Pacific-Basin Finance Journal 74 (2022) 101815

Contents lists available at ScienceDirect

Pacific-Basin Finance Journal

journal homepage: www.elsevier.com/locate/pacfin

COVID-19 and policy responses: Early evidence in banks and FinTech stocks

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ARTICLE INFO

JEL classification:
E4
E6
G01
G21
G23
H12

Keywords:
COVID-19
Crisis
Event studies
Banks
FinTech
Monetary policy

ABSTRACT

The Australian government and Reserve Bank of Australia responded to challenges posed by the COVID-19 pandemic with a number of rapid interventions within a short period of time in early to mid-2020. We examine the impact of news relating to COVID-19, monetary policy interventions, containment measures, and the unwinding of restrictions on Australian bank and FinTech stock prices. The global pandemic was caused by factors outside the banking sector and capital markets, therefore, the policy responses from this unique crisis provides us with new knowledge. Bank and FinTech stock prices were more sensitive to the government's macroeconomic announcements and the unwinding of containment measures than to monetary policy interventions in this unique environment. The response of banks and FinTechs to COVID-19 related macroeconomic decisions is consistent with the response of bank stock prices in previous financial crises. This finding suggests a stronger emphasis on macroeconomic announcements is required as a stabilizing policy tool when managing future crises from outside the banking and capital market sectors.

1. Introduction

2020 will be remembered in the annals of history as a year marred by the COVID-19 pandemic, which resulted in a global health and economic crisis. In response, governments and central banks around the world actioned stimulus packages to counteract against the adverse economic and financial consequences of the crisis. In 2020–2022, the crisis continued in many parts of the world and the long-term effects of the policy responses are yet to be determined. The aim of this paper is to empirically analyze how two important groups in the financial sector, banks and FinTech companies, were impacted by the arrival of the crisis and the policy actions of authorities in the short-run.

This study employs the Australian context to conduct this investigation because this country had undergone almost the full cycle in 2020, beginning with the onset of the pandemic and the near elimination of broad community transmission of the COVID-19 virus. In this unique Australian setting, we examine the impact of quarantine restrictions, stimulus packages and monetary policy interventions on bank and FinTech equity returns.

At the onset of the crisis, the design of effective government and central bank interventions becomes the most pressing priority. Previous literature on the impact of the Global Financial Crisis (GFC) of 2007–2009 suggests that stock price responses to various interventions may be different during crisis periods (Demirguc-Kunt et al., 2013; Fiordelisi et al., 2014). However, the crises of the

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https://doi.org/10.1016/j.pacfin.2022.101815
Received 22 October 2020; Received in revised form 5 July 2022; Accepted 8 July 2022
Available online 14 July 2022
0927-538X/

global scale such as the COVID-19 pandemic are rare with the last episode being the 1918 flu pandemic. It is quite possible that the occurrence of pandemics may increase in frequency in the future, therefore, designing effective policy and learning the lessons from the COVID-19 response is essential.

The external shock from COVID-19 has motivated researchers to evaluate the impact of the pandemic on the banking sector around the world. As often occurs with the banking and finance literature, the extant research is heavily focused on the United States due to practical data availability and completeness issues. For example, Acharya et al. (2021) show the performance of U.S. bank stocks were significantly lower for those with undrawn credit facilities. The onset of COVID-19 and government-imposed lockdowns saw unprecedented corporate demand for pre-arranged credit line drawdowns and the share prices of these banks underperformed during the crisis. To develop a more comprehensive understanding of policy responses and their level of effectiveness, Berger and Demirgüç-Kunt (2021) advocate broader based studies that include other countries around the world. For example, Demirgüç-Kunt et al. (2021) employ a global dataset to find that the negative effects of COVID-19 were more severe on banks than on other non-bank financial institutions. Furthermore, countercyclical prudential measures led to negative bank stock returns and larger banks experienced significant underperformance. These results are consistent with our findings in the Australian context. Duan et al. (2021) show the systemic risk in banks around the world increased due to the impact from the pandemic and this risk was mitigated by factors including bank regulation, ownership structure, and informal institutions. Berger and Demirgüç-Kunt (2021) suggest that future research needs to evaluate the effect of the crisis on FinTech and bank business models. To the best of the authors' knowledge, our study is the first to fill this gap and focuses on comparing bank and FinTech performance during the depths of the pandemic as various government decisions, fiscal and monetary announcements were made.

This paper examines what works and what does not from the viewpoint of the finance industry and how much weight should be allocated to macroeconomic and financial sector policies. Furthermore, the pandemic, restrictions imposed to contain the spread of the virus, government's income support measures, monetary policy interventions, and the relaxation of restrictions may have different effects on various types of financial services firms. The timing of these measures may also be important and the same policy actions may result in different outcomes during the crisis, in comparison to normal conditions.

We focus on FinTech and bank stock returns in this research because previous studies find that stock returns reflect and adjust rapidly to new information and unexpected changes in macroeconomic and monetary policies (Abugri, 2008; Fama et al., 1969). There is also evidence that stock returns exhibit a much stronger response to unexpected changes in central bank target rates in recessions (Basistha and Kurov, 2008) or if a government policy change is preceded by a short economic downturn (Pastor and Veronesi, 2012). Moreover, stock prices convey noisy but unbiased information about a firm's future prospects (Faure-Grimaud, 2002) as well as the effectiveness of regulations and policies (Yin et al., 2010). Since COVID-19 led to sudden and unexpected cessations in economic activity induced by containment measures, the pandemic provides us with a quasi-natural experiment that is not caused by problems inside the banking sector or capital markets. Aldasoro et al. (2020) argue that banks were harder hit than most industry sectors when the rapid and global spread of COVID-19 sent equity markets into a significant sell-off, and subsequent recovery.

It should also be noted that the FinTech sector was at an embryonic stage during the previous major shock to the world economy, namely, the 2007–2009 GFC. However, through the waves of innovation in the years following the GFC, the finance sector embarked on a FinTech transition. Many researchers consider larger FinTech companies as serious challengers to banks in specific product areas (Buchak et al., 2018; Stulz, 2019). We examine the sensitivity of bank and FinTech stock returns, which provides us with investor perceptions on whether FinTechs are considered in the same league with banks. While many industries/sectors expected to contract as a result of the COVID-19 induced recession in 2020, the impact of the crisis on FinTechs remains unclear. Obviously, a recession may impact FinTechs negatively; however, in an environment that forces consumers to switch to online channels and contactless purchases, FinTech companies offer digital solutions and may even thrive under these conditions. Furthermore, the reaction of FinTech stock returns may hint at how the pandemic may impact on the future of these companies. This is a crucial element of the analysis as FinTech innovation is expected to democratize financial services. As emphasized by Carney (2017), the FinTech sector promises more choice, an inclusive approach, better-targeted services, competitive pricing for consumers, greater access to new credit for small and medium sized businesses, lower transaction costs, greater capital efficiency, stronger operational resilience for banks, and greater diversity for the financial system.

This paper makes three contributions to the literature. First, prior studies have examined the effect of policy decisions on equity markets and bank stock returns during financial crises from recent history (Fiordelisi et al., 2014; Ricci, 2015). We extend this literature by evaluating the policy responses of a crisis as severe as the COVID-19 global pandemic and the impact on bank stock prices. Furthermore, we broaden this analysis by considering the effect of crisis policy responses on FinTech stocks given their ever-increasing role and importance in the financial services sector. FinTechs are perceived to hold distinct advantages over banks during this unprecedented global pandemic where social distancing is required. This extended analysis of banks and FinTechs allows us to evaluate the stock performance of both groups in the midst of this unique health and financial crisis. Our empirical results indicate that the reaction of bank and FinTech stock prices was more sensitive to the government's macroeconomic support policy announcements than to monetary policy responses during the pandemic. This finding suggests that macroeconomic announcements are an effective stabilizing policy tool (as opposed to monetary policy announcements), when managing future crises which may originate outside of the banking and capital market sectors.

Second, the emerging literature on FinTechs shows these enterprises compete with banks by delivering services using advanced technologies, deploying low or nil capital requirements, and operating in a lower regulatory environment (Buchak et al., 2018; Di Maggio and Yao, 2021; Fuster et al., 2019). These stark differences have enabled FinTechs to increase their market share in various banking services through the shadow banking system (Fuster et al., 2019; Tang, 2019). Whilst there are commonalities in the products or services being delivered by banks and FinTechs, they are substantively different as they operate using contrasting business models, competitive positioning, and regulatory regimes (Claessens et al., 2018). These structural differences in their respective business models may be reflected in the reaction of their respective stock prices. We extend our understanding of banks and FinTechs by considering the behavior of stock prices when external shocks as severe as this global pandemic arrive in the market by comparing the performance of FinTech and bank stocks. We find that the FinTech stocks are more sensitive and, in many cases even contrasting, to changes in government emergency measures, COVID-19 news, and monetary policy related announcements, compared to banks.

Third, we contribute to the FinTech literature by employing an event study methodology and analyzing the implications of the pandemic and policy responses in the short to medium term for the FinTech sector in the Australian context. While there is a growing body of literature on the development and growth of FinTech around the world with particular focus in the U.S., U.K., continental Europe and China (see, for example, G. Berg et al. (2020b); Thakor (2020); Wang et al. (2021)), this paper is the first of its kind to compare the impacts of fiscal and monetary policy responses on the behavior of traditional banks versus FinTech equity returns. We extend the literature by examining the investment experience during this most unprecedented of crises, the COVID-19 pandemic. Our findings indicate that the reaction of FinTech stock returns was positive when containment, stringency, and health measures were introduced to combat COVID-19. We interpret this empirical result as a sign that investors were impounding new opportunities and expectations for FinTechs in the pandemic and post-pandemic periods.

The remainder of the paper is structured as follows: Section 2 discusses the relevant literature and Section 3 provides the background for the research by introducing the Australian bank and FinTech sectors. Section 4 describes the methodology applied in the research. Section 5 presents the empirical findings and discusses the results. Finally, Section 6 concludes.

2. Review of literature

Although there are some reservations that the initial market reaction to new public information incorporated in stock prices is incomplete (Zhang, 2006), the theoretical literature argues that stock prices contain valuable information about the future prospects of firms (Dow and Gorton, 1997; Subrahmanyam and Titman, 1999). Therefore, investigating the link between macroeconomic and monetary policy interventions as well as stock returns is warranted. However, while there is no shortage of empirical literature examining the impact of monetary policy changes on stock market performance in general, mainly focusing on U.S. markets (Bernanke and Kuttner, 2005; Bjørnland and Leitemo, 2009; Bomfim, 2003; Chuliá et al., 2010; Ehrmann and Fratzscher, 2004; Maio, 2014; Rangel, 2011), the research on the effects of economic and monetary policy measures on bank equity returns is sparse. This is surprising as the extant body of research finds that interest rate sensitivity of non-financial firms is substantially lower than the corresponding effect of interest rates on financial services firms (Dinenis and Staikouras, 1998; Kim et al., 2013). The empirical literature which examines the link between economic policies confirm that bank stock returns only respond to surprise or unexpected changes in interest rates (Yin et al., 2010) and the effect of changes in the U.S. federal funds rate is more pronounced for large banks than on small banks (Yin and Yang, 2013).

A bank's stock price reflects all publicly available information in a single market valuation and, in accordance with the efficient markets hypothesis, these prices at any point in time impound a forward-looking component reflecting expectations of both positive and negative prospects Castrén et al. (2006). Recent economic and financial crises show that banks usually become conduits of policy responses to these types of shocks (Fiordelisi et al., 2014). This is due to their important role in the allocation of resources and facilitating economic growth (Beck and Levine, 2004). All these facts point at the relevance of investigating the reaction of stock returns of banks and financial services firms to policy interventions as these can be viewed as the collective wisdom of investors about these policy actions. However, surprisingly, to the best of our knowledge, there are only two studies that scrutinize the response of bank equity returns to monetary policy changes, namely, Fiordelisi et al. (2014) and Ricci (2015). Furthermore, only the latter research specifically focuses on this link during a crisis, that is, the 2007–2009 GFC. Using the data for European Central Bank interventions during the GFC, Ricci (2015) finds that banks are more sensitive to non-conventional monetary policy measures than to interest rate decisions. In our study, we examine whether this empirical finding continues to hold in a unique health crisis, such as COVID-19.

More than a decade after the GFC, the global economy faces a new challenge, but this time the crisis originates from outside the financial system but poses a commensurate economic threat. COVID-19 has resulted in rapid, coordinated responses from governments, central banks and other supervisory authorities (Alberola-Ila et al., 2020). Particularly, central banks' rapid intervention shows their ability to draw on the lessons learned from the 2007–2009 GFC (Cavallino and De Fiore, 2020), confirming the evolution of central banks and their new role as important contributors to financial stability in the economy (Moshirian, 2011). However, the shape of the financial system has also changed during this time with the emergence of new players emulating banks, that is, FinTech companies.[1]

The term 'FinTech' is defined as the use of technology to provide new and improved financial services (Thakor, 2020). The Financial Stability Board further elaborates the definition of FinTech as "*technologically enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and institutions and the provision of financial services.*"[2] Goldstein et al. (2019) define FinTech firms as young, start-up firms who introduce technological innovation to deliver financial products and services in an effort to disrupt traditional incumbent financial institutions. FinTech firms

[1] Although the FinTech sector commenced its spectacular growth after the 2007–2009 GFC, the interaction between information technology and the finance sector has been present for some time. For example, refer to Berger (2003) for a discussion of the productivity and consumer welfare implications of information technology for banking.

[2] See https://www.fsb.org/work-of-the-fsb/financial-innovation-and-structural-change/fintech/

compete against established financial competitors by exploiting their inherent advantages in the areas of technological innovation, differences in regulatory regimes, speed-to-market, lower costs in information acquisition, easier customer access to financial products, and lower overall compliance costs (Berg et al., 2020a; Chen et al., 2019; Di Maggio and Yao, 2021; Fuster et al., 2019; Goldstein et al., 2019; Grennan and Michaely, 2021).

The regulatory differences and technological advantages resulted in nearly a doubling of the market share of shadow banks in residential mortgage origination from 2007 to 2015 in the U.S., with particularly dramatic growth among online FinTech lenders (Buchak et al., 2018). Claessens et al. (2018) emphasize that even though FinTech credit has grown rapidly around the world in recent years, its size still varies greatly across economies reflecting the differences in economic development and financial market structure.

In the case of Australia, there is a paucity of literature in the area of FinTechs. Buckley et al. (2020) state that over 600 FinTech firms operate in Australia which is larger than in countries such as Hong Kong, Singapore and Switzerland, yet, there is an absence of empirical studies. Davis (2016) examine the regulatory regime of peer-to-peer (P2P) lending services in Australia. Other studies consider the potential business opportunities for FinTech; however, these findings are limited due to the unavailability of data in the Australian FinTech sector (Cai, 2018, 2021; Manning et al., 2016; Pollari, 2016). Our study on ASX listed banks and FinTechs extends this emerging literature in the Australian setting.

Recent trends indicate that FinTech companies that specialize in lending services will not replace banks anytime soon, but they are creating a market niche for themselves in cases when banks are capital-constrained and for borrowers who have not accumulated sufficient savings as collateral for secured loans (Thakor, 2020). Furthermore, FinTech payments systems carry the biggest disruptive potential leading to the emergence of new money market instruments, which has significant implications for monetary policy (Thakor, 2020). FinTechs may improve access to credit for underserviced segments, enhance the efficiency of financial intermediation (Claessens et al., 2018), and some of these firms are developing into institutions challenging banks themselves, therefore, it is worthy of investigating the reaction of FinTech stock returns to recent policy responses in tandem with bank stock returns.

Previous research shows that bank stock returns may exhibit different reactions to policy actions during a crisis episode compared to a non-crisis period. For example, the empirical literature observes that banks are more sensitive to non-conventional measures of monetary policy (e.g. quantitative easing and liquidity provision) than to interest rate decisions, indicating the importance of non-standard policy actions during extraordinary shocks, when traditional channels may be significantly hampered (Ricci, 2015). In a similar vein, Demirguc-Kunt et al. (2013), investigate the impact of the GFC on banks, and find that before the crisis, differences in capital did not have a significant impact on stock returns. Yet during the crisis, better capitalized banks, especially larger banks, experienced superior stock market performance. Whilst the majority of policy actions in the GFC originated from central banks, the COVID-19 crisis offers a unique setting whereby we can compare the efficiency of various policy interventions, and how these decisions impact both bank and FinTech stock returns.

The literature above leads to three testable hypotheses on the responses of banks and FinTech stocks in relation to monetary and government macroeconomic decisions in managing the COVID-19 crisis. Prior studies show that bank stock prices are more responsive to non-conventional measures during a crisis (Ricci, 2015). Furthermore, a government's broader economic and emergency actions presumably may have more flexibility compared to more narrow focused monetary policies of central banks. In this study, we test whether this hypothesis holds for Australian banks and FinTechs during the depths of the COVID-19 crisis in 2020.

Hypothesis 1. *(H1): The stock market response (*i.e. *returns) to the announcements of income support or macroeconomic decisions to tighten or lift COVID-19 restrictions are stronger than the responses to monetary policy interventions.*

The second hypothesis examines the effect of the events of the COVID-19 crisis on banks and FinTechs. Although the fledging FinTech sector has gained significant ground in the past decade, these firms still lack the broad clientele and capital base of their banking intermediary competitors (Buchak et al., 2018; Tang, 2019). Therefore, it is expected that strong external shocks in the period of a pandemic will influence FinTech prices more significantly, than for banks. This leads to our second hypothesis:

Hypothesis 2. *(H2): The announcements of changes in government emergency measures, COVID-19 related news, and monetary policy actions of central banks are likely to exhibit a stronger impact on FinTech stock prices compared to banks.*

The third hypothesis evaluates the reaction of banks and FinTechs in relation to policy decisions made during the COVID-19 crisis. Despite the emergence of FinTechs challenging incumbent banks in many areas of financial services as noted in the literature, the main competitive strength of FinTechs is their positioning in the payments system and lending to higher risk clientele (Di Maggio and Yao, 2021; Tang, 2019). These financial products are expected to be in demand during the pandemic due to social distancing, stay-at-home recommendations, business shutdowns, and hence, requiring digital solutions that FinTechs provide. This leads to our third hypothesis:

Hypothesis 3. *(H3): The response of FinTech stock returns to crisis and policy measures are different compared to bank returns. More specifically, FinTechs may fare better in terms of their stock performance during this pandemic compared to banks.*

3. Background: COVID-19, policy responses, and banking/FinTech in Australia

3.1. COVID-19 timeline

Australia's response to the COVID-19 pandemic in 2020 was considered as quite successful (Duckett and Stobart, 2020). After an exponential increase that peaked at more than 400 new cases a day in late March 2020, daily cases declined to no new locally acquired cases of coronavirus on 9 June 2020. The first coronavirus cases in Australia in late January and early February were linked to travellers from Wuhan, China. The initial government response was primarily focused on containing the external threat presented by the virus and consisted of screening arrivals from Wuhan and evacuating vulnerable Australians out of Hubei province in China. These restrictions escalated to banning arrivals from China on 1 February, after which the government did not take any significant steps until late February. Due to the novelty of the virus and a lack of information, there was concern about the potential social and economic cost of widespread action to prevent the possible spread of infection. Yet throughout early March, the Australian government response shifted. Bans on foreign nationals entering Australia were extended to Iran, South Korea, and Italy in the first two weeks of March. Australian travellers from these countries were required to self-isolate for 14 days on arrival. In early March, the government commenced preparations for the looming pressures on Australia's health system and impacts on its economy. At this point in time, the government's measures still appeared to underestimate the scale of the response required to combat the virus. On 12 March, the Government announced its first but small economic stimulus package of A$17.6 billion. The first national spatial distancing announcement was issued on 13 March, when social gatherings were limited to fewer than 500 people. The Government still did not consider COVID-19 as a serious threat at that time and this was illustrated with the reassurance of Prime Minister Scott Morrison that the announced restrictions would only take effect after the weekend (during which he expressed his desire to attend a football match). By 15 March, Australia recorded 300 confirmed cases, mostly from overseas arrivals, and self-isolation was made mandatory for all international arrivals, although enforcement measures were weak.

In the second half of March 2020, Australia's case numbers began to increase exponentially, doubling every 3 to 4 days. Australians looked at Italy's overwhelmed health system and feared the same unless stronger action was taken. The second half of March was a turbulent period marked with significant change. Within two weeks, Australia transitioned into a full shutdown. Widespread spatial distancing measures were announced alongside broader travel bans, testing, contact tracing, and quarantine. Restrictions shut down all non-essential businesses as well as activities, and Australians were urged to 'stay at home'. In their efforts to control the spread of the virus, some Australian states and territories closed their interstate borders. The state of Tasmania commenced border restrictions on 20 March, followed by the Northern Territory, Western Australia, South Australia, and Queensland within a few days. On 22 March, the Australian federal government announced a A$46.1 billion cash flow support package for small and medium businesses, and greater financial assistance to people on transfer payments. By the end of March, it became clear that some returning travellers were not adhering to the self-isolation requirement and the government further enhanced border controls on 27 March, to require mandatory quarantine in designated facilities for all remaining arrivals. The A$130 billion JobKeeper program was announced on 30 March, providing wage support for workers and businesses to encourage employment and maintain workforce engagement. Some states enhanced their spatial distancing measures, including effectively closing their public schools by bringing the Easter holidays forward. They also focused their attention on enforcing the restrictions, with police issuing severe on-the-spot fines to individuals and businesses breaking the social distancing regulations.

After approximately one month of stay-at-home life, Australians' efforts to contain COVID-19 was evidenced in the daily cases of infections and the nation appeared to be flattening the pandemic curve. New cases were rapidly declining with an average daily new case rate of 70 in April versus 20 new cases a day at the start of May. This was in stark contrast to some comparable countries such as the U.S. and the U.K., who struggled to control the virus. At the same time, the Prime Minister started to shift his rhetoric from concern about the health risks to concern about the economic fall-out from the crisis. Building on the momentum to ease restrictions, on 8 May, the National Cabinet agreed to a three-step plan and a national framework to bring Australia out of lockdown over the coming months.

Thus, the primary response to the virus was to manage the health of the population, but other policy actions, including monetary policy and economic stimulus measures were actioned to reduce the economic and financial disruption resulting from COVID-19 in Australia. Containment measures, economic stimulus packages, restrictions, and ease of restrictions had significant impacts on the Australian stock market and bank share returns as depicted in Fig. 1. The figure illustrates $1000 invested as at 31st December 2019 in the ASX All Ordinaries Index, ASX Small Ordinaries Index, value-weighted portfolio of 8 bank stocks, value-weighted portfolio of 12 FinTech stocks and an equal-weighted portfolio of 12 FinTechs. We can observe that Australia's oldest and broadest measure of stock market performance, the All Ordinaries Index fell sharply in tandem with bank share returns in the second half of March. At the same time, both value-weighted and equal-weighted portfolios of FinTech stocks experienced sharper, precipitous declines in February and March 2020 and then staged a remarkable recovery from these lows.

The Reserve Bank of Australia (RBA) reduced the cash rate target twice in March 2020, from 0.75 to 0.25%. The RBA also announced that it will not increase the cash rate target until progress is made towards reaching full employment and it is confident that inflation will be sustainably within the 2–3% target band. During the pandemic, the RBA established the term funding facility (TFF) with the aim to lower funding costs for the entire banking system. Under the TFF, authorised deposit-taking institutions (ADIs) in total had access to at least A$90 billion in funding from the RBA. In March 2020, the Bank announced it would conduct regular one-month, three-month and six-month maturity repurchase operations as long as market conditions were warranted.

3.2. Banks

Banks play a central role in the Australian financial system, holding 58.8% of financial institutions assets.[3] In addition to traditional retail deposit-taking and lending activities, Australian banks are involved in almost all other facets of financial intermediation, including business banking, trading in financial markets, stockbroking, insurance and funds management. Australia's financial system

[3] For details of distribution of financial system assets among main types of financial institutions in Australia see RBA website: https://www.rba.gov.au/fin-stability/fin-inst/main-types-of-financial-institutions.html

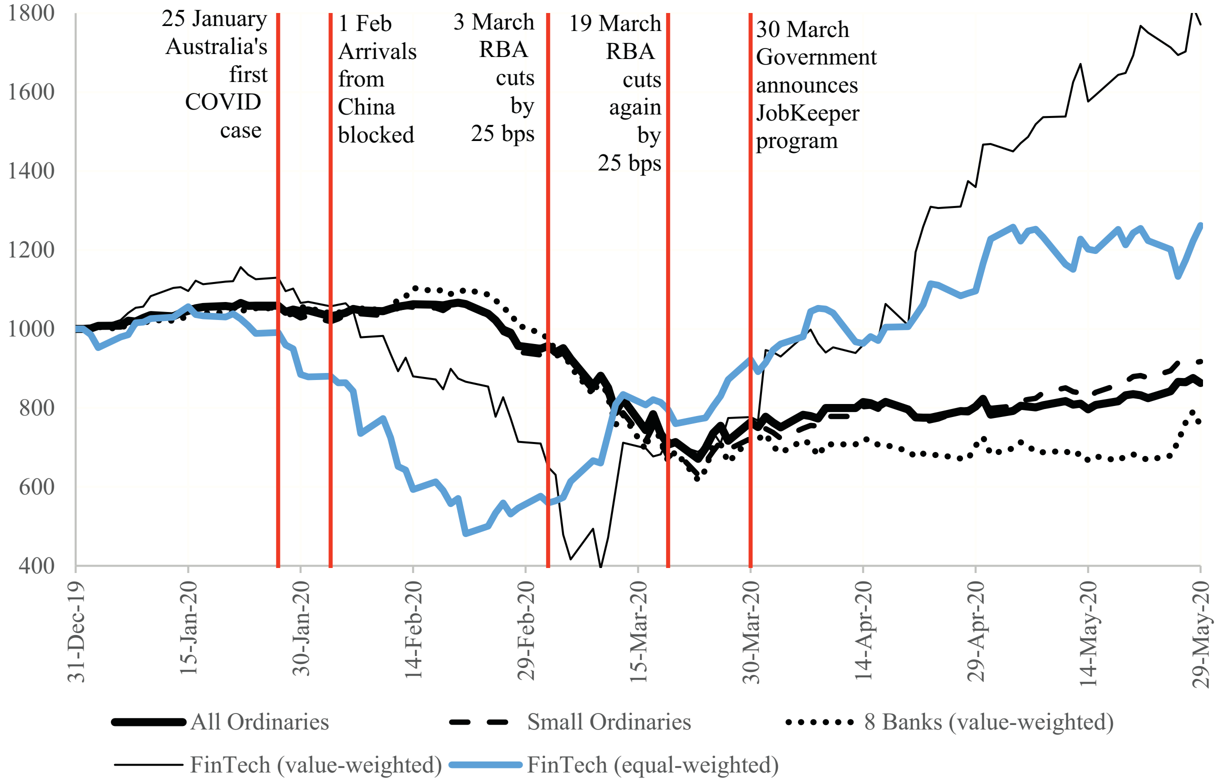

Fig. 1. Performance of $1000 invested in the ASX All Ordinaries Index, ASX Small Ordinaries Index, Banks and FinTech stocks.

is more concentrated and complex than in the U.S. or U.K., and exhibits an oligopoly market structure with a long tail for smaller providers (Productivity Commission, 2018). As of the end of September 2020, the 'big four' major banks held approximately 72% of total assets held by ADIs in Australia.[4] Although there are 42 banks at the end of February 2021, only 8 banks' shares are actively traded on stock exchanges in Australia.[5] Table 1 presents the list of these eight banks listed on the Australian Securities Exchange (ASX). The banks are partitioned into two groups based on market capitalization, namely, small banks and large banks.

3.3. FinTechs

The rapid rise of FinTechs since the 2007–2009 GFC suggests we need to understand how the equity of these firms respond to government and monetary policy decisions as these interactions have consequences in the development, as well as the potential regulation of these new enterprises in the future. Chen et al. (2019) categorize U.S. based FinTech innovations into seven categories, namely, cybersecurity, mobile transactions, data analytics, blockchain, peer-to-peer (P2P), robo-advising, and internet of things (IoT). As an example of the changing environment, Fuster et al. (2019) document the rising importance of this segment of the finance sector with the market share of U.S. mortgage lending by FinTech firms increasing from 2% to 8% from 2010 to 2016, respectively.

As at the end of 2019, there were 629 FinTechs active in Australia, an 8% rise since September 2018, with the big increases in FinTech companies in insurance, as well as middle and back office services (KPMG, 2019a). Investment in the Australian FinTech sector has followed the subdued trend globally, with A$101 million of investment activity recorded in the first half of 2019 (KPMG, 2019b). Payments & Digital remains the largest sector, with 141 FinTech companies operating in this space. Five Neobanks have also made an appearance on the Australian FinTech landscape (KPMG, 2019b).

Whilst a large majority of FinTech firms are privately owned, some are listed on publicly traded stock exchanges. The availability of these publicly traded FinTech stocks on the ASX and the COVID-19 pandemic allows us to examine the effect of policy actions on both traditional banks and innovative FinTech firms in the financial services sector. At the time of writing, there are no data vendors or

[4] These calculations are based on financial statements of the big four banks and RBA data on assets of financial institutions available from https://www.rba.gov.au/statistics/tables/

[5] The MSCI Global Industry Classification Standard (GICS) classifies the ASX listed company Suncorp Group Ltd. in the Insurance sector, therefore, it is not included in our analysis. In the most recent 2020 Suncorp Group Annual Report, 69% of Suncorp's revenues are from insurance while only 16% of revenues are generated from banking services.

Table 1
Sample of Australian banks.

No.	Bank Name & ticker	1 January 2020	29 June 2020
Panel A: Smallest banks by market capitalization			
1	Auswide Bank (ABA)	$246.77 m	$201.99 m
2	Bank of Queensland (BOQ)	$3204.51 m	$2803.25 m
3	Bendigo and Adelaide Bank (BEN)	$4829.79 m	$3694.22 m
4	BNK Bank (BBC)	$49.52 m	$44.31 m
Panel B: Largest banks by market capitalization			
5	Australia & New Zealand Banking Group (ANZ)	$69,855.05 m	$52,639.45 m
6	Commonwealth Bank (CBA)	$141,442.10 m	$121,403.00 m
7	National Australia Bank (NAB)	$72,593.45 m	$59,484.21 m
8	Westpac (WBC)	$87,511.12 m	$64,251.87 m

This table reports the list of Australian banks selected on the basis of the following criteria: (1) the bank is domiciled in Australia; (2) the bank stock is listed on the Australian Securities Exchange (ASX); and, (3) the bank shares are actively traded. The final two columns report the market capitalization of the stocks on 1st January and 29th June 2020, respectively. Panel A reports the four smallest banks in the sample in terms of market-capitalization. Panel B reports the four largest banks in the sample in terms of market-capitalization.

index providers that have developed an Australian FinTech index or a list of these types of companies on the ASX.

4. Data, methods and events

4.1. FinTech definitions and data

Daily data is collected from Bloomberg and Datastream for the period 1st January 2018 to 30th June 2020. We obtain Australian publicly listed firms that match the Goldstein et al. (2019) and Thakor (2020) definitions of FinTech companies. First, we obtain all 2285 companies listed on the Australian Securities Exchange (ASX) and 57 firms listed on the National Stock Exchange of Australia (NSX).

Second, we collect the business descriptions of these companies in Bloomberg and search for the seven FinTech category names and associated keywords as defined by Chen et al. (2019). Table 2 reports the definitions and keywords employed in the search procedure. This search finds 118 companies with these keywords in their respective business descriptions (i.e. 6 in Cybersecurity, 54 in Mobile Transactions, 36 in Data Analytics, 3 in BlockChain, 8 in P2P, 7 in Robo-advising, and 4 in IoT).

Third, we manually remove companies that are listed on an Australian publicly listed exchange but do not operate in Australia. Firms must operate their business in Australia, such that they are influenced by Australian monetary policy and/or fiscal policy and/or Australian health restrictions. We find there are listed firms from the United States, Canada and China whose stocks are publicly traded on the ASX but they operate outside of Australia, therefore, the performance of these firms have stronger influence from overseas governments, central banks and policies than what was enacted in Australia during COVID-19 in the 2020 calendar year.

Fourth and final, a manual check of the remaining companies is conducted to examine whether more than 50% of their company revenues are derived from one of these seven FinTech categories. This procedure is important in order to remove firms that present or promote themselves as a FinTech firm, but in reality, a majority of their revenues do not reflect this definition, and therefore, are not included in our sample.

Table 3 presents the twelve FinTech firms included in the final sample in this study and a brief description of their business activities. Six of the twelve FinTechs operate lending businesses which reflects a cohort of enterprises competing directly against banks for credit related products and services. Daily price returns of these ASX listed FinTech companies are employed in the event study analysis in this paper.

4.2. Event study methodology

We analyze economic and monetary policy interventions during the COVID-19 pandemic in Australia using the event study methodology and Stata *estudy* program developed by Pacicco et al. (2018). The event study methodology is widely used in the finance and economics literature. For example, according to Kothari and Warner (2007), 565 papers were published in leading finance and business journals in the period from 1974 to 2000 using an event study empirical methodology. In the finance literature, the event study methodology usually applies financial market data to measure the impact of a specific event or announcement on the behavior of firms' stock prices. In capital markets research, event studies are frequently used to test market efficiency. The main strengths of the methodology are simplicity and parsimony (Ait-Sahalia et al., 2012). Assuming market efficiency and rationality of the market, the effects of an event or announcement will be reflected immediately in security prices, so that a measure of the event's impact can be constructed using security prices observed over a relatively short time period (MacKinlay, 1997).

We estimate the stock price reaction for Australian banks and FinTech companies by measuring abnormal returns (ARs), which are computed as the difference between the actual ex-post return of the security over the event window and its normal or expected return over the same window without conditioning on the event taking place. Therefore, in our sample of banks and FinTech companies, we

Table 2
FinTech definitions and classifications.

No.	Category	Keywords
1	Cybersecurity	cybersecurity, encryption, token, authentication, biometric.
2	Mobile Transactions	mobile, transaction(s), wireless, digital wallet, payment(s).
3	Data Analytics	algorithm, big data, cloud, artificial intelligence, machine learning.
4	Blockchain	blockchain, distributed ledger, crypto, proof, smart contracts, acyclic.
5	Peer-to-peer (P2P)	peer, P2P, P-2-P, crowd, lend, customer-to-customer.
6	Robo-advising	robo, artificial intelligence, big data, machine learning.
7	Internet-of-Things (IoT)	IoT, near field, sensor, actuator.

This table reports the seven FinTech categories and keywords as defined by Chen et al. (2019). We employ these definitions and search for these keywords in the business descriptions of Australian publicly listed companies in Bloomberg as at 1st January 2020.

Table 3
Sample of Australian FinTech companies.

No.	Name & ticker	Description	1 January 2020	29 June 2020
1	Afterpay (APT)	Afterpay Limited is a FinTech company operating in Canada, United Kingdom, Australia, United States, and New Zealand. Afterpay is best known for its "buy now pay later" service that allows in-store and online customers to purchase a product immediately and pay for it later with four equal repayments. In June 2017, Afterpay merged with one of its technology suppliers, Touchcorp, to form the Afterpay Touch Group. In November 2019, the company was renamed Afterpay Limited.	$7632.3 m	$15,249.6 m
2	Digital X (DCC)	Financial technology company specializing in blockchain application development and digital asset management services.	$18.17 m	$11.51 m
3	DomaCom (DCL)	The company operates an online property crowdfunding platform based on an Australian Securities and Investments Commission (ASIC) registered managed investment scheme (MIS) legal structure.	$16.42 m	$10.05 m
4	Fatfish Blockchain (FFG)	An international venture investment and development firm investing in cryptos, blockchain, FinTech & consumer internet.	$8.14 m	$4.89 m
5	Identitii (ID8)	Identitii was founded in 2014 and specializes in regulation technology (RegTech). The company helps financial institutions improve regulatory compliance and reduce financial crime.	$17.17 m	$7.44 m
6	MoneyMe (MME)	Personal lender and credit provider.	$245.69 m	$193.16 m
7	NetWealth (NWL)	Specialist platform provider.	$1856.4 m	$2113.1 m
8	Prospa (PGL)	Australia's largest online business lender.	$311.41 m	$151.67 m
9	Raiz Invest Ltd. (RZI)	Formerly known as Acorns, it is a mobile first micro-investing platform, which allows customers to invest in a portfolio of Exchange Traded Funds (ETFs) in and outside of superannuation on a single platform.	$65.21 m	$44.97 m
10	SelfWealth (SWF)	An online broker and adviser platform.	$29.63 m	$87.16 m
11	Wisr (WZR)	Wisr is a FinTech non-bank lender focused on the Australian consumer finance market.	$130.18 m	$217.18 m
12	Zip (Z1P)	Zip Co Limited previously known as ZipMoney Limited is an Australian public limited FinTech company, specializing in the digital retail finance and payments industry, offering point-of-sale credit and digital payment solutions. Zip clientele includes consumers and SMEs.	$1382.0 m	$1987.1 m

This table reports the list of investigated Australian financial technology (FinTech) companies selected on the basis of the following criteria: (1) the FinTech company operates in Australia; (2) the FinTech company is listed on an Australian stock exchange; and, (3) more than 50% of firm revenues are derived from FinTech operations. The final two columns report the market capitalization of the stocks on 1st January and 29th June 2020, respectively.

first measure the reaction to announcements related to the COVID-19 crisis/restrictions, economic stimulus packages, and monetary policy interventions.

Since the market model represents a potential improvement over the constant mean return model (MacKinlay, 1997), in our baseline estimations, we employ the single index market model to compute expected returns so that the equation for the ARs becomes:

$$AR_{i,t} = \mathrm{R}_{it} - \left(\alpha_i + \beta_i R_{m,t}\right) \tag{1}$$

where $R_{i,t}$ and $R_{m,t}$ are the period t returns on security i and the market portfolio, respectively, α_i and β_i are the parameters of the market model, which are obtained with daily log returns of each Australian bank, FinTech company and the Australian All Ordinaries Index over a 250-day estimation period, ending 20 days before the event or announcement.

ARs are cumulated over a period of time to construct cumulative abnormal returns (CARs) around the announcement date ($t = 0$)

for each bank and FinTech stock. However, in the interests of brevity, we report CARs for the portfolios.[6] Kothari and Warner (2007) suggests a portfolio approach as an alternative method to computing both Average Abnormal Return (AARs) and Cumulative Average Abnormal Returns (CAARs). Therefore, levering on an equally weighted portfolio that groups all securities under scrutiny (before computing the abnormal components), we compute the portfolio ARs and CARs, considering the portfolio as a single security. This method calculates equal-weighted portfolio returns of the constituents, so there may be firm size effects that may bias our results, especially in the case of banks, therefore, the sample of banks are also partitioned into 'large' and 'small' bank portfolios based on market capitalization and then the ARs and CARs are re-estimated. The sample of small-banks and large-banks are shown in Table 1. The results reported in a subsequent section shows some variation in the sensitivity of large and small bank portfolio returns; however, there are no fundamental differences between various size bank portfolios and FinTech returns.

In terms of time horizons, we follow Ait-Sahalia et al. (2012); Ricci (2015) and Fiordelisi et al. (2014) by employing the following short event windows: 5-day (−1;+3), 3-day (−1;+1) and one-day (0;0). As a robustness check, we also estimate CARs on (0;+1). For each event window, CARs are obtained as follows:

$$CAR_i(t_1, t_2) = \sum_{t=t_1}^{t_2} AR_{i,t} \quad (2)$$

To test the robustness of our results, we also use the market-adjusted return model for the calculation of normal returns. As MacKinlay (1997) notes, this model is used in cases with limited data and when it is not feasible to have a pre-event estimation period for the normal model parameters. In this model, normal returns are set equal to the market returns on the event days and an estimation period is not required to obtain parameter estimates. Therefore, abnormal returns are the difference between the ex-post stock returns and the market return on the respective date:

$$AR_{i,t} = R_{i,t} - R_{m,t} \quad (4)$$

The market-adjusted model is used when available data may bias risk parameters because relevant events are likely to be included in the estimation period, making the estimation of beta contaminated (Draper and Paudyal, 2008; Fuller et al., 2002), which could be the case with our dataset given the frequency of economic, monetary, and other interventions in the turbulent period of the COVID-19 pandemic. Recent studies using the market-adjusted method focus on crisis events because during these episodes the risk-return dynamics is likely to be different compared to normal environments (Fiordelisi and Ricci, 2016; Kutan et al., 2012). As noted by Fiordelisi and Ricci (2016), by using abnormal returns as a difference between the actual stock return and the market return on the day of the event, it is possible to take into account that risk parameters may be volatile during the crisis period, which may have introduced a certain level of bias in the market model estimates.

After computing CARs, we test whether a reaction in stocks is significantly different from zero. The literature recognizes that the variance in ARs during the days near the event may increase, with respect to the estimation period, as an effect of the announcement (Cummins and Weiss, 2004). Therefore, our hypothesis testing methodology must consider this escalation in variance. To take this effect into account, Patell (1976) suggests a parametric test that is based on scaled ARs. The Boehmer et al. (1991) test statistic (BMP) improves the Patell (1976) test by accounting for the possible cross-sectional increase in the variance of the returns that may occur within the event window. However, both of the above-mentioned tests suffer from the cross-sectional correlation of ARs, which may seriously affect their outcome in the case of event-day clustering that verifies when a single event simultaneously affects all securities included in the analysis (Pacicco et al., 2018). A test suggested by Kolari and Pynnönen (2010) modifies the BMP test, introducing a correction for the cross-correlation, and hence, overcomes the problems associated with previous tests. Therefore, we employ the Kolari and Pynnönen (2010) test to examine the statistical significance of CARs.

For the market-adjusted returns in our analysis, regression estimates are not calculated, thus, we cannot employ the Kolari and Pynnönen (2010) test. Therefore, to form inferences, we calculate simple *t*-tests and the nonparametric test developed by Kolari and Pynnönen (2011), known as the generalised rank test (GRANK). The results of using these two tests are broadly similar, therefore, we report the results using the GRANK test. This test is considered as one of the most powerful tests for both shorter CAR-windows and longer periods. The GRANK test outperforms both previous rank tests and other parametric variants without suffering from the potential biases caused by serial correlation of ARs or event-induced volatility (Pacicco et al., 2018).

4.3. Events

To evaluate the impact of various types of policy events on bank and FinTech stock prices, the chronological events of this study are derived from three sources, namely, RBA media releases, Australian federal government press releases, and Duckett and Stobart (2020). We classify the announcements into three categories, namely: (a) monetary policy decisions of the RBA; (b) news related to COVID-19; and, (c) economic policy interventions of the Australian government. Some announcements were released on weekends and some others occurred in the evenings when the markets were closed, therefore, we focus on daily frequency observations. When announcements are disclosed on the weekend or public holiday, our estimation window centres around the first workday after the last business day.

Table 4 presents a summary of the most important COVID related events, monetary policy actions and macroeconomic

[6] Estimation results for each bank and FinTech company are available from the authors upon request.

Table 4
COVID-19 pandemic, policy response and monetary policy interventions.

Covid-19 events		Monetary policy actions		Macroeconomic/containment interventions	
Date	Event announcement	Date	Event announcement	Date	Event announcement
25 January 2020 (Saturday)	Australia confirms its first four cases of coronavirus cases	3 March 2020 (Tuesday)	The RBA Board decides to lower the cash rate by 25 basis points to 0.50%.	22 March 2020 (Sunday)	Australian government guarantee for 50% of new SME loans and a new, automatic cash payment of up to $100,000 for SMEs. Australians encouraged to work from home. Non-essential businesses ordered to close from March 25. Australians banned from travelling overseas.
1 February 2020 (Saturday)	Arrivals from China blocked	19 March 2020 (Thursday)	The RBA board decides to lower the cash rate by 25 basis points to 0.25%. In addition, for the first time, the RBA announces the implementation of quantitative easing. A term funding facility for the banking system, with particular support for credit to small and medium-sized businesses is extended.	24 March 2020 (Tuesday)	The Australian states & territories of Northern Territory (NT), Queensland, South Australia (SA), and Western Australia (WA) enforce border controls.
13 March 2020 (Friday)	Cases double every 3 days, surging from less than 200 to more than 2000 in less than 12 days. Prime Minister Scott Morrison advises ban on non-essential outdoor gatherings of more than 500 people from March 16. Overseas arrivals required to self-isolate for 14 days.	7 April 2020 (Tuesday)	The RBA Board reaffirms the targets for the cash rate and the yield on 3-year Australian government bonds of 25 basis points, as well as the other elements of the package announced on 19 March 2020.	30 March 2020 (Monday)	On 30 March 2020, the government announces its intention to provide businesses affected by COVID-19 with a subsidy to continue paying their employees. The program is known as the JobKeeper Payment.
		5 May 2020 (Tuesday)	The RBA Board decides to maintain the current policy settings, including the targets for the cash rate and the yield on 3-year Australian Government bonds of 25 basis points.	29 April 2020 (Wednesday)	Prime Minister Scott Morrison flags easing of coronavirus restrictions in the near future.
23 March 2020 (Friday)	On Monday 23 March, the number of confirmed cases from the ship Ruby Princess increases to 48 in total – 27 in NSW, and 21 interstate. The cruise ship becomes Australia's largest single source of Covid-19 infection. Nearly 700 cases (about 10% of Australia's cases) and 22 deaths (about 20% of Australia's deaths) are linked to the ship.	2 June 2020 (Tuesday)	The RBA Board decides to maintain the current policy settings, including the targets for the cash rate and the yield on 3-year Australian Government bonds of 25 basis points.	8 May 2020 (Friday)	The Prime Minister unveils the National Cabinet's three-step plan to ease restrictions imposed to prevent the spread of Coronavirus.
11 April 2020 (Easter Saturday – first business day after the announcement 14 April)	Western Sydney aged care home Newmarch House announces a confirmed COVID-19 case in a staff member. By 14 April, NSW Health confirms 10 coronavirus cases at Newmarch House.				
1 June 2020 (Wednesday)	The total number of COVID-19 cases linked to the outbreak at quarantine hotel Rydges on Swanston in Melbourne increases to eight.				

This table lists the news related to the COVID-19 outbreak, major Australian government policy response actions, and Reserve Bank of Australia (RBA) actions during the pandemic. These decisions were announced in the period from January 2020 to June 2020. The information is manually collected from Australian government and RBA announcements.

containment/intervention decisions enacted during the height of the crisis from January to June 2020. The COVID related events include the first four cases of COVID-19 in Australia on 25 January 2020, travel bans on arrivals from China imposed on 1 February 2020, dramatic increases in the number of cases of COVID-19 (with cases doubling every 3 days at that point in time) in Australia on 13 March 2020, a spike in the number of COVID-19 cases among the Ruby Princess cruise liner passengers after docking (Sydney), the

Newmarch House aged care facility outbreak (Sydney), and the epidemic cluster in the quarantine hotel Rydges on Swanston (Melbourne). The monetary policy related events include two decisions to cut the cash rate target, two decisions to keep the policy interest rate unchanged and the implementation of a quantitative easing (QE) program for the first time in Australia. The latter decision coincided with one of the decisions to lower the cash rate target. The major macroeconomic/containment interventions included support for small to medium enterprises (SMEs), temporary closure of some businesses, the announcement of the JobKeeper income support program and others.

One of the major problems in conducting event studies is overlapping events. When two or several major events impact stock returns and occur around the same date, it is difficult to disentangle which event has a major or dominant effect. To mitigate the impact of overlapping events that may bias results, we focus on major events only. The work of Duckett and Stobart (2020) was employed to identify the importance of these events. In case of coincidental but different types of events or news, the announcement of the economically more significant one was selected. Using the Fiordelisi et al. (2014) and Ricci (2015) criterion, when different announcements belong to the same event-type category, we interpret them as a single event. For example, on 19 March 2020, the RBA cut the 0.50% cash rate target to 0.25%, created a term funding facility for the banking system, and announced a QE program. Since the cut in the cash rate target and QE decisions are monetary policy related, both of these events were considered as a single event. It should be noted that the announcement of QE received more coverage in the financial media, therefore, more precisely, it could be classified as a QE subcategory of the monetary policy intervention. As a result of the above-described selection procedure, we identified 15 announcements, including 5 related to monetary policy, 6 associated with COVID-19, and 4 related to macroeconomic interventions of the government.

5. Results

We commence with a preliminary analysis of CAPM betas for the Australian banks and FinTechs in our study. Table 5 presents the

Table 5
Bank and FinTech betas.

	Pre-COVID	COVID period	Wald Test	Δ in Mean Beta
Panel A: FinTech betas				
APT	2.14	2.33	0.453	
DCC	0.81	0.66	0.723	
DCL	0.83	1.49	0.123	
FFG	1.39	0.88	0.323	
ID8	–	0.30	–	
MME	–	0.96	–	
NWL	−0.99	−1.34	0.225	
PGL	–	1.61	–	
RZI	–	1.35	–	
SWF	0.98	0.95	0.913	
WZR	1.32	2.90	0.000**	
Z1P	1.61	2.03	0.079	
Mean	1.14	1.17		3.4%
Panel B: Bank betas				
ANZ	1.13	1.40	0.000**	
ABA	0.19	0.73	0.000**	
BOQ	1.01	1.00	0.938	
BEN	1.06	1.15	0.141	
BBC	−0.28	0.27	0.007**	
CBA	1.05	1.21	0.001**	
NAB	0.96	1.30	0.000**	
WBC	1.15	1.29	0.015*	
Mean	0.78	1.04		33.2%
Panel C: Other betas				
ASX 50 Index	1.01	1.02	0.358	
ASX Small Ordinaries Index	0.99	0.95	0.150	
ASX Small Industrials Index	0.99	0.94	0.866	
ASX Small Resources Index	0.96	0.99	0.647	
Mean	0.99	0.98		−1.3%

This table presents the Capital Asset Pricing Model (CAPM) beta estimates of all FinTech and banking stocks employed in this study. Panels A and B report company betas estimated from daily returns for FinTech and banks stocks, respectively. The Pre-COVID subperiod refers to the sample from 1st January 2018 to 31st December 2019 which represents the two-year period prior to the COVID-19 Coronavirus outbreak. The COVID period refers to the subperiod from 1st January 2020 to 29th June 2020 which are the days of the COVID-19 outbreak and the subsequent period experienced in global markets during the global pandemic crisis. The ASX All Ordinaries Index is employed as the market portfolio and the Bloomberg Bank Bill Index is the proxy for the risk-free rate. Wald Test denotes the *p*-value from the Wald test of equality of two regression coefficients. * and ** denote statistical significance at the 5% and 1% levels, respectively.

betas for these stocks based on daily returns in the pre-crisis period (i.e. 2018–2019 calendar years) and the COVID-19 period during the depths of the pandemic in Australia (i.e. January to June 2020). We employ the ASX All Ordinaries Index as the market-wide proxy of systematic risk. Panel A reports the Wald tests of equality of two regression coefficients are insignificant for all FinTechs except Wisr Ltd. (WZR) and the mean increase in betas over the two periods is 3.4%. Despite their small market capitalization, the systematic risk of FinTechs did not significantly change during the two sample periods. In contrast, Panel B reports significant Wald tests for six out of the eight banks and a 33.2% increase in the mean betas over the two sample periods. Furthermore, the big four banks (ANZ, CBA, NAB and WBC) all report statistically significant changes in betas. This result for banks is expected as they are a critical component of the financial system and markets priced in higher systematic risk in these firms with the onset of COVID-19 crisis. As a comparison, Panel C reports the betas of the ASX Small Ordinaries, Small Industrials and Small Resources Indexes and we can see they were relatively stable in both sample periods. Overall, these findings suggest the systematic risk of banks increased significantly during the COVID period while FinTech betas did not significantly change. The preliminary analysis of betas suggests the behavior of systematic risk of banks and FinTechs were different during the initial phase of the COVID-19 crisis in 2020.

Next, we shift our attention from systematic risk to idiosyncratic risk. It is instructive to study the volatility of the market, industry sectors, the small-firm effect and their effects on firm-specific volatility of banks and FinTechs. We employ the Campbell et al. (2001) decomposition of volatility procedure to disaggregate the volatility of banks and FinTechs in our sample period. The Campbell et al. (2001) procedure does not require the estimation of covariances or betas for industries or firms. The returns of stocks are decomposed into three components, namely, the market-wide return, an industry-specific residual and a firm-specific residual. First, we employ the daily absolute returns of the ASX All Ordinaries Index as the market-wide return. Second, we calculate the industry specific residual returns from the market-value weighted absolute returns of the eleven (11) ASX 200 GICS industry sector indices. We use ASX 200 GICS industry sector indexes as they are investable (i.e. realizable) returns and do not suffer from biases associated with ASX listed small- and micro-capitalization stocks. The inclusion of ASX small- and micro-capitalization stocks creates biases in returns which have been extensively documented in the literature including Brailsford et al. (2012), Brailsford and O'Brien (2008), Zhong et al. (2014), Dou et al. (2013), O'Brien et al. (2010), Demir et al. (2004), Gaunt and Gray (2003), Marshall and Cahan (2005), and more recently in Cakici et al. (2021). Third, after estimating industry-wide returns, we estimate firm-specific residuals in the twelve FinTech firms (value-weighted) and a second estimation of firm-specific residuals in the eight banks (value-weighted). This procedure allows us to compare the firm-specific residuals of bank stocks and FinTechs.

Fig. 2 reports the daily estimation of the Campbell et al. (2001) procedure. Fig. 3 follows Chiah, Gharghori and Zhong (forthcoming) and reports the 7-day moving average of the daily estimations which presents a clearer illustration and less noise with the interpretation of results. The first observation is, as expected, the firm-specific volatility of banks is lower than FinTechs in the pre-COVID era. Second, the volatility decomposition reveals that the response of bank stocks in terms of firm-specific residuals to COVID-19 was immediate in early February 2020. The rise in bank firm-specific volatility was large and significant in magnitude in February 2020 in comparison to what was previously observed in the pre-COVID period. The firm-specific volatility of bank stocks increased significantly in March to April 2020 and then subsequently decreased in May 2020 but remained moderately elevated compared to 2019.

In this same period, Figs. 2 and 3 show the firm-specific volatility in FinTechs did not respond to the impact of COVID as rapidly as banks. It can be observed that the rise in firm-specific volatility of FinTechs occurs a few weeks after the initial reaction in bank stock volatility. This finding suggests the market response to banks in relation to COVID-19 was immediate while the impact of COVID on FinTechs can be observed afterwards. This difference in timing in the firm-specific behavior between FinTechs and banks is evidence that FinTechs responded differently to the global pandemic. For more details, Fig. 2 shows the firm-specific volatility of FinTechs rose

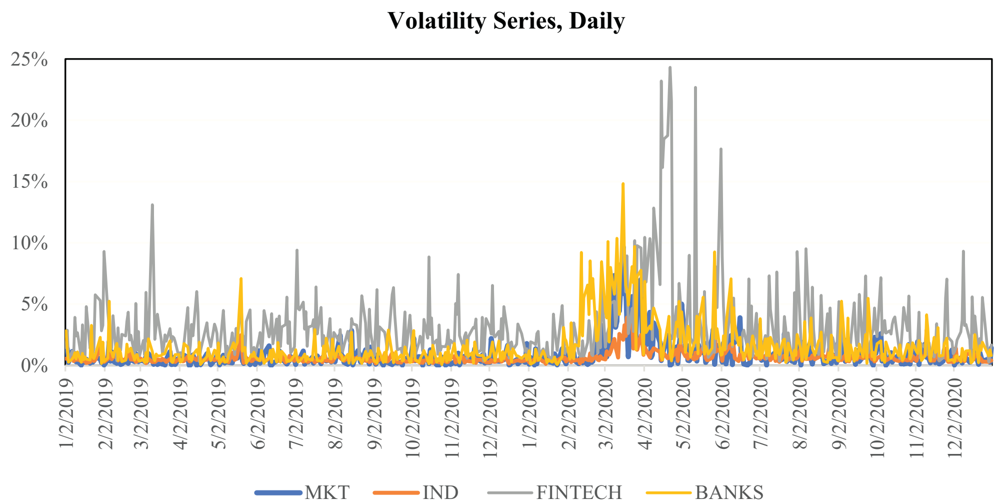

Fig. 2. Volatility series, Daily.

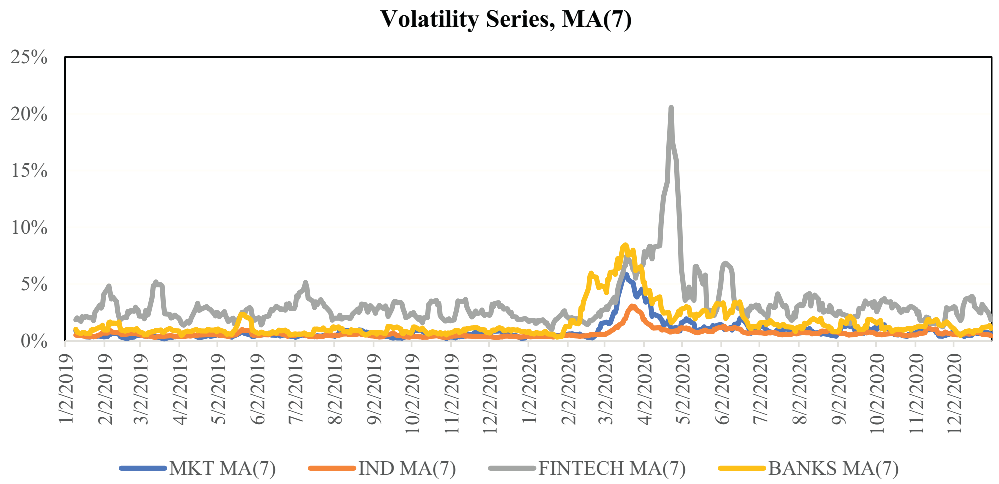

Fig. 3. Volatility series, MA(7).

rapidly in mid-March to mid-April 2020 when the same estimation for banks was falling. Again, this behavior of firm-specific volatility suggests the behavior of banks and FinTechs are substantially different. A closer inspection of market events during this time period reveals that the FinTech company Afterpay (APT) released an announcement on 14 April 2020 declaring that it was tightening credit lending standards as a response to the COVID-19 lockdowns. As a result, we can observe the extreme firm-specific volatility in the period 15–23 April 2020, as the market embedded this new information into APT and other FinTech stock prices.

To examine the small-firm effect on FinTechs, Figs. 4 and 5 repeat the Campbell et al. (2001) procedure but incorporates the ASX Small Ordinaries Index and removes industry-sector returns from the volatility decomposition as we extend the pre-COVID period for the two years of 2018–2019. Figs. 4 and 5 reveal the major driver of volatility is market-level risk while the ASX Small Ordinaries contributes a marginal increase in overall volatility. This result is consistent with the beta estimates reported in Table 5. By far, the most significant contributor to total volatility is firm-level volatility. We now proceed to examine the behavior of these two groups as various types of announcements and information arrived in the market in early- to mid-2020.

Table 6 presents the impact of COVID-19 related restrictions on the returns of financial services firms. Panel A reports the impact of the initial announcement on 25 January 2020 of the first four cases of coronavirus in Australia and Panel B shows the effect from the decision to block arrivals from China on 1 February 2020. Both announcements report an insignificant impact on stock prices which suggests that markets were not taking the threat of COVID-19 seriously in the early stages of the unfolding crisis. Panel C reports the first COVID related announcement on 13 March 2020 which resulted in a significant market response. This announcement included the doubling of confirmed cases every 3 days, the banning of non-essential outdoor gatherings of more than 500 people, along with mandatory self-isolation of overseas arrivals for 14 days. This announcement resulted in a strong and statistically significant negative impact on both banks and FinTech stocks. It is also evident that smaller banks were more sensitive to these announcements compared to larger banks. Panel D reports the announcement on 23 March 2020 of an increase in COVID-19 cases among passengers of the Ruby

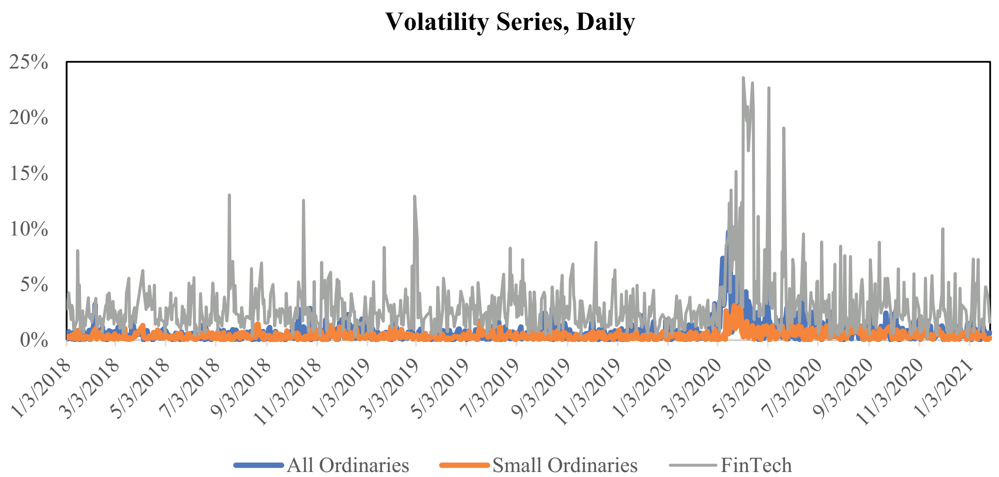

Fig. 4. Volatility series, Daily.

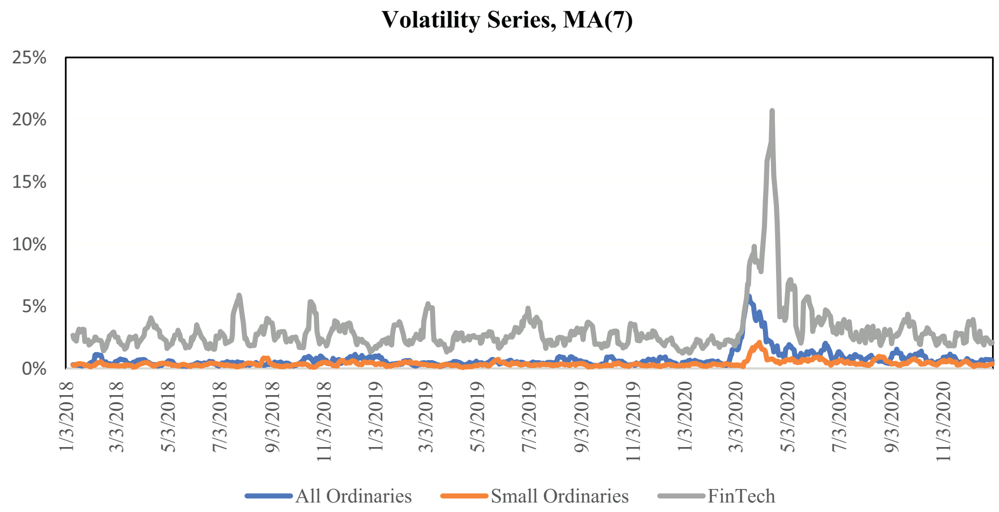

Fig. 5. Volatility series, MA(7).

Princess cruise liner (docked in Sydney) which also resulted in heavy negative market returns across the board.

Panels E and F report the reactions to the outbreak of cases at the Newmarch House aged care home (in Sydney) on 11 April 2020 and the Rydges Hotel (Melbourne) quarantine scandal on 1 June 2020, respectively.[7] Both of these events corresponded with significant declines in stock prices and significant increases in FinTech stocks. More importantly, these two events report opposite impacts on the two groups of financial services firms under investigation. While bank stock returns declined over some of the estimation windows, FinTech stock prices increased significantly over a number of event periods using both single index and market adjusted models. These results are linked to the gradual introduction of social distancing and stay-at-home policies progressively introduced before these events. Investors may have perceived that under these conditions, the focus of FinTechs on contactless payment services and digital solutions may give them a competitive edge over banks. As an example, Afterpay's share price increased 219% between 23 March and 14 April 2020. These results support hypothesis 3 (H3) that the reaction of FinTech stock prices is different compared to banks and reflects the positive market expectations for the FinTech sector. As to the differences in the reaction between different size bank stock portfolios, we again observe that small banks were more sensitive to these announcements compared to large banks.

Table 7 reports the reaction of bank and FinTech stocks to monetary policy interventions. In general, the findings show that expansionary monetary policy interventions resulted in predominantly negative effects on share prices. Panel A reports the effect of cutting policy interest rates on 3 March 2020 while Panel B shows the impact of cutting interest rates on 19 March 2020 in combination with the implementation of quantitative easing and credit support for SMEs via the banks. Both announcements result in significant declines in banking stock returns. In fact, large bank stock returns exhibit a stronger negative reaction to this news compared to small banks. However, the effect of the 3rd of March cut in the cash rate target on FinTechs is insignificant. As the pandemic in Australia approached its climax, the 19th March announcement of an interest rate cut as well as QE (before introduction of social distancing restrictions) exhibits a more homogenous negative impact on both groups. This outcome is consistent with the findings in Ricci (2015) and indicates that at the deepest moment of the crisis, these drastic monetary policy measures are interpreted as a signal of the severity of the pandemic. The comparison of the reaction of small versus large bank stocks reveals a mixed picture. Small banks appear to be more sensitive over the longest estimation window (−1,3 days) measured by CARs. However, the impact of this announcement on both types of banks over the longest estimation window measured by MARs appears to be broadly similar. Over the shortest estimation window (0,0), the reaction of large banks is more sensitive. Interestingly, the small bank portfolio return is even positive over the three short to medium estimation windows. Nevertheless, this effect is wiped out and turns negative over the longest estimation time period. Notwithstanding some differences in the reaction of large versus small banks, the findings in Panels A and B lend support to our first hypothesis that monetary policy interventions do not always translate to positive market reactions.

Panels C to E examine the three RBA decisions to leave the cash rate target unchanged which resulted in significant positive returns for FinTechs, while banks reported significantly negative, insignificant and flat to significant positive returns, respectively. The reaction of large and small bank portfolios to unchanged interest rates on 7 April is broadly similar. We interpret this finding as the market opinion of a more positive expectation for FinTechs in the "new normal" of a post-COVID environment. The stark difference in performance between these two groups supports our second hypothesis (H2) that announcements tend to exhibit a stronger impact on FinTech stocks compared to banks. Furthermore, this evidence is also consistent with our third hypothesis (H3) that the response of FinTech stock returns to crisis and policy measures are different compared to bank returns.

[7] The Newmarch House outbreak was announced on Saturday 11th April 2020. The ASX was closed for the Easter Monday public holiday on 13th April 2020, hence, the first trading day after the initial announcement was Tuesday 14th April 2020.

Table 6
Reaction to major news related to COVID-19.

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Panel A. Event date: 28 January 2020. The first trading day after the first four cases of coronavirus were confirmed in Australia				
Bank portfolio CARs	0.0206	0.0121	−0.0010	−0.0098
Large bank CARs	0.0193	0.0144	0.0094	0.0011
Small bank CARs	0.0219	0.0098	−0.0113	−0.0208*
Fintech portfolio CARs	−0.0155	0.0072	0.0064	0.0095
Bank portfolio MARs	0.0195	0.0119	−0.0004	−0.0083
Large bank MARs	0.0152	0.0117	0.0072	−0.0006
Small bank MARs	0.0237	0.0121	−0.0079	−0.0160
Fintech portfolio MARs	0.0013	0.0173	0.0132	0.0124
Panel B. Event date: 3 February 2020. The first trading day after arrivals from China were blocked.				
Bank portfolio CARs	−0.0005	−0.0009	−0.0005	−0.0025
Large bank CARs	−0.0040	−0.0020	0.0025	0.0020
Small bank CARs	0.0031	0.0002	−0.0036	−0.0070
Fintech portfolio CARs	0.0047	−0.0096	−0.0105	−0.0244
Bank portfolio MARs	−0.0049	−0.0007	0.0008	0.0004
Large bank MARs	−0.0069	−0.0041	0.0011	0.0011
Small bank MARs	−0.0028	0.0027	0.0005	−0.0002
Fintech portfolio MARs	0.0185	0.0001	−0.0037	−0.0200
Panel C. Event date: 13 March 2020. News announcement of cases doubling every 3 days. A ban on non-essential outdoor gatherings of more than 500 people. Overseas arrivals are required to self-isolate for 14 days.				
Bank portfolio CARs	−0.0392**	−0.0559***	−0.0452***	−0.0164**
Large bank CARs	−0.0107	−0.0443***	−0.0327***	−0.0111
Small bank CARs	−0.0676***	−0.0675***	−0.0576***	−0.0217*
Fintech portfolio CARs	−0.1639**	−0.1543***	−0.0742*	−0.0413
Bank portfolio MARs	−0.0083	−0.0265**	−0.0327***	−0.0263***
Large bank MARs	−0.0116	−0.0447***	−0.0331***	−0.0114
Small bank MARs	−0.0049	−0.0083	−0.0324	−0.0412***
Fintech portfolio MARs	−0.1386**	−0.1348***	−0.0641*	−0.0428
Panel D. Event date: 23 March 2020. New South Wales (NSW) Health announce the number of confirmed cases from the Ruby Princess cruise ship at 48 in total.				
Bank portfolio CARs	−0.0218	−0.0536***	−0.0819***	−0.0658***
Large bank CARs	0.0277	−0.0040	−0.0479***	−0.0506***
Small bank CARs	−0.0713***	−0.1032***	−0.1159***	−0.0810***
Fintech portfolio CARs	0.0706	−0.0150	−0.0890**	−0.1394***
Bank portfolio MARs	−0.0400**	−0.0518***	−0.0776***	−0.0510***
Large bank MARs	0.0246	−0.0041	−0.0475***	−0.0487***
Small bank MARs	−0.1046***	−0.0994***	−0.1076***	−0.0533***
Fintech portfolio MARs	0.0775	−0.0067	−0.0825**	−0.1320***
Panel E. Event date: 14 April 2020. New South Wales (NSW) Health confirms 10 coronavirus cases at Newmarch House, Sydney.				
Bank portfolio CARs	−0.0410**	−0.0066	−0.0044	0.0010
Large bank CARs	−0.0059	0.016	0.0042	−0.0002
Small bank CARs	−0.0762***	−0.0291	−0.0131	0.0022
Fintech portfolio CARs	0.1130*	0.0934*	0.0755*	0.0723***
Bank portfolio MARs	−0.0489***	−0.0131	−0.0070	−0.0014
Large bank MARs	−0.0045	0.0181	0.0043	0.0007
Small bank MARs	−0.0933***	−0.0443**	−0.0183	−0.0035
Fintech portfolio MARs	0.1313**	0.1091**	0.0812**	0.0782***
Panel F. Event date: 1 June 2020. The total number of COVID-19 cases linked to the outbreak at the quarantine hotel Rydges on Swanston in Melbourne increases to eight individuals.				
Bank portfolio CARs	−0.0047	−0.0319**	−0.0071	−0.0070
Large bank CARs	−0.0128	−0.0420**	−0.0131	−0.0062
Small bank CARs	0.0034	−0.0218	−0.0012	−0.0077
Fintech portfolio CARs	0.1614***	0.0715	0.0681	−0.0071
Bank portfolio MARs	−0.0109	−0.0353**	−0.0097	−0.0083
Large bank MARs	−0.0113	−0.0448**	−0.0113	−0.0045
Small bank MARs	−0.0105	−0.0260	−0.0080	−0.0122
Fintech portfolio MARs	0.1857***	0.0809	0.0794*	−0.0001

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for 6 major COVID-19 related news from January to June 2020. The impact of the news is estimated for the portfolio of banks and FinTech companies listed in Tables 1 and 3, respectively. Daily Abnormal Returns for portfolios of stocks are obtained using the market model with a 250-day estimation period and market-adjusted model measured as the simple difference between the stock and market index returns. The proxy for the market portfolio is the Australian All Ordinaries Index. The statistical significance of cumulative abnormal returns (CARs) is calculated by employing the Kolari and Pynnönen (2010) adjustment to the Boehmer et al. (1991) procedure to account for possible cross-sectional correlation of abnormal returns and to capture potential event-induced increases in returns volatility. Market-adjusted returns (MAR) refers to the Kolari and Pynnönen (2011) generalised rank test. ***, **, * denote statistical significance at the 1, 5, and 10% levels, respectively.

Table 7
Reaction to monetary policy interventions.

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Panel A. Event date: 3 March 2020. RBA Board lowers the cash rate target by 25 basis points from 0.75% to 0.50%				
Bank portfolio CARs	−0.0639***	−0.0321**	−0.0195*	−0.0056
Large bank CARs	−0.0737***	−0.0467***	−0.0349***	−0.0212***
Small bank CARs	−0.0541**	−0.0176	−0.0042	0.0100
Fintech portfolio CARs	−0.0292	−0.0110	−0.0050	0.0071
Bank portfolio MARs	−0.0571***	−0.0288**	−0.0178*	−0.0079
Large bank MARs	−0.0761***	−0.0481***	−0.0358***	−0.0217***
Small bank MARs	−0.0380	−0.0096	0.0002	0.0060
Fintech portfolio MARs	−0.0120	−0.0011	0.0014	0.0088
Panel B. Event date: 19 March 2020. RBA board lowers the cash rate target by 25 basis points from 0.50% to 0.25%. In addition, for the first time, the RBA announces the implementation of quantitative easing. A term funding facility for the banking system, with particular support for credit to small and medium-sized businesses is extended.				
Bank portfolio CARs	−0.0794***	0.0020	0.0116	−0.0167**
Large bank CARs	−0.0578***	−0.0107	0.0016	−0.0422***
Small bank CARs	−0.1010***	0.0146	0.0216	0.0088
Fintech portfolio CARs	−0.0788	0.0108	0.0425	−0.0316
Bank portfolio MARs	−0.0551***	0.0225*	0.0177	−0.0081
Large bank MARs	−0.0585***	−0.0110	0.0012	−0.0422***
Small bank MARs	−0.0517*	0.0559***	0.0343***	0.0261***
Fintech portfolio MARs	−0.0549	0.0277	0.0506	−0.0253
Panel C. Event date: 7 April 2020. RBA Board decides to leave the cash rate target unchanged at 0.25%.				
Bank portfolio CARs	−0.0347*	−0.0329**	−0.0218*	0.0038
Large bank CARs	−0.0301*	−0.0426***	−0.0471***	−0.0100
Small bank CARs	−0.0392	−0.0233	0.0036	0.0176
Fintech portfolio CARs	0.1930***	0.1003**	0.0748*	0.0636**
Bank portfolio MARs	−0.0445**	−0.0370***	−0.0215*	0.0038
Large bank MARs	−0.0275	−0.0420***	−0.0484***	−0.0105
Small bank MARs	−0.0615**	−0.0320	0.0055	0.0181
Fintech portfolio MARs	0.2166***	0.1105**	0.0753**	0.0643**
Panel D. Event date: 5 May 2020. RBA Board decides to leave the cash rate target unchanged at 25 basis points.				
Bank portfolio CARs	−0.0265	−0.0092	−0.0046	0.0009
Large bank CARs	−0.0292	0.0000	−0.0082	0.0035
Small bank CARs	−0.0237	−0.0183	−0.0011	−0.0017
Fintech portfolio CARs	0.0839	0.0095	0.0086	−0.0054
Bank portfolio MARs	−0.0295	−0.0110	−0.0058	0.0004
Large bank MARs	−0.0247	0.0047	−0.0059	0.0071
Small bank MARs	−0.0343	−0.0266	−0.0058	−0.0063
Fintech portfolio MARs	0.1014	0.0228	0.0163	0.0017
Panel E. Event date: 2 June 2020. RBA Board decides to leave the cash rate target unchanged at 25 basis points.				
Bank portfolio CARs	0.0474**	0.0077	0.0146	−0.0001
Large bank CARs	0.0432	0.0090	0.0153	−0.0068
Small bank CARs	0.0517	0.0063	0.0140	0.0066
Fintech portfolio CARs	0.1426**	0.1405***	0.1477***	0.0751**
Bank portfolio MARs	0.0409**	0.0036	0.0120	−0.0013
Large bank MARs	0.0485**	0.0141	0.0186	−0.0068
Small bank MARs	0.0333	−0.0069	0.0054	0.0042
Fintech portfolio MARs	0.1725**	0.1612***	0.1613***	0.0795***

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for 5 major Covid-19 related news events from January to June 2020. The impact of the news is estimated for the portfolio of banks and FinTech companies listed in Tables 1 and 3, respectively. Daily Abnormal Returns for portfolios of stocks are obtained using the market model with a 250-day estimation period and market-adjusted model measured as the simple difference between the stock and market index returns. The proxy for the market portfolio is the Australian All Ordinaries Index. The statistical significance of cumulative abnormal returns (CARs) is calculated by employing the Kolari and Pynnönen (2010) adjustment to the Boehmer et al. (1991) procedure to account for possible cross-sectional correlation of abnormal returns and to capture potential event-induced increases in returns volatility. Market-adjusted returns (MAR) refers to the Kolari and Pynnönen (2011) generalised rank test. ***, **, * denote statistical significance at the 1, 5, and 10% levels, respectively.

Table 8 presents the reactions from major macroeconomic interventions. The estimations show that macroeconomic policy announcements from the Australian government are more effective for banks stock returns and are in line with expected outcomes. However, we again detect notable differences in the response of FinTech and bank returns to these announcements. This finding confirms the robustness of our previous finding that banks and FinTechs reacted differently to the pandemic induced policy actions. Consistent with hypothesis 3 (H3), Panel A reports that non-essential business closures resulted in a significant drop in the value of bank returns, while FinTech stocks experienced positive returns. We also note that the response of the portfolio of small banks to the introduction of restrictions was stronger compared to the response of the larger banks. We conjecture that this is due to fact that larger banks have more resources and are more diversified to withstand the crisis.

Panel B reports the impact from the announcement of the JobKeeper Payment program (a subsidy to continue paying employee salaries for businesses) and reveals a positive effect on bank shares and statistically insignificant impact on FinTech stock returns. This announcement translated into a more positive expectation for banks (the effect is statistically more significant for large banks), as their customers stand to gain more from the JobKeeper program compared to FinTech clientele. The significant reaction to this announcement is consistent with hypothesis 1 (H1) that stock market responses to macroeconomic decisions during the pandemic are stronger than the responses to monetary policy interventions.

Table 8

Reaction to news of major macroeconomic interventions.

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Panel A. Event date: 24 March 2020. Non-essential businesses are ordered to close from March 25.				
Bank portfolio CARs	−0.0515***	−0.0512***	0.0142	−0.0163**
Large bank CARs	−0.0355**	0.0009	0.0517***	0.0029
Small bank CARs	−0.0675**	−0.1033***	−0.0232	−0.0355***
Fintech portfolio CARs	0.0225	−0.0540	0.0843*	0.0498*
Bank portfolio MARs	−0.0547***	−0.0602***	0.0093	−0.0266***
Large bank MARs	−0.0367**	−0.0009	0.0478***	0.0011
Small bank MARs	−0.0728***	−0.1196***	−0.0663***	−0.0544***
Fintech portfolio MARs	0.0338	−0.0491	0.0829***	0.0495*
Panel B. Event date: 30 March 2020. The Australian government announces the Jobkeeper program which provides businesses affected by COVID-19 with a subsidy to continue paying their employees				
Bank portfolio CARs	0.0436**	0.0368***	0.0358***	0.0254***
Large bank CARs	−0.0187	0.0279**	0.0476***	0.0267***
Small bank CARs	0.0491	0.0457**	0.0240	0.0240*
Fintech portfolio CARs	0.0837	0.0460	0.0128	−0.0185
Bank portfolio MARs	0.0109	0.0362***	0.0251**	0.0117
Large bank MARs	−0.0202	0.0274**	0.0452***	0.0238***
Small bank MARs	0.0420	0.0451**	0.0051	−0.0004
Fintech portfolio MARs	0.0944	0.0518	0.0197	−0.0127
Panel C. Event date: 29 April 2020. Prime Minister Scott Morrison flags the easing of coronavirus restrictions in the near future				
Bank portfolio CARs	0.0304	0.0325**	0.0300**	0.0199**
Large bank CARs	0.0453**	0.0340**	0.0347**	0.0355***
Small bank CARs	0.0155	0.0310	0.0253	0.0044
Fintech portfolio CARs	0.0813	0.0347	0.0063	0.0074
Bank portfolio MARs	−0.0275	0.0313**	0.0298**	0.0197**
Large bank MARs	0.0434*	0.0430**	0.0446***	0.0392***
Small bank MARs	0.0117	0.0196	0.0151	0.0003
Fintech portfolio MARs	0.0874	0.0534	0.0245	0.0146
Panel D. Event date: 8 May 2020. The Prime Minister unveils the National Cabinet's three-step plan to ease coronavirus restrictions.				
Bank portfolio CARs	−0.0297	−0.0229	−0.0141	−0.0082
Large bank CARs	−0.0403	−0.0407*	−0.0238	−0.0121
Small bank CARs	−0.0192	−0.0052	−0.0045	−0.0043
Fintech portfolio CARs	0.0662	0.1022**	0.0935**	0.0650**
Bank portfolio MARs	−0.0335	−0.0252	−0.0157	−0.0090
Large bank MARs	−0.0417*	−0.0385*	−0.0201	−0.0111
Small bank MARs	−0.0254	−0.0120	−0.0113	−0.0069
Fintech portfolio MARs	0.0782	0.1135**	0.1040**	0.0691**

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for 4 major COVID-19 related news events from January to June 2020. The impact of the news is estimated for the portfolio of banks and FinTech companies listed in Tables 1 and 3, respectively. Daily Abnormal Returns for portfolios of stocks are obtained using the market model with a 250-day estimation period and market-adjusted model measured as the simple difference between the stock and market index returns. The proxy for the market portfolio is the Australian All Ordinaries Index. The statistical significance of cumulative abnormal returns (CARs) is calculated by employing the Kolari and Pynnönen (2010) adjustment to the Boehmer et al. (1991) procedure to account for possible cross-sectional correlation of abnormal returns and to capture event-induced increases in returns volatility. Market-adjusted returns (MAR) refers to the Kolari and Pynnönen (2011) generalised rank test. ***, **, * denote statistical significance at the 1, 5, and 10% levels, respectively.

Table 8 Panel C reports the effects from the initial relaxation of social restrictions which resulted in stock price appreciation for banks as well as FinTech companies, although this effect is statistically significant for large banks only. This is due to the fact that easing restrictions and opening non-essential small businesses were considered beneficial for both types of financial services firms, and especially for large banks. Again, this evidence is consistent with hypothesis 1 (H1).

Panel D reports the effect from the announcement of the National Cabinet's three-step plan to ease COVID-19 restrictions. This event exhibited a marginally statistically significant negative impact on banks (at the 10% confidence level). Conversely, FinTechs report significant positive returns due to the details of the national strategy to ease restrictions, which led to the commencement of COVID safe plans for workplaces and businesses. These measures envisage the notable role of digital technologies and online payment systems in the new 'COVID' normal environment. Again, this result lends support to hypothesis 3 (H3) that the response of FinTech returns to crisis and policy measures are different compared to bank stocks.

Overall, our estimations for each event date indicate that FinTech share prices are more sensitive to external shocks from the COVID-19 pandemic as well as the monetary and economic policy interventions, and in some cases, similar to the behavior of small bank stocks. Most likely, this is a reflection of lower diversification in their customer base compared to large banks and the fact that small capitalization firm stock returns are more sensitive in comparison to large capitalization stocks (refer to Table 5). It also appears that the FinTech sector remains far from being considered as part of the financial system, or at least, at par with traditional well capitalized incumbent banks.

The main advantage of the preceding estimations is the focus on the type of policy intervention on a specific date. The timing of these actions is essential for identifying the direction and strength of the impact of the policy interventions. However, it is of interest to investigate the overall impact of similar policy interventions. Therefore, in addition to estimating the outcome of interventions on each event/day, we also classified similar events into groups, namely, COVID-19 related news, macroeconomic interventions, and monetary policy actions. Tables 9 to 12 present the results of estimations for the groups of news related to COVID-19, RBA decisions to leave cash rates unchanged, decisions to lower cash rates, and the unwinding of economic stringency measures.

Table 9 presents the aggregation of events which shows that COVID-19 related news caused an immediate statistically significant negative impact on bank returns over a 3-day period but then returned to normalized levels. It is also notable that small banks exhibited stronger reactions, indicating that smaller banks are more vulnerable to external shocks. In contrast, the reaction of FinTechs is mostly statistically insignificant. Consistent with hypothesis 3 (H3), these findings show that the response of FinTech returns are different (and positive) compared to bank returns.

Table 10 presents the effects of the RBA decisions to leave cash rates unchanged. These findings report a statistically significant positive effect for FinTechs in all estimation windows, whereas the impact of these decisions on banks is largely neutral for both large and small banks. These statistically different outcomes support our second hypothesis (H2) that monetary policy announcements exhibit a stronger impact on FinTech stocks compared to banks. Furthermore, the results also provide strong support for hypothesis 3 (H3) that the response of FinTech stock returns to the crisis and policy actions are different compared to bank returns.

Table 11 shows the lowering of the cash rate target resulted in a negative impact on bank share prices. The reaction of the large bank portfolio stock returns is stronger and statistically more significant in virtually all estimation windows. These results are consistent with prior literature which suggests that monetary policy announcements during these critical periods tend to be interpreted as a signal of the severity of the crisis (Born et al., 2012; Gregoriou et al., 2009; Ricci, 2015). The effect on FinTechs is not statistically significant. This is supporting evidence that the effect of monetary policy interventions during crises are very different compared to normal periods. Since the pandemic represented a unique shock, it appears that investors perceived the lowering of cash rates as an indicator of the severity of the crisis. This finding lends further support to hypothesis 1 (H1) that the stock market response to the announcements of income support or macroeconomic decisions are stronger than the responses to monetary policy interventions.

Table 12 presents the effects from the easing of restrictions. It is interesting to observe that the unwinding of COVID-19 restrictions resulted in a positive impact on FinTechs, while the influence of these policy actions on both large and small bank portfolio returns was not statistically significant. We interpret this finding as another sign that FinTech returns are more responsive to policy measures compared to bank returns. Overall, these results provide strong support for both hypotheses 2 and 3.

Overall, these empirical findings contribute and extend the literature on COVID-19 and its impact on banks and FinTechs. In contrast to Duan et al. (2021), who examines changes in systematic risk in banks globally due to the pandemic, our study disaggregates the systematic and idiosyncratic risks to reveal that bank stocks responded early to the pandemic followed by FinTech stocks and then

Table 9
Reaction to major news related to COVID-19 (Grouped).

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Bank portfolio CARs	−0.0109	−0.0343***	−0.0298***	−0.0168***
Large bank CARs	0.0063	−0.0257**	−0.0212**	−0.0107*
Small bank CARs	−0.0290**	−0.0428***	−0.0384***	−0.0229***
Fintech portfolio CARs	0.0352	−0.0134	−0.0110	−0.0215*
Bank portfolio MARs	−0.0032	−0.0276**	−0.0221**	−0.0077
Large bank MARs	0.0133	−0.0197	−0.0142	−0.0025
Small bank MARs	−0.0197	−0.0355**	−0.0330**	−0.0130
Fintech portfolio MARs	0.0583*	0.0026	0.0030	−0.0092

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for all 6 major COVID-19 related news events from January to June 2020, grouped together.

Table 10
Reaction to unchanged cash rate target decisions (Grouped).

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Bank portfolio CARs	0.0208	0.0091	0.0087	0.0087
Large bank CARs	0.0263	0.0147	0.0026	0.0046
Small bank CARs	0.0154	0.0036	0.0149	0.0129
Fintech portfolio CARs	0.1871***	0.1160***	0.0924***	0.0535***
Bank portfolio MARs	−0.0429*	−0.0154	0.0148	0.0104
Large bank MARs	−0.0331	−0.0083	0.0082	0.0061
Small bank MARs	−0.0527**	−0.0224	0.0216	0.0148
Fintech portfolio MARs	0.1316***	0.0976***	0.1042***	0.0583***

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for the three RBA decisions to leave the cash rate target unchanged during the COVID-19 pandemic from January to June 2020, grouped together.

Table 11
Reaction to lower cash rate target decisions (Grouped).

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Bank portfolio CARs	−0.1168***	−0.0518***	−0.0160*	−0.0255***
Large bank CARs	−0.1377***	−0.0632***	−0.0199**	−0.0374***
Small bank CARs	−0.1099***	−0.0276*	0.0001	−0.0006
Fintech portfolio CARs	−0.0854	−0.0409	−0.0093	−0.0184
Bank portfolio MARs	−0.0937***	−0.0401***	−0.0096	−0.0308***
Large bank MARs	−0.1123***	−0.0503***	−0.0128	−0.0431***
Small bank MARs	−0.0825***	−0.0138	0.0077	−0.0069
Fintech portfolio MARs	−0.0590	−0.0263	−0.0003	−0.0184

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for the two RBA decisions to lower the cash rate target during the COVID-19 pandemic from January to June 2020, grouped together.

Table 12
Reaction to the easing of economic restrictions (Grouped).

	CAR/MAR (−1,3)	CAR/MAR (−1,1)	CAR/MAR (0,1)	CAR/MAR (0,0)
Bank portfolio CARs	0.0066	0.0147	0.0191	0.0099
Large bank CARs	0.0106	0.0106	0.0208	0.0173
Small bank CARs	0.0027	0.0187	0.0174	0.0026
Fintech portfolio CARs	0.0816**	0.0778*	0.0606*	0.0399*
Bank portfolio MARs	0.0006	−0.0077	−0.0029	0.0012
Large bank MARs	0.0045	−0.0084	0.0023	0.0099
Small bank MARs	−0.0033	−0.0069	−0.0080	−0.0075
Fintech portfolio MARs	0.0864***	0.0728*	0.0543	0.0377

This table reports the statistics of cumulative abnormal returns estimated over 4 event windows for the two cases to wind back COVID-19 related economic restrictions during the pandemic from January to June 2020, grouped together.

the overall market.

While Acharya et al. (2021) shows that bank stock returns are related to exposures of undrawn credit facilities and different levels of capital buffers, our findings extend this work by revealing that small bank stock returns were more sensitive to COVID-19 related news and less sensitive to the negative impact of monetary policy intervention announcements, compared to large banks.

Our findings complement Demirgüç-Kunt et al. (2021) by comparing immediate stock price reaction to news of bank and FinTech stock prices during COVID-19. Whereas Demirgüç-Kunt et al. (2021) focuses on the performance of banks versus non-bank financial institutions, we show that the response of FinTechs to these news announcements was more positive.

A key contribution of this study shows that FinTechs outperformed banks and exhibited greater resilience compared to banks during the COVID-19 crisis. Furthermore, we also find that various policy actions resulted in contrasting effects on the stock returns of FinTechs, large and small banks. While Demirgüç-Kunt et al. (2021) as well as Duan et al. (2021) use a global context and Acharya et al. (2021) focus on the U.S. setting, we concentrate on the impact of the pandemic, including the subsequent policy reactions in Australia. In addition, we extend the emerging literature on the impact of pandemics with additional insights by contrasting FinTechs and bank stock performance, by differentiating between systematic and idiosyncratic risks, as well as comparing large and small bank stock reactions.

6. Conclusion

To the best of our knowledge, this is the first study to examine the effects of the COVID-19 pandemic, the economic measures as well as the coordinated monetary policy actions on bank and FinTech stock prices. The pandemic engulfed all economies around the world and triggered complementary responses from federal governments and monetary authorities. Social distancing measures, economic restrictions, easing of restrictions, temporary closures of businesses, quantitative easing, interest rate cuts, and fiscal backstops were applied at different stages of the crisis. The scale and impact of quarantine and social distancing measures in Australia in March 2020, unforeseen by earlier expectations, effectively brought a large proportion of domestic economic activity to an abrupt standstill. The heightened financial market turbulence at the time amplified this initial shock, as investors came to grips with the seismic reduction in corporate activity. The policy responses of central banks around the world were unprecedented at the time and will continue to support economies and markets in the months (and possibly, years) to come.

The COVID-19 crisis created a unique opportunity to examine both conventional and unconventional monetary policy and macroeconomic interventions under these pandemic-type conditions. This unique environment provided a natural setting to compare the effectiveness of these tools on bank stock prices as well as FinTech stocks. The social distancing measures and lockdown restrictions to combat the pandemic created a new business environment for the incumbent banks and the emerging FinTechs.

Our findings reveal that the response of bank and FinTech stocks to economic stimulus measures was stronger and positive as expected, and less sensitive to monetary policy announcements during the depths of the COVID-19 crisis. On the contrary, monetary policy interventions aimed at lowering the policy rate resulted in lower bank stock prices. This contrasts with the findings of Diggle and Brooks (2007), who focus on a business-as-usual period from September 1990 to June 2000 and find that the announced changes in the Australian target cash rate did not result in a statistically significant impact on bank returns during the months of the announced policy change. Kim and Nguyen (2008) focus on the daily volatility effects of interest rate news from the RBA. Their estimations show that NAB and WBC stock prices significantly increased in response to the news about a rise in the target cash rate during the period from January 1998 to December 2006. Contrary to this, the news relating to decreases in the cash rate was associated with a rise in the CBA stock price. However, none of the big bank shares posted losses. The key difference between our findings and the previous literature is the RBA's monetary policy announcements in 2020 was interpreted as a signal of the crisis' severity during the deepest moment of the COVID-19 crisis, thereby causing negative returns in bank stock prices. Our findings of the RBA's monetary policy announcements during the COVID-19 crisis are consistent with Fiordelisi et al. (2014) and Ricci (2015) who also show that monetary policy action appears to be less effective in restoring investor confidence and trust during financial crises. Our study extends this literature by revealing that these crisis signalling effects from monetary policy announcements can be observed in financial crises and in a health crisis as well, such as the onset of the COVID-19 global pandemic in 2020.

We also find that the perverse impact of monetary policy intervention announcements was stronger for the portfolio of large banks compared to small banks. Overall, we find monetary policy was less effective in this COVID-19 pandemic environment while macroeconomic backstops show a stronger impact due to the greater flexibility of these decisions, which were more effective during the global pandemic.

Our event study framework also shows that FinTech stock prices are more sensitive compared to bank stocks during the COVID-19 news and announcements in early to mid-2020. We interpret these findings as a sign that the reaction of FinTech stock prices is in line with the behavior of small capitalization portfolios. Stronger reaction of the small bank portfolio compared to large banks to the COVID-19 related news also appear to confirm this conclusion. Furthermore, FinTechs are more volatile in terms of their stock price reaction to a distressed market environment, a weakening economy, and tight funding conditions. Based on this evidence, we foresee that the pandemic will result in contrasting impacts on different types of FinTech companies. Some FinTechs may suffer from worsened funding conditions and exit opportunities for founders of FinTechs may be delayed (that is, IPOs, sales of strategic stakes to other investors so that the founders can cash out on their venture), while others may thrive on the popularity of their contactless services in the post-pandemic era.

We also find that FinTech stocks reported superior returns compared to banks when social distancing, stay-at-home recommendations, and business shutdown measures were enacted. FinTechs also posted better returns than banks when a glimpse of a future "new normal" involving precautionary spatial distancing measures emerged. This finding indicates that investors developed a positive expectation and outlook on the new business opportunities emerging for FinTech companies.

As an avenue for future research, it would be interesting to examine the implications of COVID-19 on FinTechs domiciled in other economies where they are at a more advanced phase, such as in the U.S. and U.K. It is the intention of the authors to expand the present study to cover other economies and markets.

We also acknowledge some limitations of the event study methodology adopted in this paper. While the methodology is known for its parsimony, the main limitation of the present investigation is similar to the Ricci (2015) study, that is, our focus on the COVID-19 period is characterized by the unusual increased frequency of policy interventions. Even though best efforts were made to isolate the impact of overlapping events, it may not have always been possible.

Notwithstanding these limitations, the investigation provides empirical evidence that monetary policy interventions were less effective at the time of the COVID-19 pandemic. These results are consistent with the findings in Ricci (2015) that banks' reaction to monetary policy actions may be different from their usual reaction under normal conditions. Macroeconomic policies from government appear to be more instrumental in dealing with the crisis. It also transcends that the FinTech sector is entering into a period of turbulence and opportunities, which may have major implications for the future of the industry and result in improved prospects for some segments of FinTech.

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