in the operator’s rulebook. The recent transfer of funds from the Ethereum DAO entity, by an unknown actor exploiting a loophole in a contract, highlights the need for greater consideration of the vulnerabilities that smart contracts could create in a DLT system (Waters 2016).

Closing remarks
As noted, we are at an early stage in the emergence of this technology. Its potential transformative impact is yet to be revealed. There are many challenges in the transition to its large-scale adoption, including the difficulty of unravelling the existing structure and firmly embedded business processes. Economic incentives, including those arising from back-office savings and capital reduction, could nevertheless accelerate some aspects of the transition.

Recognising the potential policy implications should this technology be widely adopted, regulators around the world are watching very closely and engaging very actively in the debate — both within their respective jurisdictions and internationally.

As noted, we are at an early stage in the emergence of this technology. Its potential transformative impact is yet to be revealed. There are many challenges in the transition to its large-scale adoption, including the difficulty of unravelling the existing structure and firmly embedded business processes. Economic incentives, including those arising from back-office savings and capital reduction, could nevertheless accelerate some aspects of the transition.

Appendix 1
Background on post-trade processing in the equity market
Existing post-trade arrangements involve layers of intermediation and reconciliation (Figure 1). Some of these could be eliminated or transformed by the introduction of distributed ledger technology.

To settle an exchange-traded equity transaction, the current process generally consists of the following steps:

1. The details of a trade are submitted to the CCP which reconciles orders and performs novation and netting.
2. Both clearing participants are notified of the trade including information on security payment/receipt and funds payment/receipt. The CSD is also notified of the trade.
3. The clearing participants inform their respective customers/brokers of their obligations and the customers/brokers instruct their settlement participants.
4. The seller (or its broker) submits an instruction for the securities to be transferred from its custodian to the settlement participant’s account at the CSD.
5. a. On the settlement date, funds are transferred across accounts at the central bank.
   b. Securities are transferred (simultaneously, i.e. on a delivery-versus-payment (DvP) basis) from the seller settlement participant’s account at the CSD to the buyer settlement participant’s account at the CSD.
6. Both settlement participants receive confirmation of the completion of the DvP transfer.
7. The purchased securities are transferred from the buyer settlement participant’s CSD account to the buyer’s custodian.
8. When new securities are issued, the securities are added to a CSD when they are ready to be traded.
Figure 1: Current post-trading process in the equity market

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References


Waters, R 2016, “‘Ether’ brought to Earth by theft of $50m in cryptocurrency”, Financial Times, 18 June.
PEER-TO-PEER LENDING:
Structures, risks and regulation

KEVIN DAVIS SF Fin, Professor of Finance, University of Melbourne, Research Director, Australian Centre for Financial Studies and Professor of Finance, Monash University
JACOB MURPHY, Department of Finance, University of Melbourne

In this paper we outline the key characteristics of peer-to-peer (P2P) lending, the risks involved and alternative approaches to regulating P2P platforms. We argue that P2P lending is an example of how modern technology enables the integration of a range of economic functions, including market operator, financial services provider and credit broker. This removes the basis for separate legislative treatment of financial products and credit, and existing regulatory distinctions between different types of financial service providers. Arguably, a new approach to market regulation is warranted which is more consistent with emerging institutional arrangements. An earlier version of this paper was presented at the 21st Melbourne Money and Finance Conference.

Peer-to-peer (P2P) lending involves the matching of borrowers and investors via an online platform with the P2P operator managing the repayment obligations of borrowers, acting as an agent for investors. P2P lending is a fast growing industry globally, both in terms of number of operators and loan volumes. The US and the UK have the most-established P2P lending markets. UK-based Zopa, recognised as the first P2P operator, launched in 2005 while US-based Lending Club (launched in 2007) is the world’s largest P2P operator, having funded over US$20.6 billion worth of loans by June 2016. The Australian P2P lending industry has been slower to develop but now includes P2P operators such as RateSetter, MoneyPlace, SocietyOne, ThinCats and True Pillars.

P2P lending is similar to other platform-based markets which enable buyers and sellers of heterogeneous goods and services to trade, with prices being determined ultimately by demand and supply and, in the short run, by auction processes or fixed-price offers. Examples include accommodation services (AirBnB or Hotels.com), transport (Uber), new and second-hand goods (EBay, Gumtree and GraysWine Online), all of which have been made feasible by modern digital technology.2

There are, however, some important differences. First, P2P operators provide quality assessment of the product (loan) being offered, which is a form of financial advice.3 Second, P2P operators manage (over several years) the subsequent physical delivery to the purchaser (investor) of the obligations (interest and principal repayments) of the vendor (borrower), creating a principal–agent relationship.4 Third, P2P operators provide purchasers with account management (financial) services (investor directed portfolio services — IDPS)5 enabling purchasing (and possibly subsequent resale) and custody of products (loan assets), and receipt (and possible reinvestment in new products, storage, or withdrawal) of cash receipts from products owned.

Development of regulation of P2P platforms in Australia has recognised all of these features (ASIC 2016) but has arguably focused on account management and investment facilitation, which is a feature of both managed investment schemes (MIS) and IDPS (such as operated by stockbrokers). In the absence of suitable legislation, which reflects all of the features outlined above, regulation of P2P operators has defaulted to compliance with MIS regulatory requirements.

We argue that this is not ideal and that P2P platforms (and associated services) are an example of a more general integration of the provision of a number of economic functions made possible by ‘fintech’.6 This warrants reassessment of the current legislative framework which is based on treating those functions as being provided separately by separate entities, as was the case under older technology. Specifically, we argue that P2P platforms combine the functions of
a market (exchange) operator and a provider of financial services (individual account and trading facilitation), as exemplified by stockbrokers (market participants). It is particularly important that fintech can enable direct access to the market by end-users (without the need for a broker or a designated market participant) and integrated provision of those functions listed above. This removes the case for a regulatory structure based on a distinction between market operators and financial services providers (market participants) which is a special case of non-integrated provision resulting from old technology.

ASIC (2013) notes that its Regulatory Guide 172 regarding market operator licences will be reviewed in total in ‘due course’. We suggest that this needs to be undertaken in the context of the now (or emerging) feasible integration of market operation and associated services (such as IDPS or IPO bookbuilds for new security issuers) due to fintech, to recognise that separate specialised treatment of market operators is no longer appropriate (but may be a special case of a more general approach). As part of that more general review, P2P regulation could be shifted from the MIS category (which itself may be a subset of the more general approach) to a new ‘omnibus’ regulatory model.

We first outline the key features of P2P lending, then consider risk characteristics which give rise to regulatory concerns before examining the options for regulation.

**Structures: Key characteristics of P2P lending**

The focus of P2P operators has predominantly been personal and small business loan markets, but it is expanding into an increasing number of different loan markets such as trade credit and mortgages. P2P lending is often thought of as connecting retail investors and borrowers, but has evolved such that on some platforms the majority of investor funds come from institutional investors. This has led to the term ‘marketplace lending’ also being used to describe P2P lending.

The attraction for borrowers is the potential to access credit (if rejected by traditional lenders) and/or the possibility of receiving more attractive interest rates. While traditional intermediaries can use risk-based pricing and ‘new’ forms of credit-relevant information (such as social media), their limited use of these has been one factor providing growth opportunities for P2P platforms. Investors are attracted by access to different asset classes with risk-return characteristics that may appear superior to traditional investment options. Personal loans, for example, have traditionally been the domain of banks and credit unions. P2P lending allows investors to directly invest in this asset class and potentially benefit from any associated yield premiums.

P2P lending is an innovation that uses new techniques to overcome financial frictions such as information asymmetry and transactional costs. Ultimately, long-run viability will depend upon whether new technology and techniques for assessing (and managing) borrowers and matching them with investors leads to reduced operating costs and/or better risk assessment than traditional intermediation. It will also depend upon the interest of investors in the risk-return features offered and the compatibility of outcomes with investor expectations.

The P2P operator uses the online platform to directly match borrowers and investors rather than acting as a traditional financial intermediary (see Figure 1). The P2P operator will perform a proprietary credit assessment of potential borrowers. If deemed creditworthy, their loan request will be anonymously listed on the platform, together with risk-related information, for investors to fund. Investors select the loans or type of loans based on their individual risk appetite. Investors are either forced or highly recommended to invest in smaller fractions of multiple loans rather than being exposed to the risk of investing in a single loan. Once (if) the loan has been fully funded the borrower is granted the loan. The P2P operator will perform ex post monitoring and management of borrowers on behalf of investors.
P2P operators do not typically invest any of their own capital into loans on their platform and thus are not exposed to the credit risk despite being responsible for the credit assessment of borrowers. The main source of revenue for P2P operators is borrower transaction fees from matching loans on their platforms. This creates a principal-agent problem as P2P operators have a short-run incentive to maximise loan volume, which could influence the stringency of their credit assessments. Competition between P2P operators for borrower listings could also have similar effects.

However, the long-term viability of P2P operators depends ultimately on meeting investor expectations, providing a long-run reputational incentive to maintain the integrity of the credit assessment process. But potential reputational spillovers mean that operational failures or poor performance of ‘fly by night’, or incompetent, operators can pose reputational risks for other industry members. Thus, some method of imposing minimum quality standards on entrants is important for existing operators as well as for consumer protection.

Murphy (2016) defines two different types of P2P lending operating models in use around the world. The first is the Active P2P Lending Model that enables investors to directly select loans from those listed. Investors see information arguably related to the anonymous applicant’s creditworthiness, such as annual income, home ownership status and the purpose of the loan. This model contrasts with the Passive P2P Lending Model whereby investors select their desired risk category and loan maturity and the P2P operator will match them to a set of loan applications which meet these criteria. Investors are only aware of the average characteristics of categories of borrowers rather than the specific characteristics of the borrowers they have financed. Arguably, passive model operators are exposed to a greater reputational risk from investments not meeting an investor’s reasonable expectations. Thus passive model operators implement a provision fund discussed below.

A major challenge for both model types is to set the interest rate on loans to efficiently equate the flow of loan demand and supply of funds (Murphy 2016). The first of three different approaches is to allow the borrower to set the maximum rate at which they are willing to borrow (above some risk-related, operator-determined, minimum rate) and for investors to then bid for the loans in an auction process. If there are sufficient bids to fully fund the loan by the auction closing date, the interest rate is set, if it is a uniform rate auction, at the highest successful bid. If it is a mixed rate auction, investors receive the rate that they bid and the borrower pays a weighted average of all the successful bids. If the loan is not fully funded by the auction closing date, the loan is withdrawn from the platform and investors can invest their funds in other loans. Only active P2P model operators use this method.

The second approach, used by some active and passive P2P operators, is to set a rate based on the proprietary risk grade assigned to the loan. This creates the risk of an excess supply of funds (and rapid funding of the borrower) or a deficient supply of funds (and non-funding of the borrower). In an active model, that can occur at the individual borrower level while, in a passive model, the operator will need to determine some way (such as by adjusting interest rates) to equilibrate aggregate demand and supply for the particular risk category.

The final approach used by P2P operators is to operate a market similar to a stock market order book. Based on their level of risk and the maturity of the requested loan, borrowers receive an indicative estimate of the interest rate they could receive in the market. The borrower sets a maximum rate at which they are willing to borrow. Investors also see the indicative market rate
for the different investment options and set the minimum rate at which they will invest. The P2P operator then matches investors and borrowers whose bid and offer interest rates are compatible (and which generate the required level of funding) to originate loans. This method is currently used only by passive P2P model operators.

Both active and passive model types either force or strongly recommend that investors implement diversification. However, investors have less control over their level of diversification under a passive model as the P2P operator selects the number of borrowers funded by an investor. Passive model operators counteract this potentially higher risk for investors by typically implementing a provision fund in an attempt to cover any potential capital losses investors may experience. Borrowers pay a fee into the fund when applying for the loan and the fund is designed to grow to exceed the expected default rate on the platform such that investors at least receive a return of their capital. Thus investors’ exposure to borrower default risk is reduced.

Risks of P2P lending

P2P lending involves a range of risks for poorly informed participants, which regulators are rightly concerned about.

Default risk and poorly informed investors

P2P operators are providing access to asset classes to which investors have previously had limited, if any, exposure. Investors may not understand the true nature of the risks of P2P lending and rely, to some degree, on the integrity, accuracy and consistency of the P2P operator’s risk assessment. To help alleviate concerns, P2P operators publicly release details and risk characteristics of all loans on their platform. Such transparency decreases the level of informational asymmetry between the investor and P2P operator.

Investors must also assess the appropriateness of the credit spreads provided across the risk spectrum of borrowers. P2P operators use risk-based pricing and investors can, in principle, use the publicly available information to assess the consistency of a P2P operator’s risk assessment with their own.

Even if investors understand the risk, the issue remains of what rate of return they should expect. Intuitively, a P2P investment is approximately equivalent to holding both equity and deposits in a depository institution specialising in the same type of loans. Consequently, the required return of P2P investors should be similar to the weighted average cost of funds of a similar depository institution. This highlights the fact that long-run viability of P2P operators will depend upon comparative operating cost and risk assessment abilities.

Financial advice

P2P operators perform a function equivalent to a credit rating agency when they provide risk grades of potential borrowers. This is a form of financial advice to potential investors and raises the issues of the quality of such advice and the potential for conflicted remuneration arrangements. Further potential advice-related risks arise if the marketing of P2P investment opportunities involves relationships with financial advisers.

Investment illiquidity

The maturity matching of borrowers and investors makes P2P investments largely illiquid. There is the potential for P2P operators to develop secondary markets and many P2P operators do provide such a facility. Asymmetric information should not be an impediment to secondary markets given publication of borrower characteristics and repayment performance of loans. In such circumstances, investors wishing to sell loans have no superior information to potential purchasers, thus alleviating the adverse selection problem that can otherwise impede market development.

Agency risk

Investors face the risk that a P2P operator may cease operations due to unprofitability of the business model or operational events such as failure of the platform software, even though borrowers are not in default. In that case, the problem arises of how the management of ongoing borrower repayments and their transmission to investors is to be handled. While transfer of the ‘loan book’ and investor accounts to another operator is one possibility under the direction of an administrator or liquidator, this would most likely involve significant losses to investors.
Risks for borrowers
Australian credit regulation imposes a number of constraints upon retail lenders. One is ‘responsible lending’ requirements imposing an obligation to assess the suitability of a loan given the borrower’s personal circumstances. It is not clear how this accords with P2P lending involving many investors (lenders) and where the P2P operator in effect facilitates rather than makes the loan. Currently, P2P operators are required to hold an Australian Credit Licence given that facilitation role. Rejection of potential borrowers for whom a loan is unsuitable is one way of meeting responsible lending requirements, but arguably so is assigning a credit grade that reflects an assessment of the likelihood of default.

Another potential risk for borrowers arises from the nature of loan collection and default management policies.

Regulation of P2P lending
Regulators around the world have been developing regulatory responses to the new operating models in the P2P lending industry. The objectives are to ensure investors and borrowers are protected from fraud and mis-selling of products while not stifling potential benefits from financial innovation. In some jurisdictions, regulators have attempted to fit existing legislation to P2P lending, while others have implemented specific P2P lending. In this section, we consider how P2P lending overlaps with a range of specific extant regulatory arrangements and argue that it provides an informative example of how ‘fintech’ is making those arrangements less relevant. Arguably, a rewriting of legislation to facilitate new types of financing arrangements is required.

Despite both banks and P2P operators competing in loan markets and raising funds from retail investors, P2P operators do not come under bank regulations such as Basel III capital and liquidity requirements. This reflects the passing on of credit and liquidity risk to investors. Whether this gives P2P lending a regulatory cost advantage over depository institutions is unclear since, as outlined earlier, a P2P investment is broadly equivalent to a combined investment in bank equity, deposits and debt. The answer hinges, inter alia, on whether costs to banks of minimum capital (and other) regulations offset the benefits of explicit and implicit government guarantees, about which there are conflicting views.

Australia regulates P2P operators under a MIS framework (ASIC 2016). This existing legislation was not designed with P2P lending in mind but ASIC has required (in the absence of an obviously better legislative alternative) P2P operators to fit into this structure. Arguably this is the wrong model (although existing P2P operators appear comfortable with what has emerged). First, investors are not involved in a ‘collective’ investment where all have pro rata share in a common set of assets. Second, MIS do not, in principle, originate new securities, but enable investment in a diversified portfolio of existing securities. In practice, this has not always been the case, with MIS encompassing mortgage trusts, REITs, and agribusiness where assets (real or financial) have been originated and managed by the Responsible Entity (RE). Experience suggests that this is not necessarily an ideal approach, and the RE model seems more suited to schemes where investments take the form of purchases of existing securities with market-determined prices and with limited operational activities (which affect the value of the assets) being required of the manager. This is not the case for P2P lending.

Rather, P2P platforms are primary markets for new securities in which prices are determined, but where the P2P operator also acts similarly to investment banks or stockbrokers when they enable an IPO for listing on the stock market. The P2P operator completes the risk assessment and enables the distribution, however, they do not underwrite loans. On this interpretation, a critical issue is essentially what ‘prospectus’ requirements should be applied regarding the P2P operator acting as the agent for the individual issuer of the securities. Also on this interpretation, regulation should relate primarily to the information made publicly available about potential borrowers, and also subsequent loan performance as an indicator of the reliability of the agent (the P2P operator) in providing relevant ex ante information. However, the involvement of the P2P operator in managing the assets suggests that this is only part of the relevant approach, and minimum standards to limit the operational risk (e.g. of platform failure) would also seem relevant.
Despite both banks and P2P operators competing in loan markets and raising funds from retail investors, P2P operators do not come under bank regulations such as Basel III capital and liquidity requirements. This reflects the passing on of credit and liquidity risk to investors. Whether this gives P2P lending a regulatory cost advantage over depository institutions is unclear since, as outlined earlier, a P2P investment is broadly equivalent to a combined investment in bank equity, deposits and debt. The answer hinges, inter alia, on whether costs to banks of minimum capital (and other) regulations offset the benefits of explicit and implicit government guarantees, about which there are conflicting views.

The potential for P2P operators to develop secondary markets suggests that regulation as a ‘market operator’ might be even more appropriate. But here the distinction between financial products and credit facilities in Australian legislation creates complications. The Corporations Act 2001 defines a financial market as a facility where acquiring and disposing of financial products regularly occurs. The Act generally excludes credit facilities from its definition of a financial product. If a P2P operator was considered to be providing or facilitating provision of a credit facility to borrowers, the operator would not appear to be running a financial market. From the investor perspective, their investment could be considered as a financial product. Thus operation of a secondary market matching buyers and sellers would appear to involve running a financial market but, if it were itself an intermediary acting as buyer and seller, arguably it would not be considered a market operator but instead would be acting as a market maker. The P2P operator would be providing a financial service rather than operating a market.

While the loans issued on their platform do not sit on the P2P operator’s balance sheet they play an important role in managing the assets, quite different to the activities of a traditional exchange. This structure makes the P2P platform somewhat comparable to a special purpose vehicle (SPV) used in securitisations, where securities are originated and placed into a structure that obtains funding from investors. However, there are a number of differences. Typically in a securitisation, the origination occurs separately to the ultimate investor funding (via warehouse or deposit funding). Also, in contrast to an SPV (where third-party insurance or guarantees may be incorporated), the P2P operator does not provide any implicit backing of loans and there are no equity tranches to help overcome information asymmetries or pre-payment risks. Nevertheless, there are apparent similarities between a P2P platform and a securitisation master-trust arrangement, which involves a number of separate securitisations in which investors have claims on different loan pools.

Yet another perspective in considering regulatory arrangements is to note that P2P operators play a role similar to credit rating agencies, assigning risk grades and receiving fees from potential borrowers. But whereas ratings agencies provide advice about financial products and are regulated because of potential influence on investor decisions, P2P operators provide advice about credit risk associated with provision of a credit facility, and thus may be more akin to a credit bureau, which is not treated as providing financial advice. Australian legislation treats financial products and credit separately and therefore is not well suited to dealing with situations such as P2P lending where the individuals are investing in a financial product which is simultaneously a credit facility.

Another important consideration is that P2P operators also provide individual managed accounts for investors, and enable end-user investors to interact directly with the market rather than through designated market participants. Because funds are required to be in place in an account on the platform prior to submitting demand for securities and ultimately investing in them, and because of the advances in digital information technologies, the traditional need for designated market participants to reduce transactions costs and settlement risks is removed.
Modern technology thus requires a rethink of the structure of capital markets regulation which involves distinctions and separate regulation based on institutional practices and arrangements emanating from older technology. P2P lending is special case of fintech developments creating the possible need for of a more general regulatory framework, including rethinking the separate legislative treatment of financial products and credit.

Currently, regulation of market operators is separate from regulation of market participants as financial services providers. That latter regulation encompasses concerns about operational risks and financial advice. What the P2P development shows is that, with modern technology, there is not necessarily any natural distinction between a market operator and a financial services provider. Indeed, there is no obvious reason why the one entity could not operate a market for particular securities, provide direct access for end-user investors and issuers of securities, provide managed accounts for investors which include provision of deposit-like facilities, and manage the flow of payments from securities issuers to holders of those securities.

Modern technology thus requires a rethink of the structure of capital markets regulation which involves distinctions and separate regulation based on institutional practices and arrangements emanating from older technology. P2P lending is special case of fintech developments creating the possible need for of a more general regulatory framework, including rethinking the separate legislative treatment of financial products and credit.

Conclusion
ASIC (2013) notes the case for updating market operator regulation and we argue that P2P lending provides a clear example of the need for this, to allow for the integrated provision of a market and a range of financial services. It is important to develop a regulatory structure more consistent with emerging institutional arrangements, which are potentially more efficient than traditional business models and which incorporate a different range of risk characteristics.

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We are grateful to Martin Joy for valuable comments on regulatory issues and to several P2P operators for providing us with valuable insights. Any sins of omission or commission are our responsibility alone.

Notes
1. This paper is partly based on work undertaken for an Honours thesis in the Department of Finance, University of Melbourne and subsequently under a Kinsman Studentship.
2. Einav et al. (2015) analyse these types of peer-to-peer markets and discuss issues involved in their regulation. They note that in fast growing and evolving industries, regulations that appear sensible at an early stage may soon become unsuitable. On the other hand, in platform businesses where there may be significant network and scale economy effects, early stage regulation may be appropriate to influence emergence of a desirable industry structure and conduct.
3. Quality assessment of vendors or products (or purchasers) on other platform markets is typically via participant ratings.
4. Another principal–agent relationship is created when (some) platforms allocate investors’ funds to loans meeting specified criteria (e.g. risk grade and or maturity).
5. A definition of IDPS and relevant regulation can be found in ASIC (2015).
6. Thus, whereas much discussion of financial innovation relates to potential for ‘unbundling’ of economic functions (such as in the case of securitisation enabling separation of origination and funding of loans), we note that it may also provide new opportunities for ‘bundling’.
7. Some operators have introduced ongoing loan management fees charged to borrowers, rather than solely upfront fees. Thus they have a credit risk exposure due to revenue loss if borrowers default. In this case moral hazard concerns may be reduced.
8. That does, however, raise the potential for such requirements to act as a regulatory entry barrier to the benefit of traditional intermediaries or existing P2P operators.
9. There are obvious differences due to the illiquidity of the P2P investment, and the need for depository institutions to hold liquid assets to deal with depositor withdrawals.
10. ASIC has exempted certain organisations that offer market-type functionality from obtaining market licensing.
References


Understanding consumer credit data

Credit data has a unique position in the data spectrum. For centuries, lenders have grappled with issues associated with understanding the creditworthiness of a borrower. The advent of computing power and digitised data has shifted credit assessment from an art practised by experienced credit professionals to a science performed by data analysts trained in statistics. However, the fundamentals of considering the likelihood of a borrower repaying a loan have not changed.

Consumer credit data is typically used to address two questions:

> What is the willingness of the borrower to meet their loan obligations?
> What is the capacity of the borrower to meet their loan repayments?

Willingness deals with a borrower’s propensity to comply with their contractual obligations and is typically assessed using models that use historical information to predict future performance.

Capacity involves the assessment of a borrower’s financial position to determine whether they have sufficient surplus income to meet their repayments.

Credit data is a key ingredient in addressing the information asymmetry between lenders and borrowers.

High-quality credit assessment and allocation of loan funds provide benefits to society by reducing the costs associated with repayment uncertainty. Simply put, when lenders can’t distinguish between ‘good’ and ‘bad’ borrowers, all borrowers are charged an average interest rate that reflects their pooled experience. This type of cross-subsidisation means that borrowers with productive uses for loans are cross-subsidising less qualified borrowers who are less likely to put their loan to productive purposes. In addition, lenders charge a premium to cater for a level of uncertainty in the risk rating process, adding unproductive costs to the economy.

In Australia, two significant legislative interventions, National Consumer Credit Protection (NCCP) and Consumer Credit Reporting (CCR), have attempted to introduce better use of credit data into the Australian financial services industry to address the issues of willingness and capacity. In both cases, the legislation has not solved the problems identified without unintended consequences.

CCR and why has it hit roadblocks

Proponents of credit bureaus have long advocated that increasing the amount of data available to lenders provides significant economic benefits. Their calls were heeded by government, leading to the introduction of legislation enabling a new credit reporting regime (CCR) in March 2014. However, two years after legislation was introduced, the additional data elements are still not being shared among lenders.
The lack of uptake of the new credit reporting framework has led the government to request the Productivity Commission to consider recommendations for improving participation in such initiatives. CCR is symptomatic of the complex issues involved in regulating the availability of private sector data. On the one hand, large incumbent lenders such as the major banks are reluctant to share their customer data with other lenders while, on the other hand, new marketplace lenders are actively lobbying for access to bank data.

While Australia has been slow to embrace CCR, New Zealand has made significant advancements in CCR with both consumers and participating lenders beginning to reap benefits. New Zealand CCR legislation was enacted in April 2012, two years before Australia, and they now have around 65 per cent of CCR data being shared among lenders.

There are a number of reasons why the pace of CCR has been faster in New Zealand, three of which are significant:

> The New Zealand consumer credit market is dominated by one lender — a structure that encourages the second tier lenders to share their data — (i.e. against ‘the common enemy’).
> Important operational elements are contained in the Credit Reporting Code in New Zealand rather than the Privacy Act (i.e. ‘black letter law’).
> The principles of reciprocity are less complex than those in Australia.

Proponents of credit data sharing point to benefits in terms of reduced losses and increased availability of credit. However, in the long run, these benefits do not accrue to the incumbent lenders. In a competitive market, the marginal price benefit of better credit assessment will ultimately accrue to the borrower and not the lender.

In Australia’s oligopolistic market where major banks provide around 70 per cent of consumer loans, there is little commercial incentive for them to share information with other lenders, particularly if the cost and compliance risk of sharing information is high relative to the benefits. The cascading effect is that only the smallest lender has commercial incentives to share data.

Why are large incumbent lenders in Australia so reluctant to share their data? Basically, because they are being asked to fund changes that result in social benefit but no commercial benefit to them. Incumbent lenders also argue that they have made considerable investments in managing and maintaining credit data for many years. By providing this data to competitors, the value of their data asset will diminish with no compensating increase in value.

The rigid legislation, standards and consequences of non-compliance surrounding CCR data sharing in Australia has created a very difficult and complex environment for lenders. The costs to develop systems that comply with the regulatory and legislative requirements of the new credit reporting regime are high. At the same time, they face uncertainty about how the rules will be interpreted and applied. Faced with these realities, it is more cost effective for incumbent lenders to ‘do nothing’ in relation to CCR and deploy resources to investments that offer better returns or deal with more pressing regulatory demands.

In some jurisdictions, government is mandating the sharing of data to promote competition and growth in financial services. The Productivity Commission has been asked to consider this option in Australia.

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The rigid legislation, standards and consequences of non-compliance surrounding CCR data sharing in Australia has created a very difficult and complex environment for lenders. The costs to develop systems that comply with the regulatory and legislative requirements of the new credit reporting regime are high. At the same time, they face uncertainty about how the rules will be interpreted and applied. Faced with these realities, it is more cost effective for incumbent lenders to ‘do nothing’ in relation to CCR and deploy resources to investments that offer better returns or deal with more pressing regulatory demands.
NCCP — the importance of data
Recognising the consequences of overreliance on data-driven predictive models by lenders, regulators in many countries have introduced a range of responsible lending obligations. Among other requirements, the responsible lending obligations require lenders to make reasonable inquiries about the consumer's requirements and objectives, make reasonable inquiries about the consumer’s financial situation, and verify the consumer’s financial situation.

While many lenders argued that they were already meeting these obligations, the effect of the legislation was that they needed to be able to demonstrate and provide evidence of compliance with the legislation. Much of the data required to support compliance was not available in digitised format (e.g. payslips, expenses) or not readily accessible from systems (e.g. taxation data, multi-bank statement data, loan repayment data). Nor is any of this data available via the consumer’s credit bureau report.

The unintended consequence of responsible lending obligations under NCCP has been higher cost back-office processing, longer lead times to decisions, high drop-out rates through the application process and general irritation among lenders and their customers. Lenders continue to grapple with ways of making this process more efficient through digitisation. The advent of distributed computing (the internet of things) and software as a service has provided a range of technical solutions. There are a number of examples where third parties have stepped in to provide consumer-controlled data sharing. Methods to obtain customer financial transaction data online (e.g. Yodlee, Mogo) have emerged as well as Optical Character Recognition (OCR) techniques for capturing salary information. While these emerging technologies are being developed, criminal opportunists continue to expand their methods of identity theft, cyber fraud and information falsification. At the same time, privacy and consumer advocates are actively opposing potential solutions that threaten consumer protection.

Why is a new approach needed?
The examples of CCR and NCCP demonstrate the difficulty in satisfying the myriad of stakeholders interested in credit data. Prescriptive legislation can be an impediment to optimising the use of credit data (e.g. CCR) while principles-based legislation can create significant costs if not considered in the context of credit data (e.g. NCCP).

The challenge we face is how to manage the market for credit data, which is well summarised as follows:

What is the allocation of surplus gained from the usage of individuals’ personal data? How should that surplus be allocated — based on market forces, treating privacy as another economic good, or based on regulation, treating privacy as a fundamental right? And should an allocation favor the data subject as the owner of the data, or the data holder who invested in collecting and analyzing the information?

When new data is shared it changes traditional information asymmetries which, in turn, advantages some participants over others:

In choosing the balance between sharing or hiding personal information both individuals and organisations face complex, often ambiguous, and sometimes intangible trade-offs.

The principles for data sharing presented by the UK Government provide a useful foundation for considering how credit data should be shared:

> For data sharing to be useful to users, it should be simple, low friction and scalable.
> Users should provide fully informed consent before their personal data is shared and should remain in control of how it is used.
> To create optimal conditions for innovation, datasets that do not contain personal or commercially sensitive information should be made as accessible as possible.
However, these principles need to consider the unique aspects of credit data, particularly recognising its distinct purpose (i.e. assessing willingness and capacity) and need for prudential oversight to prevent adverse financial system outcomes. The cost of maintaining the veracity of the data must also be considered, particularly incentives for the custodians of the data to continue to invest in its development.

There are two issues that Australia is currently dealing with regarding data sharing for credit assessment:

- limited data access where good information is not available
- oversharin where unreasonable intrusiveness into people's lives compromises their privacy without providing sufficient benefit to suggest as a society we should allow it.

**Issue 1 — Limited data access**

It turns out that most of the data needed to assess credit is well known and the gaps are clear-cut. Global evidence suggests that around 80 per cent of the predictive power of credit risk models comes from the same data it did 20 years ago. In Australia, the lack of positive credit data (evidence of good as opposed to poor borrowing behaviour) is a clear gap, along with evidence of the individual’s ability to repay loans. Legislative efforts to address these two gaps have had less than ideal results due to limited data access, despite the black letter law changes.

**Issue 2 — Oversharing**

At the other end of the spectrum is the problem of oversharing. We live in an increasingly data rich world. However, not all data that can be provided is relevant for credit assessment and, in many cases, there is a risk that lenders who ask for the data will use it poorly (creating more credit risk cost for society). How can this data creep be managed? How can we stop overzealous risk departments who might trawl social media accounts and employ big data techniques with dubious predictive value and clear exogenous costs to the consumer?

Historically, credit data has been furnished by third parties (e.g. credit reporting agencies) and by the individuals themselves (in the case of income and expenses). However, there is now an opportunity for an enlarged role for the individual in enabling sharing (via new technology and new business models) that can address the limitations of the current approach. With an access regime that enables the consumers to share what they want, the intervention of other market participants whose incentives are less aligned (e.g. incumbents, new entrants, regulators, consumer and privacy advocates), can be avoided.

Organisations feel they possess and therefore own data in its electronic form and reject the idea of being compelled to share it. Customers of those organisations feel free to do what they want with information on their dealings with those organisations. However, customers cannot gain as much value as they would like because without the support of the data source, the information cannot be verified. Nor can it be ingested electronically into other business processes without the support of some form of online platform.

A way through this problem (of overlapping assertions) is to assert that customers own their data (even if they don’t possess it electronically) and that a policy preference is that the veracity of the data be easily confirmed — so that the customer has the right to ask this of the data source as the default position (in the absence of a negotiation to a different position).

Verification necessarily involves the input of the data source, possibly to provide data in a useful electronic form but, more importantly, to ensure that in the provisioning of this data, its authenticity is confirmed. If consumers had access to their data in this way, they could begin to evolve their role as providing access to their micro credit bureau — a ‘credit bureau of one’.

**A new approach — the right data, accessed and used correctly**

Black letter law solutions haven't been as successful as originally anticipated. Legislating data fields to share doesn’t enable the dynamism required to evolve the use of data over time. But allowing a ‘free-for-all’ approach will unnecessarily lead to data creep and intrusion into people’s lives.

The issues can be defined in terms of data access (supply) and data usage (demand).
In this paper we argue for two key mechanisms:

> **Data access (supply)** enables consumer access to their data in a way that allows them to share this data within the lending process. This builds on existing privacy law and prevents agents with misaligned incentives from restricting the use of important data.

> **Data usage (demand)** can be addressed by vigorously supervising the use of data in credit models to prevent data creep by overzealous credit departments without limiting the ability of the sector to innovate over time.

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**Data access (supply)**

Data access is usually constrained because of the data sources’ assertion of property rights over the data and belief (often rightly) that holding on to the data gives them a competitive advantage. The problem is that they are actually asserting the value of possession — both the consumer and the corporate data source have recognised rights to what is in a sense common property. The individual’s rights arise from the fact that they have access, via portals and paper copies, to some aspects of their data, and they also have rights under privacy law to all the data held on them. To resolve this issue, the existing privacy law right of access for individuals needs to be strengthened.

On the flip side, data sharing happens all the time when corporates see mutual self-interest — the issue is more that in doing so they are often breaching the reasonable expectations of the consumer and possibly operating in a privacy grey zone. This is where the risk of oversharing creeps in. Again, privacy law deals with this with the test of the reasonable expectations of individuals. But, to manage the data economy for social good, the systemic use of data (rather than data breaches) needs to be the primary goal of privacy supervision.

If we talk about using privacy laws to enhance both access to and control of data use, then consumers need to be able to access their data at scale (i.e. electronically), in a way that can be efficiently ingested into other business processes (via API) and in a way that confirms the veracity of the data. This is beyond an individual’s capacity, but third-party services can and do enable individuals to access their data in this manner. The crucial point of difference is whether the third parties act for the consumer or the lender. New technology enables the consumer to share their data by enabling them to collate their information and then share it directly with a business process (such as a loan application). This is to be contrasted with the means of sharing CCR data, via credit reports, where the method is for credit bureaus to share personal data from one lender with another without the direct permission and control of the individual. This distinction is crucial because within it is the paradigm shift towards consumers’ control of their data — which incorporates elements of consumer data sovereignty and privacy by design.

The issue is that without creating an obligation for data sources to participate, the services resort to impersonating the individual, which creates significant issues in terms of information security and breach of the individual’s obligations to keep passwords secret. The way the Australian Government enables verification of identity (the Document Verification Service (DVS)) is a great example of a sensible way to achieve this goal, however, the Australian Government is a willing data source.

The UK Government’s midata programme is another example of government providing a mechanism for consumers to have access to the information that companies hold about their transactions in a machine-readable and reusable format. The UK Competition and Markets Authority (CMA) recently announced that it is implementing a package of reforms that will enable personal customers and small businesses to share their data securely with other banks and with third parties. These type of changes will enable a new ecosystem to assist consumers to share their data with prospective lenders for the purpose of credit assessment. However, the DVS example illustrates the need for controls to ensure third parties meet information security and privacy standards.
Data usage (demand)

In terms of the use of data, existing supervision models for banking translate readily to data usage but obviously supervision scope would need to expand beyond banks and incorporate data usage criteria.

Allowing use of shared credit data without appropriate prudential controls can lead to adverse market outcomes. Australian banks have a long history of being able to weather adverse economic conditions through the prudent management of risk and oversight by the regulatory authorities. The risk in providing inexperienced lending organisations with open access to data is that they may not have the capability to appropriately and prudently manage the data. The recent issues facing Lending Club in the US provide evidence of the need for strong prudential supervision when inexperienced lenders are confronted with the realities of the financial system.

In order to deal with these additional data-related usage issues, we believe that instead of major black letter law, what is needed is a pooled data regulatory approach across the three regulators that all have part of the remit: APRA, from a banking prudential perspective; ASIC, from a responsible lending perspective; and the Information Commissioner, from a privacy perspective.

Conclusion

To improve the predictive capability of credit models and keep up with market trends, technology changes and shifts in consumer behaviours, lenders need to continuously explore and analyse alternative sources of credit data. However, misuse of credit data can create systemic issues in financial markets and compromise consumer privacy.

To enhance the availability of high-quality credit data, there should be a focus on both data access (supply) and data usage (demand):

> **on the supply side** — creating a data verification obligation to support the individual’s right of access to their data to enable other lenders to request data directly from consumers

> **on the demand side** — requiring that any organisation using data to evaluate credit be supervised in terms of the type of data they use and the method by which it is assessed. This addresses concerns of data creep and poor lending practices; the former is a privacy issue and the latter is a systemic financial system failure issue.

A permission-based credit data regime requires a supervisory model that takes a systemic, structured approach, balancing positive economic outcomes with appropriate consumer privacy protection. A regulatory mandate, which combines aspects of prudential, consumer and privacy regulation with data-focused economic analysis, is crucial to support the development of a dynamic data economy, particularly in financial services. This may require the combined effort of agencies such as APRA, ASIC, Privacy and Treasury or a new organisation that leverages the relevant strengths of these agencies. But, in order for Australia to achieve a thriving data economy, good policy making around data use and access must become a central rather than an incidental issue, as is currently the case.

Notes


12. *FOS Determination 422745 on 21 April 2016* is an example of rulings that considerably alter the way that lenders report and use CCR.


16. Based on benchmarking work that the authors conducted for six lenders in Australia before and after the NCCP regulatory change.


18. Ibid. Acquisti et al.


20. FICO 2015, ‘Can alternative data expand credit access?’, *FICO Decisions, Insights Whitepaper*, no. 90

21. See, for example, [Data Republic](https://www.datarepublic.com).


PREDICTION MARKETS ON CROWDSOURCING PLATFORMS: Potential gains for corporate governance and current case studies

KARL MATTINGLY, CEO, affiliated with Almanis, Percypt and Dysrupt Pty Ltd, Melbourne
ANNE-LOUISE PONSONBY, Professor of Epidemiology, affiliated with Population Health, Murdoch Childrens Research Institute, Royal Children’s Hospital Melbourne, School of Population and Global Health, University of Melbourne and Member, Dysrupt Advisory Board

Crowdsourcing platforms can enhance an organisation’s management decisions and governance, by harnessing the ‘wisdom of the crowds’. Prediction markets go one step further: to also provide an iterative summary signal of the crowd estimate back to participants. Evidence is accumulating that prediction markets can perform better than opinion experts, management consultants and surveys under specific conditions. Multinational and other companies are currently using prediction markets predominantly for improved information delivery, and adopting reward structures to induce informed participation by employees. This is an abridged and revised version of a paper presented at the 2016 Melbourne Money and Finance Conference.

In the internet age, teams are accomplishing complex tasks in management. However, relatively little attention has been directed towards optimising work group processes to reduce random or systematic error (bias) in order to improve performance and optimise decision making. Internet-based prediction markets have been developed to meet this need. Prediction markets can be used for forecasting and the performance of responders can be assessed when the future event actually occurs. Combinatorial prediction markets forecast the likelihood of combined events.¹

Here, we aim to compare traditional open group work to internet-enhanced crowdsourcing and, in particular, prediction markets. We describe prediction markets and how their performance compares to other sources of information gathering and decision making. We describe the current and potential uses of prediction markets for governance within organisations, and the related advantages and disadvantages.

Questions that could be opened to a prediction market in a financial institution include:

> Accounting: ‘What will be the loan loss provision for the department for this half-year?’
> Audit: ‘At next review, what will the severity code be on issue ABC identified in this year’s audit?’,
> Compliance: ‘What new compliance breach will be flagged in this quarter’s review?’
> Credit: ‘At next review, what will be the risk grade on customer Z?’
> Markets: ‘What will competitor Bank Beta’s RBA rate cut pass-through be on their standard mortgage rate?’
> Project management: ‘What will the red/amber/green status be on project alpha at the end of next month?’
> Sales: ‘Will customer 123 close the deal this quarter?’
How crowdsourcing platforms such as prediction markets add value beyond open group work

Our familiar group process in business is that of open group work. Traditionally, this has occurred face to face, but now is often performed electronically. It provides real-time multidisciplinary input and interactive feedback but can have several disadvantages.

First, for effective communication, open group size needs to be limited and Wheelan et al. (2009) found that groups of three to eight were generally more productive than larger groups. If intragroup communication is not required, very large teams will have advantages of greater human resource capital and larger cognitive diversity. Crowdsourcing is then ideal.2

Second, intragroup social influence can reduce the diversity of individual opinions without reducing collective error.3 Individual biases may become correlated and a new set of social biases introduced at the interactive group level (Table 1).

It is well established that independent aggregation of multiple independent opinions through simple averaging, majority rules or market-based algorithms have led to a marked improvement in decision accuracy. This phenomenon is known as the ‘wisdom of the crowd’ effect.4 Not only is the group aggregate average decision accurate but only a very small minority of individuals can perform consistently better than the group average.5 An advantage of a collective group aggregate approach is that the group size can be very large, maximising cognitive diversity without social bias. Page (2007) provides evidence that even as the average amount of expertise decreases when a crowd grows, the increased diversity may more than compensate for this.

Crowdsourcing social software platforms have emerged to service the need for big data and associated analytics, whether through internet platforms like Survey Monkey, or through prize-based competitions. Prediction markets provide further enhancement by providing a continually updated group aggregate summary estimate as an iterative feedback signal to the wider group. This signal can take the form of an updated summary of the probability of event occurrence or the likely value. This important concept has been taken up for market-based decisions on outcomes. In this collective intelligence process no direct member-member communication is required.

Crowdsourcing platforms harness the ‘wisdom of the crowds’, which is partly derived from the greater cognitive diversity and chance of uncovering hidden information from very large groups and partly due to a lack of social bias if individuals within the crowd provide independent input. Prediction markets go one step further: to also provide an iterative summary signal of the crowd estimate back to participants in the crowdsourcing platform.

Individualising incentives for participants in crowdsourced prediction markets

Because the prediction markets detect both effort and individual informative and accurate input, standard market mechanisms can be used to deliver rewards providing incentives that are based not only on activity but on forecasting accuracy and informativeness. To reward based on the informativeness of the participants’ trades, one must judge the quality of participants’ forecasts once the outcome is known. This enables participants to be rewarded so that they are incentivised to continue forecasting. Market algorithms, such as Hanson’s logarithmic market scoring rule (LMSR),6 provide an effective method of assessing the quality of a participant’s forecast on a single question by evaluating the amount of additional information the particular forecast provided to the group's aggregate forecast on the question.

Reputational incentives have also been demonstrated to be important. These include Leaderboards, listing high-performing participants (often by a codename) or badges. Prediction markets can adopt some of the real time psychic utility of ‘gamification’.7 Finally, altruistic and charitable motivations can be included. Mueller (2008) observes that in a large open work group a lack of individual reward or recognition linked to personal effort can lead to social loafing. In the crowdsourcing platform of a prediction market, these incentives — monetary, reputational, experiential and altruistic — can be targeted back to the individual based on the merit of their specific contribution.
Table 1: Key biases that operate in open groups

- **Group think:** desire for harmony or conformity within the group decreases external input and critical thinking, results in an incorrect decision-making outcome. Group members try to minimize conflict and reach a consensus decision without critical evaluation of alternative ideas or viewpoints, and by isolating themselves from outside influences.

- **Halo effect:** the tendency for a person’s positive or negative traits to ‘spill over’ from one area of their persona to another in others’ perceptions of them. Thus social or status cues can weight the relative importance of an individual’s input, regardless of actual merit.

- **Unacceptability bias:** questions that may embarrass or invade privacy are avoided and hidden information is not disclosed.

Standard market mechanisms can be used in a prediction market to deliver incentive-based monetary rewards to individuals not only based on activity but also forecasting accuracy and informativeness.

**Potential problems with prediction markets**

First, there is an **inefficiency problem**, due to lack of cognitive diversity when the market is small. For example, Graefe (2011) evaluates prediction markets compared to other group work processes and found no evidence of outperformance by prediction markets in small groups (of less than 10 members). Evidence of optimal prediction market size for various purposes is not yet available but it is likely that at least 30 to 50 members would be required to allow sufficient cognitive diversity. For thin markets, one advance to assist low liquidity markets is the LMSR.3

Second, prediction markets may not include **sufficient expertise**. However, prediction market membership rules can be altered to ameliorate this. Cowgill and Zitzewitz (2015) examine prediction markets used by Ford which only allowed staff with expertise to participate.

Third, prediction markets could be susceptible to **manipulation**. Yet, to date, prediction markets appear relatively resistant with only small and temporary effects on trading. Also, difficult questions may be more prone to **misinterpretation** than by face-to-face query. However, complex questions such as the effect of a possible rare event on an outcome can be broken down into simpler components, such as: (a) what is the probability of the event occurring?; and (b), if it does, what is the impact on the outcome? In a bank credit assessment situation, the prediction market could ask for separate estimates of the probability of default (within some given timeframe) of a specified borrower, and of the size of the loss given default, rather than the expected loss from granting a loan to that borrower.1

Finally, one obstacle to the uptake of prediction markets within small businesses and other organisations is the **complexity of development and use**. To date, most companies (Google being a major exception), have required external consulting expertise to build and operate in-house prediction markets. Dysrupt labs (with which the authors are associated) has developed a user-configurable platform with a simple user interface and supporting use case collaterals that dramatically reduce the initialisation costs for a prediction market. This enables low cost deployment for simple recurring forecasts as well as the more complex bespoke problems and question sets that may be expensive to initialise in a traditional prediction market.

**Evaluation studies of prediction market performance**

Prediction markets have been found to outperform expert panels, professional management consultants and simple or competence based-surveys and polls in the following ways.

- **Official estimates and experts:** Plott and Chen (2002) report that at Hewlett Packard, prediction markets predicted outcomes six out of eight times more reliably than official forecasts in one experiment and 15 out of 16 in another. Eli Lilly, a pharmaceutical company, found a prediction market was able to prospectively identify the three most popular sales products. Siemens reports that an in-house prediction market provided a more reliable project end date than official management estimates. SciCast reports that their prediction market generally outperformed an unweighted linear opinion poll of experts seven out of 10 times across a range of issues, including geopolitical. Higher performance for prediction markets than expert forecasting was documented for the three case studies of in-house prediction markets, reviewed by Cowgill and Zitzewitz (2015).
Consultants: Thompson (2012) reports that in 2007 the CEO of Misys ran an in-house prediction market in parallel with a McKinsey management consulting assignment including interviewing staff to determine preferred strategy over the next three years. The questions for strategy were similar for the McKinsey consulting team and the prediction market. They both gave the same answer but the prediction market was much more cost-effective because it could be then used repeatedly once purchased and the initial purchase price was similar to a one-off McKinsey consult. Subsequently, Thompson reports Misys prediction markets proved to be 96 per cent accurate measured against actual outcomes, much more accurate than the company’s own internal three-month forecasts, compiled using usual business processes.

Surveys: Surveys face some shortcomings that make them less appropriate tools than prediction markets for making decisions on complex issues. There is little incentive for a survey respondent to give their best answers, as rewards tend to be based purely on participation rather than the quality of responses. In addition, once an early respondent provides an answer that is a fixed answer, there are generally no ‘feedback loops’ to guide them to re-evaluate their decision. These may be some of the reasons underlying the accumulating evidence that surveys do not forecast as well as prediction markets.

Perhaps some of the strongest evidence to date comes from the evaluation of the reproducibility of results of over 40 studies published in prominent psychology journals. Prediction markets forecasted the outcomes of future replication studies well and outperformed a survey of individual forecasts. Compared to a reference point of correctly identifying 50 per cent of replication studies by chance, the prediction markets correctly predicted the outcome of 71 per cent of scientific replication studies, significantly more than expected. In comparison, an average of a simple survey predicted 58 per cent, and an average of a survey weighted by self-reported expertise predicted 50 per cent. As further evidence, on the SciCast platform, a prediction market performed 20 per cent better than an unweighted baseline survey.

Polls: The public prediction market Iowa Electronic Markets performance consistently outpredicted opinion polls for election results from 1988 to 2004. It is one of the earliest prediction markets and has significantly outperformed the polls in every presidential election when forecasting more than 100 days in advance: Berg (2008) compares 964 polls over the five presidential elections from 1988 to 2004: the Iowa market was closer than the poll to the eventual outcome 74 per cent of the time.

Prediction markets: These do differ, but not substantially, in their performance, provided that the respondent number is large and the question is appropriately framed. There are numerous ways to measure the accuracy of a forecasting prediction market platform, but the most common method is the Brier Score, which is in effect the mean squared error of the forecasted likelihoods. A perfect forecasting platform will receive a score of 0. A platform that forecasts no better than chance will receive a score of 0.5. Perhaps a more intuitive measure of a platform’s accuracy is how often the forecast is on the right side of Yes/No. While a forecasting platform’s accuracy will generally be best just before the answer is objectively known, knowing likelihoods at this point is not always useful; it is often too late to take any action utilising the data. From November 2015 to March 2016, the Almanis prediction market was on the right side of Yes/No 70 per cent of the time for 10 days before settlement, improving to 90 per cent of the time at 0 days before settlement. Topics covered included geopolitics, economics and finance. Meanwhile, the Brier Score ranges from around 0.4 at 10 days out, down to 0.2 at 0 days. The Brier scores achieved by Almanis compare similarly well to other prediction markets with accessible Brier scores when predicting US Senate Election contests.
Prediction markets, information flow, and governance in organisations

Figure 1 outlines a traditional corporate structure with work specialised into context teams such as finance, human resources, marketing, production and other. Each team is led by a chief, such as chief financial officer, who sits in the executive suite, the C-suite, with the chief executive officer. In this example, the CFO and the CEO sit on the Board of Directors also.

Figure 1: Actual and potential functions for prediction markets in corporations

Abramowicz and Henderson (2006) review the ways that prediction markets could enhance the corporate governance of traditional organisations. Traditional organisations are characterised by hierarchies, where those at a lower level act as a synthesiser, summariser and gatekeeper for the collective information flow upwards (Figure 1). To some extent, this assists in the reduction of an overwhelming data load. However, self-interested actors at each level can distort this process and the information from hidden experts may not be heard, reducing transparency. Recent corporate responses include monitoring and whistle-blower protection. A key role for prediction markets,
which is already utilised by a number of companies, is the improvement of information delivery
to senior executives charged with corporate decision making. In Figure 1, this is shown within a
content team (such as the finance function generating information for the CFO) and across an
entire organisation generating information for the C-suite. If in-house staff trade anonymously
and are given incentives to provide informed and unbiased information, the signal from those
in-house who are knowledgeable becomes strong, and this is also enhanced by the market
signal feedback loop. This in-house prediction market does not replace but supplements existing
practices, as has been the case with the companies that have employed such markets.

Further, prediction markets can assist senior executive decision making. The literature indicates
that supplementary information and checks improve management decision quality. An in-house
prediction market can be used to confirm or corroborate management’s opinion. Unfortunately,
the size of most boards precludes use within the board membership only.

Shareholder signals act through a public share price signal from the market of the company’s
shares and informs the Board. However, this does not provide detailed information on
shareholder views on various different aspects of the specific company. Public share prices have
some relative disadvantages as they do not include in-house information, can only respond to
one factor at a time (not alternatives) and may reflect multiple other external factors such as
politics rather than company performance alone. A shareholder prediction market could be run
on the merit or likelihood of possible mergers, asset sales, takeover defenses or relocation to
another region (Figure 1). For high-value issues, the Board could run parallel prediction markets
among both shareholders and staff to evaluate their opinions on the effect on productivity
or various new scenarios, and the latter could be used with the benefit of anonymously
incorporating any insider information.

Auditing is another governance function requiring accurate information elicitation and benefiting
from forecasting. Here, prediction markets could play a valuable role in the internal audit, external
audit and regulation of standardised audit processes. Within a content team such as finance,
the CFO could run a prediction market as a pre-diagnostic before an official external audit to
evaluate issues such as whether the group will be more or less likely to score better than the
previous year in specific areas and identify new areas of concern. Similar processes apply in using
a prediction market preceding an external audit (Figure 1). Finally, Abramowicz and Henderson
(2006) state that prediction markets may also have value as a substitute for (or complement
to) existing securities disclosure requirements under regulatory law. Regulatory and legislator
bodies could set up standardised routine prediction markets to evaluate aspects of company
performance by mechanisms such as external audit (Figure 1).

Thus we can see that prediction market use can improve transparency within an organisation
in several ways, as well as improving the quality of information to be used by the C suite for
decision making. The C-suite, in turn, may be subject to greater accountability to their Boards
and the market. For example, where an in-house prediction market is at odds with management
representations on an issue of governance (risk, audit or compliance) it would be important
to reconcile the points of difference rather than censor the results in order to manufacture
the illusion of consensus [or plausible deniability] for the Board. Similarly, where censorship
and selective use of prediction market accuracy is pervasive, the effect is to degrade market
participation and thus the quality of the market’s signal.

Company use of prediction markets with case examples

Google has run in-house prediction markets since 2005. Some other companies, without the
internal resources to develop prediction markets, have been able to work with professional
research and consulting firms to develop appropriate in-house prediction markets but this has
been beyond the financial and technical reach of most small businesses and other organisations.
For example, at the time of journal submission, an internet search was unable to identify any
prediction markets in companies based in Australia or New Zealand, apart from the Almanis and
Percrypt markets within Dysrupt Pty Ltd.

Cowgill and Zitzewitz (2015) provide a detailed review of prediction market performance over
selected periods for three major companies: Google, Ford Motor Company and Firm X. They
also list a number of other companies running similar markets including Chrysler, Eli Lily, GE,
Best Buy, Boeing and Microsoft.10 We draw on their study to provide some salient features of the
characteristics of those markets.
The sorts of questions posed in the prediction markets included company performance, demand forecasting, project completion dates, product quality and external events. To encourage employee participation a range of incentives have been offered including monetary prizes, non-monetary prizes (such as T-shirts) and reputational recognition.

Google, a world dominant software company based in California, has a very educated workforce and an organisational culture of high transparency. Google’s prediction markets were initiated by a group of employees and were of the continuous double auction form, based on the style of the Iowa Election Markets. All employees could participate. One question example was whether chat would be launched by Gmail by the end of the quarter.

Ford Motor Company chose to focus its prediction markets on two topics: forecasting weekly sales volumes; and predicting which car features would be popular with customers (as proxied in the interim by traditional market research, including focus groups or surveys). Firm X is a global private diversified basic materials and energy organisation headquartered in Midwestern US. It decided to focus its prediction markets on relevant macroeconomic and commodity prices. Firm X’s markets were started by a senior manager in its strategic planning department. For Ford and Firm X, the LMSR was applied as the central market mechanism and only employees with expertise were invited to participate. Overall, despite some possible limitations partly due to Firm X sample size, the prediction markets performed better than forecasts by experts.

Today, multinational and other companies are currently using prediction markets predominantly for improved information delivery to senior executives charged with corporate decision making. This ranges from higher forecasting accuracy of the probability of external events, sales or alterations in company product value to in-house ideas generation.

Conclusion
We have compared group open work to internet-enhanced crowdsourcing and, in particular, prediction markets as a tool for channeling collective intelligence. We outlined the performance of prediction markets compared to other methods such as surveys and related their use within traditional corporate governance. To date, prediction markets have mainly been used to improve information delivery but their potential role in business is likely to grow.

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Notes
1. Such a combined probability is called a conditional or joint probability (Ryall and Bramson 2003). Combinatorial prediction markets have been designed (Hanson 2007) but they are not common.
2. Excellent reviews, including historical aspects, of the ‘wisdom of the crowds’ and ‘collective wisdom’ are provided by Surowiecki (2004) and Landemore (2012), respectively.
6. In decision theory, a scoring rule measures the accuracy of probabilistic predictions. It is applicable to tasks in which predictions must assign probabilities to a set of mutually exclusive discrete outcomes. The logarithmic market-scoring rule can be run as an automated market algorithm, even in relatively low liquidity markets (Hanson 2004, 2007).
7. Considerable useful psychological research has emerged from studies of online gaming that may provide useful insights for other human internet use. For example, gamers can be characterised into the extremes of social players motivated by relationships and teamwork and achievement players valuing progress, optimisation and domination. Dr Rosanna Guadagno University of Texas at Dallas. Presentation at the 16th annual meeting of the Association of Internet Researchers in Phoenix, Texas, US, 2016.

8. A linear probability model with robust standard errors with the outcome of the replication study as the independent variable and the prediction market price as the dependent variable found the beta coefficient of market price to be 0.995, which is significantly different ($p<0.003$) to 0 (no predictive effect) and not significantly different ($p>0.99$) to 1 (a very high predictive effect), see Dreber (2016).


References


Armstrong, JS 2006, ‘How to make better forecasts and decisions: Avoid face-to-face meetings,’ Foresight — The International Journal of Applied Forecasting, Fall, no. 5, p. 12.


Bratvold, D 2011, Enterprise Crowd sourcing blasts off as social media growth industry, MarkSchaefer.


Rhode, P and Strumpf, K 2007, ‘Manipulating political stock markets: A field experiment and a century of observational data’, working paper, University of Arizona and NBER, University of Kansas School of Business.


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