CHAPTER 6

THE SCOPE, PROSPECTS AND IMPLICATIONS OF NEW FORMS OF FINANCIAL INTERMEDIATION FOR MONETARY POLICY IN SINGAPORE

6.1   Background

The revolution in information technology (IT), often referred to as digital revolution 4.0, has resulted in innovations that are increasingly visible and influence most people's lives. Many individuals and businesses have subscribed to internet services to benefit from the expanding range of products, services and information that is available on the internet. These developments are shaping social lives and behaviours and affecting the way that people work and the role of the citizen within society. It is also affecting production and consumption in both the business and financial sectors. These trends are combining to further develop financial areas such as the large and growing number of digital banks, in payments, financing as well as lending within the community, which can substitute for traditional banking functions.

The explosive growth of the internet and mobile internet provide a powerful support for internet finance in many countries around the world, including ASEAN countries. This is particularly the case for Singapore, which has seen a tremendous expansion in this area. Based on the *Global Information Technology Report* from the World Economic Forum (2016), its outstanding performance is highlighted by the fact that Singapore ranks first in the world in three of the four sub-indexes (Environment, Usage and Impact). This performance is driven by top spots in several pillars: political and regulatory environment (number two in the world), business and innovation environment (first in the world), skills (first in the world), government usage (first in the world) and social impact (first in the world). To a large extent, this ranking is the result of the strong government commitment to the digital agenda, including its Smart Nation programme. Narrowing the scope to mobile activities, a survey from Global Web Index in Singapore's Digital Report January 2019 reported that 92% of internet users used internet mobile phones to send messages followed by watching videos, mobile map services and playing games. Mobile banking finished in fifth position with 64%. Among the internet users, the majority stated that they understood using online financial services in mobile banking, purchasing items online (54%) and making mobile payments (36%). This shows that other financial intermediaries are potentially well represented in Singapore, which contributes to the country's status as a leading financial centre in the region and beyond.

Different from other ASEAN countries, however, the assets of shadow banks in Singapore amounted to just 10% of GDP in 2014, while the assets of OFIs were slightly below 100% of GDP. Overall, the share of shadow banks is substantially smaller compared to the 600% ratio of banks' assets to GDP (Hoffman, 2017). According to Hoffman (2017), OFIs in Singapore are a good representation of the shadow banking sector as NBFI includes money market funds (MMFs), hedge funds, private equity funds, exchange-traded funds

(ETFs), other investment funds (OIFs), broker-dealers, structured finance vehicles (SFVs), insurance companies and finance companies that have substantial volumes. According to Stein (2010) and Pozsar et al. (2013), the securitisation process is often regarded as the most harmful aspect of shadow banking in financial markets. Looking at the structural characteristics of shadow banking, Table 6.1 provides a summary of the differences among traditional banks, shadow banks and market-based finance.

Table 6.1
Summary of Structural Characteristics of Credit-Based Intermediation

Characteristics:	Traditional Banking	Shadow Banking	Market-based Finance
Key Risk Transformation	Liquidity, maturity and leverage	Credit enhancement, liquidity, maturity and leverage	Less emphasis on credit enhancement and less opaque compared to. shadow banking
Institutions involved in Intermediation	Single entity	Can be many entities interconnected through collateral chains and credit guarantees	Single/few entities
Formal Ex-Ante Backstop	Yes	No/Indirect	No
Implied Sponsor Support	N.A.	Yes, can sometimes be contingent liabilities	No (insolvency remote)
Example of Entities	Commercial bank	Synthetic CDO, Structured Investment Vehicle (SIV), CNAV, MMF and ABCP Conduit	Bond mutual fund, distressed debt or PE partnership, direct lending by pension fund
Main Form of Liabilities	Debt and deposits, wholesale and retail-financed	Debt, mainly wholesale financed	Highly diverse short- and long-term debt and equity, retail and wholesale financed
Key Resulting Financial Stability Risk	Systemic risk (institutional spillovers)	Systemic risk (institutional spillovers)	Shift in price of risk (market risk premia)

Notes: CDO = collateralized debt obligation; CNAV = constant net asset value; MMF = money market fund; ABCP = asset-backed commercial paper; PE = private equity.
Source: IMF (2017).

In addition, the merger between financial services and technology called Financial Technology, or more popularly termed "FinTech", also plays a role in the new digital age, as it is being increasingly harnessed in shadow banking or by non-bank financial intermediaries (NBFIs). Due to the simple process and (in many instances almost instantaneous) online assessment, FinTech in the financial system is utilised by many unbanked citizens and SMEs to obtain bank loans. In Singapore, attempts are made for the collaboration and synergy among all stakeholders to promote FinTech as part of its Smart Financial Centre approach rather than as a potential source for technology disruption

(MAS, 2016). This policy sets Singapore apart from other ASEAN countries, such as Malaysia, Indonesia and the Philippines. The existence of shadow banking, especially FinTech, entails downsides for the development of the macroeconomy. For instance, the significant presence of peer-to-peer-lending leads to an enhanced interconnectedness in the financial sector that can ultimately manifest itself in contagion that transmits adverse outcomes from one institution to other institutions. Other potential implications include an increase in procyclicality that causes greater herding behaviour when firms all use the same algorithmic trading model and excess volatility that can lead to liquidity problems as a result from the overreaction to news (Ewijk, 2018). According to International Monetary Fund, the shadow banking system have inherent risks that pose threats to financial stability from the complex collateral intermediation that repeatedly channels funds in the market-based financial system (Singh, 2014) and Chen (CFA Institute, 2015).

On the one hand, research has established that FinTech can enhance creativity, foster competition between new start-ups and established players and provide financial inclusion, i.e., access to financial services for large "unbanked" part of the population. FinTech also allows for the scaling up of businesses to get easy financing, while P2P lending with advanced technology offers competitive benefits such as speeding up the processing of transactions, simplicity, enhanced product features (Oxera Economic Council, 2016) and better risk modelling and estimation opportunities from using advanced methods, including artificial intelligence and big data (Ewijk, 2018).

FinTech hubs in Singapore may also potentially displace their mainstream banks, financial institutions and humans as providers of financial services and volume growth respectively. The surge in shadow banking activity also contributes to the greater volatility of outstanding money by creating inflation. Therefore, this phenomenon will drive several changes in the scope, prospects and implications for monetary policy globally.

Referring to China's experience of using wealth asset management product, this Chapter looks at Singapore's asset management industry represented by Temasek Holdings. This choice is supported by a MAS survey of Singapore's asset management industry, which had strong growth over time and 19% expansion to reach USD2.4 trillion in 2017. A general overview that illustrates the trends of assets of financial corporations and shadow banking is presented in Figure 6.1. We can see that assets of financial corporations have increased from USD988.0 billion in 2002 to USD3,070.6 billion in 2017. Shadow banking assets, on the other hand, have risen from USD50.8 billion to USD828.5 billion over a decade. These sets of numbers indicate that shadow banking assets are roughly 27% lower compared to commercial banks, even though Singapore's overall financial assets grew slightly.

Figure 6.1
Financial Corporations and Shadow Banking Assets,
2002-2017
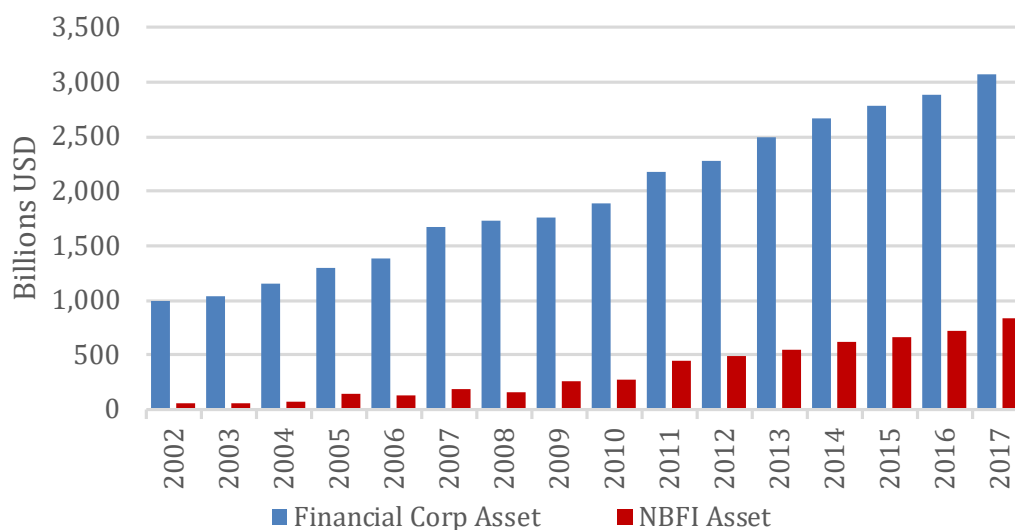
1. Commercial banks and Central Bank
2. Insurance, pension funds and other financial intermediaries.
Source: FSB (2018).

Figure 6.2
Share of Shadow Bank Assets to Financial Corporation Assets and GDP
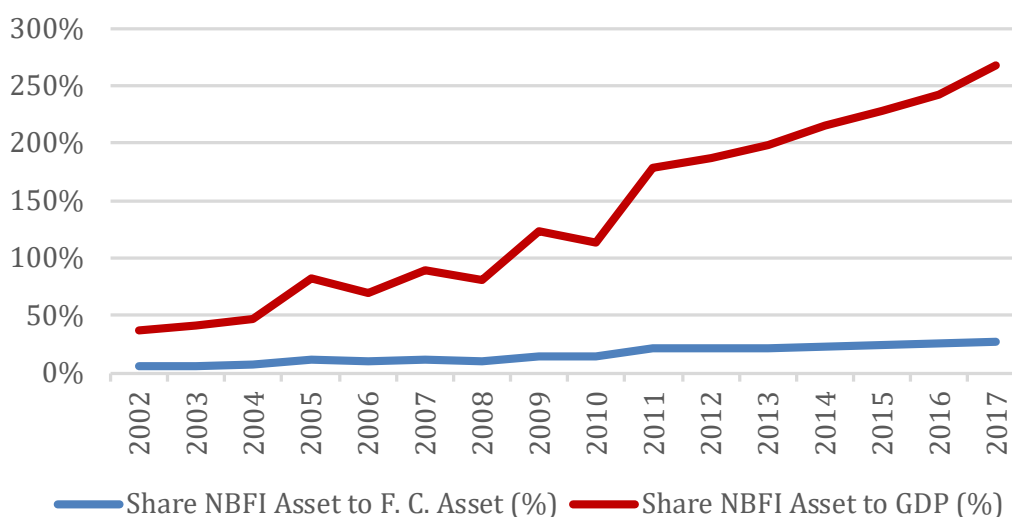

Source: FSB and World Bank (2018).

In addition, Figure 6.2 reveals that the share of shadow banking assets to financial corporations' assets grew from 5% in 2002 to 27% in 2017. By contrast, the share of shadow banking assets-to-GDP increased significantly from 37% in 2002 to 267% in 2017. This positive relationship between the share of shadow banking assets to financial corporation assets and GDP means that the participation of shadow banking in the economy of Singapore may, in consequence, affect the monetary system, particularly in channelling funds to the unbanked parts of society. By heeding the lessons from other countries like China, which has seen much higher growth of shadow banking compared to Singapore,

forward-looking policy responses to the growth of shadow banks may be required in terms of integrating, reporting, supervising and strengthening existing regulations.

Figure 6.3
Singapore GDP, Aggregate Broad Money and Ratio of Broad Money to GDP, 2002-2017
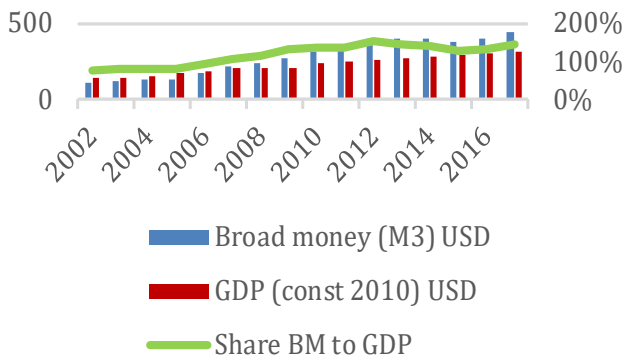
Note: M3 in USD billions, share in per cent.
Source: World Bank (2018).

Figure 6.4
Broad Money (M3) Growth and Inflation, 2002-2017
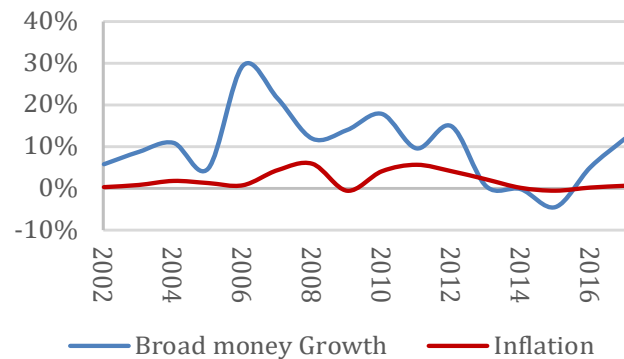
Source: World Bank (2018).

Even though a recent phenomenon, FinTech and shadow banking have grown significantly, both at the microeconomic scale for households and businesses as well at the macroeconomic scale. The increasing tendency of people to use new forms of (digital) financial intermediaries will eventually affect microeconomic and macroeconomic dynamics more broadly, including the role of the central bank in the economic and financial system. As asserted by Zhang and Wan (2017), the financial system is no longer sensitive to monetary policies pursued by the central bank. Figure 6.3 illustrates the development of GDP (in constant 2010 prices), broad money and the ratio of the two. Broad money in Singapore in this context is measured as M3 and consists of saving deposits and currency in the central bank, transferable deposits and electronic currency, foreign currency transferable deposits, commercial papers, travellers' cheques and various money market instruments such as share in mutual funds and certificates deposited by banks. The magnitude of broad money has increased from USD108.5 billion in 2002 to more than USD400 billion in 2017. We note that over the decade under observation, broad money in Singapore exceeded GDP, which was equal to USD213 billion in 2007 and USD441 billion in 2017. The ratio of broad money-to-GDP grew from 78% in 2002 to 143% in 2017. The substantial increase in broad money affects the velocity of money and may lead to inflation, which in turn may impact the monetary system.

Figure 6.4 shows broad money growth and inflation in Singapore from 2002 to 2017. Contrary to the statement in the previous paragraph, Figure 6.4 shows that inflation was broadly stable and seems not to have been affected by the growth of broad money. Hence, this is clearly not a monetary phenomenon. Still, the evidence shows that it might be time to reshape the monetary policy framework because the financial environment has changed in recent years. For example, the surge in financial innovation and the substantial growth in shadow banking entail problems and introduce complexities into the monetary system. As a result, controlling broad money has become harder. The velocity of money and the money multiplier will increase and may no longer be stable, which contradicts the

basic assumption of Fisher's quantity theory of money (Zhang and Wan, 2017). Based on such developments, the need for comprehensive research on understanding the new forms of financial intermediation from the macroeconomic and monetary policy perspectives is urgently needed and highly relevant at this time.

For example, as mentioned above regarding the risks, FinTech lenders command an interest rate premium for their services due to their use of different algorithms in personalising loan origination and pricing, which is meant to bring about greater convenience for the borrowers. This contrasts with the common belief that technology can lower costs and prices. Shadow banking activities often face riskier dimensions from the perspective of the structural characteristics. First, they can involve extensive transformation of risk characteristics through complex structuring. Second, shadow banking is linked with a lengthy collateral chain. Third, shadow banking institutions have difficulties in formally accessing official sector backstops in the same manner of a traditional deposit-taking bank. Lastly, the principal liabilities of shadow banking products are debt-financed in wholesale markets.

The above explanations support some researchers' arguments, such as Carmichael and Pomerleano (2010) that factors driving growth in shadow banking are liquidity transformation, credit transformation and high leverage. Other significant factors contributing to the growth in this activity are the current low-interest rate environment, which translate into low short-term funding costs, and regulatory arbitrage. It is only by understanding the factors that influence the development of shadow banking as a new form of financial intermediation that the central bank will be able to put in effect a monetary policy that is appropriate for a macroeconomy with Singapore's shadow banking characteristics.

6.2   Macro Mapping of New Forms of Financial Intermediation in Singapore

6.2.1   New Forms of Financial Intermediation in Singapore

The wide discrepancy between clear definitions of shadow banks across countries, including the scope of activities in Asia., leads to difficulties in estimating the size of the shadow banking industry on a consistent and comparable basis. In Asia, the proportion of shadow banks amounted to less than 15% of the assets of the total financial system in 2015. In terms of financial assets, Japan and China had the most developed shadow banking activities, whereas the two financial hubs of Hongkong and Singapore had the largest OFI sectors in relation to the size of their economies.

The profile of shadow banking in Asian countries neither abide by a single definition nor does domestic regulations follow global best practices. Nonetheless, regulations at the national level are applied with an eye for the consideration of potential risks and the applicability of the FSB's recommendations (Shadow Banking Report, 2014). However, different FSB members may employ different criteria to classify what entities are registered as NBFIs, OFIs or certain shadow banks on account of economic conditions, legal arrangements and infrastructural arguments. A broad definition of shadow banking can be found in the IMF (2014), with a classification based on three categories: entity-based, activity-based and a mixture of the two. In addition, the World Bank (2016) categorised non-bank financial institutions (NBFIs) as those that conduct financial services in terms of
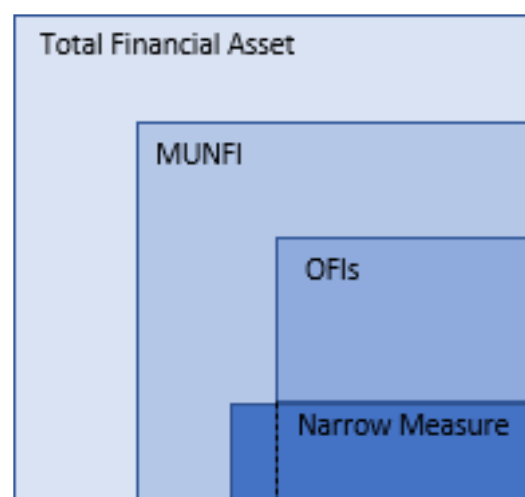
collective or individual investments, risk pooling, financial consulting, money transmission and cheques to cash. These NBFIs services are provided by insurance companies, venture capitalists, currency exchanges, pawnshops and some microfinance organisations that accommodate specialised groups or the unbanked to obtain credit access.

The Monetary Authority of Singapore (MAS) defines shadow banks as institutions for which risks may trigger systemic economic consequences which cannot be addressed by regulation (Hofmann, 2017). A large number of banks and NBFIs are currently operating in Singapore, as illustrated in Table 6.2. The MAS (2017) includes institutions such as merchant banks, finance companies, insurance companies/brokers, finance holding companies, money brokers, Singapore Government Securities (SGS) market dealers and the Central Provident Fund (CPF). Singapore also considers that short-term repurchase agreements (repos) fall under this definition. For example, repo chain transactions can enhance the interconnectivity and exposure of multiple financial intermediaries to the risk of price drops. In this case, repos become low-risk products for lenders-buyers that affect financial transactions that have been collateralised. The process begins from securitization lending to cover borrowers in return for collateral in the form of repo and reverse repo transactions (Hofmann, 2018). OFIs in Singapore hardly engage in repo transactions and collateral swaps. Such findings indicate that in the current situation, broker-dealer activities entail low systemic risk. Nonetheless, they could be a candidate for shadow banking if broker-dealer activities on the non-bank side generate high-volume transactions and leverage (Hofmann, 2018).

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Table 6.2
Number of NBFIs in
Singapore

Figure 6.5
Shadow Banks Positions in
Narrow Measure

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Type of Institution	2015	2016	2017	2018
Non-Bank Financial Institutions				
Finance Companies	3	3	3	3
Merchant Banks	38	34	32	30
Insurance Companies	181	186	186	184
Insurance Brokers	74	75	77	80
Licensed Financial Advisors	60	62	61	64
Capital Markets Service Licences	493	533	584	669
Dealing in Securities	123	137	151	166
Trading in Future Contracts	60	68	71	76
Advising on Corporate Finance	42	40	46	45
Fund Management	335	367	404	471
Leveraged Foreign Exchange Trading	24	27	29	34
Securities Financing	17	17	18	18
Providing Custodial Services for Securities	37	37	42	44
Real Estate Investment Trust Management	34	36	38	40
Providing Credit Rating Service	4	4	4	4
Licensed Trust Companies	54	53	58	58

Sources: Annual Report of 2017/2018, Monetary Authority of Singapore

This section explores the shadow bank entities in Singapore that are included in the narrow measure or pose bank-like financial stability risks (Figure 6.5) if they perform one of the FSB's five economic functions that can potentially lead to systemic risks (Global Monitoring Report, 2019). In their 2014 *Financial Stability Review*, the MAS looks at the growth in shadow banks in view of the monetary authority's implementation of tight lending regulations on the banks and subsequent attempts to provide lucrative ways for

investors to place their money in Singapore's financial sector. However, risks arising from shadow banking activities need to be closely monitored. These actions need to be done to prevent banks from lending to non-banking financial intermediaries (NBFIs), including hedge funds, insurance companies and pension funds (Nandini and Umesh, 2017).

Focusing on Singapore's shadow banks, we find broad correlation between the definitions and scope of FSB regulations that most entities were performing either Economic Function 1 and/or Economic Function 5. The MAS also defines shadow bank activities as those that can potentially lead to economic turmoil from their systemic risks, which cover maturity transformation, liquidity transformation, leverage and credit risk. MAS points out that maturity transformation uses short-term liabilities to finance the purchase of long-term assets. Liquidity transformation is defined as the issuance of liabilities that are easily repaid to finance unliquidated assets. Finally, credit risk can arise from uncertainty about the obligors' ability to fulfil their contractual obligations and commenced by credit originators or intermediaries (FSR, 2013). Further understanding of the narrow measure of shadow banks and other bank-like entities in Singapore are summarized in Table 6.3.

Table 6.3
Singapore's Shadow Bank Classification by Economic Function

EF	Definition	Typical entity types	Singapore entity Types
EF1	Management of collective investment vehicles with features that make them susceptible to runs	MMFs, fixed income funds, mixed funds, credit hedge funds, real estate funds	Collective investment scheme[1], MMFs[1], hedge funds[1], Central Provident Fund[2]
EF2	Loan provision that is dependent on short-term funding	Finance companies, leasing/factoring companies, consumer credit companies	Finance companies[2], online platform[1]
EF3	Intermediation of market activities that is dependent on short-term funding or on secured funding of client assets	Broker-dealers, securities finance companies	Money broker[2], SGS market dealers[2]
EF4	Facilitation of credit creation	Credit insurance companies, financial guarantors, monolines	Insurance companies[2], Financial Holding Company[2]
EF5	Securitisation-based credit intermediation and funding of financial entities	Securitisation vehicles, structured finance vehicles, asset-backed securities	Structured finance vehicles[1]

Note:
1. FSB (2019).
2. MAS Annual Report.
Source: Author's modification.

Table 6.4
Singapore Shadow Bank Classification by Systemic Risk

Systemic Risk	Definition	Entities
SR 1	Maturity Transformation	MMFs, Structured Finance Vehicles (SFVs)
SR 2	Liquidity Transformation	Hedge Funds, MMFs, SFVs
SR 3	Credit Risk Transfer	
SR 4	Leverage	Hedge Funds, MMFs

Source: Author's modification.

This study will first explore the developments of shadow banking according to the MAS and then focus on the FSB's explanation, which provides more uniformity in comparing and contrasting across other countries:

6.2.2 Finance Companies

According to Lee and Jao (1982), these companies conduct their activities by accepting fixed and savings deposits, but not demand deposits. At first glance, they appear to have a similar business model as commercial banks that offer savings, loans and credit facilities to their customers, but cannot provide deposit accounts which are repayable on demand by cheque. Some activities offered by finance companies are deposit-taking and lending to individuals as well as enterprises such as SMEs. The other difference between a finance company and a commercial bank is that they are unable to deal with commodities, foreign currency and share acquisitions. Considering Singapore's liberal banking regime, the MAS categorised finance companies as shadow banks because they can generate systemic risks as a result of the tight competition among institutions with their deposits and lending services as well as the provision of loans that are dependent on short-term funding (Economic Function 2).

The MAS also categorises special financial intermediation that involves a bank-like model, and such activities can lead to a recession, as occurred in 1975-1977. Lending rates are consequently higher than those of banks with four main lines of business that include (a) housing loans, (b) hire purchase of motor vehicles, television sets, air-conditioners and other durable consumer goods, (c) lease finance and (d) investment in real estate, property, stocks and shares. Therefore, finance companies engage in maturity transformation and credit risk may arise as they possess a license to follow a bank-like model (SR 1 and SR 3). Figure 6.6 reports the total assets as well as the total number of finance companies in Singapore and other selected Asian countries.

Figure 6.6
Total Assets and the Total Number of Finance Companies in
Selected Asian Countries in 2012

Number of institutions and total assets (USD m)

	AU	HK	ID	IN	JP	KR	MY	PH	SG^^	TH
Number	101	62	200	415***	2,259	65	3,445#	579	3	29
Total Assets	106,327	248,035**	36,322		580,394	154,054	21,498	16,862^	12,247	
Average Assets	1,053	4,001	182		257	2,370	6	29	4,082	

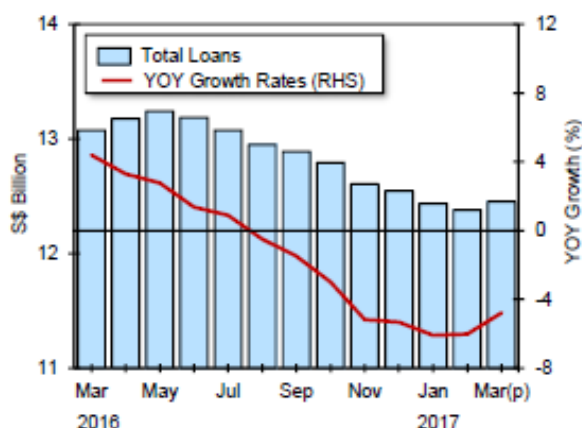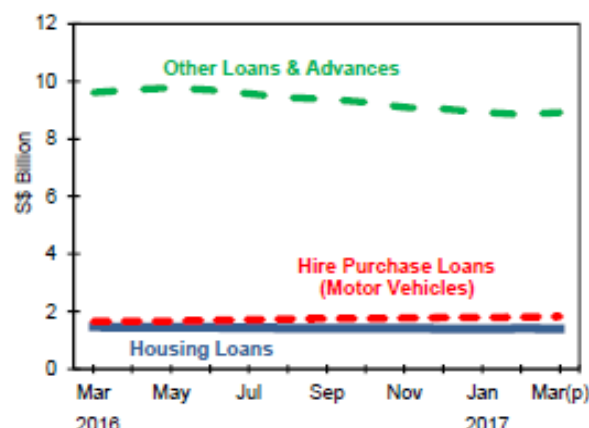**Figure 6.7**
Finance Company Loans

Figure 6.8
Finance Company Loans by Sector

Source: MAS Highlight of Monetary and Financial Developments, 2017.

6.2.3 Merchant Banks

The next type of entity that may fall into the NBFI category in Singapore are merchant banks. These institutions are obligated to arrange finance, rather than finance the project directly. Some sources of funds can come from banks and other financial institutions, but only if the fixed deposits fulfil the following two criteria: one, the amount must be more than USD250,000 per deposit and the minimum maturity is one month. In some specific conditions of the funding, the investor base is limited, and the entities have to borrow the funds either from the interbank market or from their headquarters. MAS aims to place merchant banks under its Banking Act regulation with the intent to simplify and consolidate regulation in one place in terms of administration and reference for this entity. Several typical activities falling under merchant banking are lending, asset management, corporate finance, underwriting of share and bond issues, mergers and acquisitions, portfolio investment management, management consultancy and other fee-based activities.

6.2.4 Insurance and Reinsurance Companies

The liberalisation in the insurance sector to serve domestic business needs has led to the emergence of an offshore insurance business and other reinsurance activities (MAS, 2011). Given the rapid development of these entities, Singaporean insurance plays an important role in pooling the risks for the public and has established this sector as a regional insurance hub in Asia. Aside from its potential market size, the insurance sectors offers various diversified products; including general insurance; life insurance; captive insurance; reinsurance and insurance intermediaries that are managed by licensed insurers; authorized reinsurers; approved marine, aviation and transit (MAT) insurers; and foreign insurers. For instance, direct insurance and reinsurance are classified as shadow banking because they facilitate credit creation, which is Economic Function 4. In other cases, insurance companies participate in the credit creation process due to their provisions of insurance services, derivative contracts and subscriptions of CDOs for cash investments in capital markets (Lemma, 2016). Many of these services contribute to overall economic growth and impact other financial markets by intermediating regional insurance business,

redistributing risks and providing risk advisory services. Not surprisingly, insurance has another link with financial markets as they hold a lot of assets in corporate debt, government securities and equities. Some Singaporean insurance firms established listed SGS products with a significant market share. In 2010 Q3, insurers accounted for about 10% of the SGS and local corporate debt market, but an insignificant share of the SGX-equity market (MAS, 2011). Credit enhancements such as financial guarantees, CDS and mortgage guarantees directly link insurers to financial markets and other financial intermediaries. On the other hand, some researchers such as Zafeiris (2018) do not categorise insurance business activities as shadow banking. While those activities do involve maturity and liquidity transformation, it is liability-driven, and insurance firms are able to match liabilities to long-term funding. This argument is borne out by work done by the MAS. Based on their preliminary study in investigating significant players, they conclude that insurance firms in Singapore only pose limited systemic risk (MAS, 2011).

In general, reinsurance serves as a financial intermediary between savers and investors by receiving premiums and paying insurance benefits. Furthermore, the industry covers a special purpose reinsurance vehicle by conducting insurance securitisation with the aim of fulfilling reinsurance contract obligations. These institutions help finance economic development by accepting insurance premiums and allocating the funds to investments in real estate, shares, debentures, Singapore government securities and, to a small extent, to advance loans to customers. Figure 6.9 illustrates the development of the Singaporean insurance industry and shows that it remains well-capitalised in terms of capital-adequacy ratios (CARs). Both direct life and direct general insurance industry show CAR levels of 236% and 334% respectively.

Figure 6.9
CARs of Direct Life
and Direct General Insurers

Figure 6.10
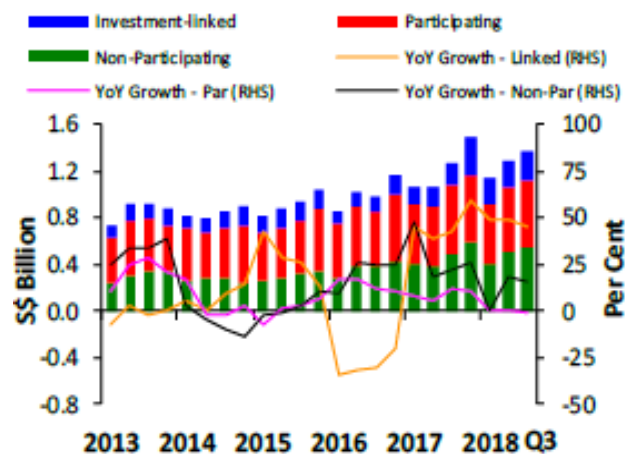**Direct Life Insurers:**
New Business Premiums
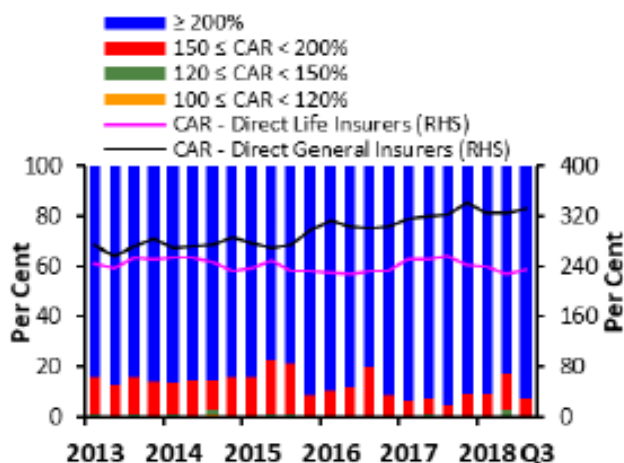
Source: MAS (2018).

Figure 6.11
Asset Composition
of Singaporean Insurance Funds
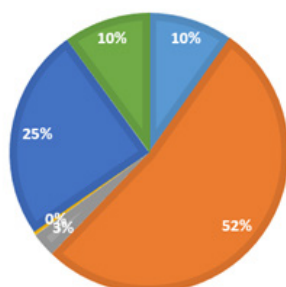
Figure 6.12
Liabilities Composition
of Singaporean Insurance Funds
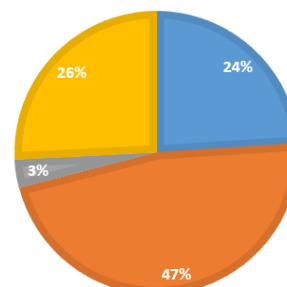
Figure 6.13
Asset Composition
of Singaporean Reinsurance Funds
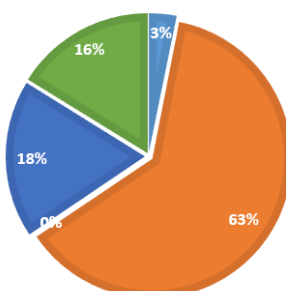
Figure 6.14
Liabilities Composition
of Singaporean Reinsurance Funds

Figure 6.15 allows us to examine in greater detail their linkages of a group of significant direct insurers and reinsurers (based on market share) with the domestic economy, financial market and other financial intermediaries.

Figure 6.15
Systemic Importance of Singapore's Insurance Sector

Source: MAS (2011).

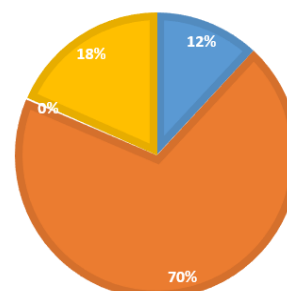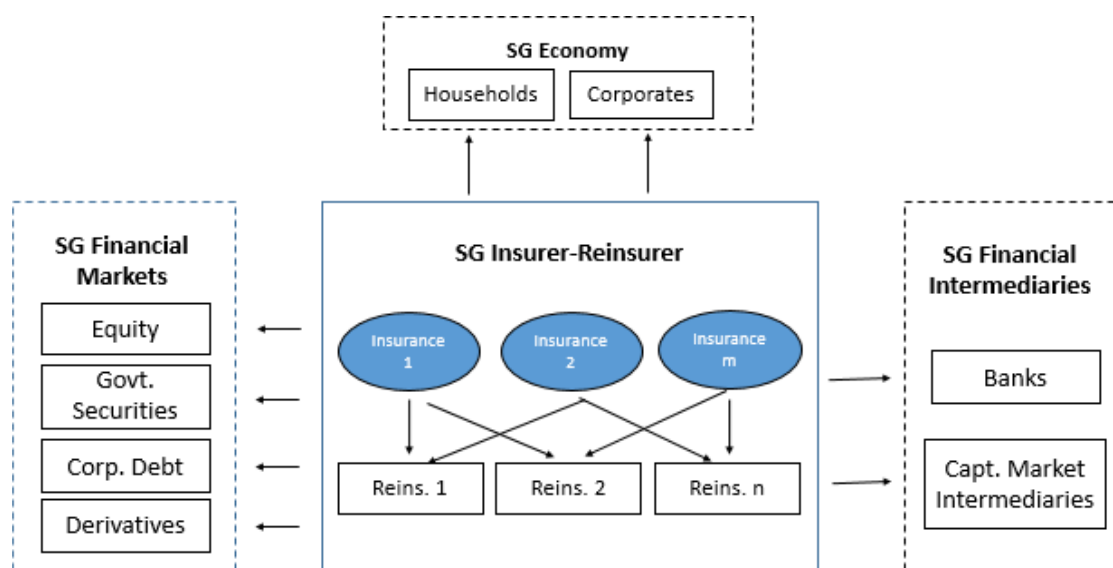While we find evidence for connectivity between insurers and financial markets, it may not provide much of an impact, as the insurance sector holds a lot of assets in the form of corporate debt, government securities, equities, cash and deposits. Moreover, linkages to other financial intermediaries occur via credit enhancements of issuing credit guarantees, CDS, mortgage guarantees and other financial products provided by insurers. Therefore, the preliminary analysis suggests that the Singaporean insurance and reinsurance sectors would pose limited systemic risk.

A more specific explanation of Singapore's shadow banks in the next sections is based on the FSB's definition.

6.2.5 Hedge Funds

A hedge fund is typically categorised as a Collective Investment Scheme (CIS) under the Securities and Future Act (SFA) regulation. The MAS (2001) ascertains that there is no precise definition of a hedge fund. A commonly used description for a hedge fund is, however, a pooled fund managed by professionals who act more aggressively than traditional sellers in speculative activity through leveraged investments strategies (Chew, 1999). The use of advanced investment strategies, such as high leverage, potentially generate large short-term fund flows and generate exposure to financial markets and economies (EF 1). Singapore also identifies CIS as shadow banking due to its potential impact on liquidity transformation risks and maturity in the implementation of credit instruments (SR 2). On the other hand, hedge funds should be classified as shadow banking, but only to the extent that they intermediate credit (i.e., placing assets backed by liabilities or pooled equity into credit instruments).

Since the 1980's, Singapore has become a leading regional and global asset management centre. A significant proportion of funds, equal to 78% of Singapore's AUMs that are managed by fund managers, are sourced from outside the country, with 67% of all AUMs invested in the Asia-Pacific area. Figure 6.16 shows that in 2018, assets under management (AUM) in Singapore amounted to SGD3.4 trillion, a 5% increase from the year before (MAS, 2018). These assets were managed by 628 registered and licensed funds managers, some of whom operated within the 270 fund management companies registered in the MAS's financial directory. Furthermore, Figure 6.17 shows that the biggest asset allocation in 2018 was private equity with an amount of SGD213 billion. This was followed by hedge funds, REITs, real estate and venture capital. The diversification sectors, consistent with the criteria of being low risk, such as equity, bonds, private equity, venture capital and real estate, were included in the alternatives. The CIS and cash/money markets categories are illustrated in Figure 6.17. Almost 50% of the allocation was distributed to equity.
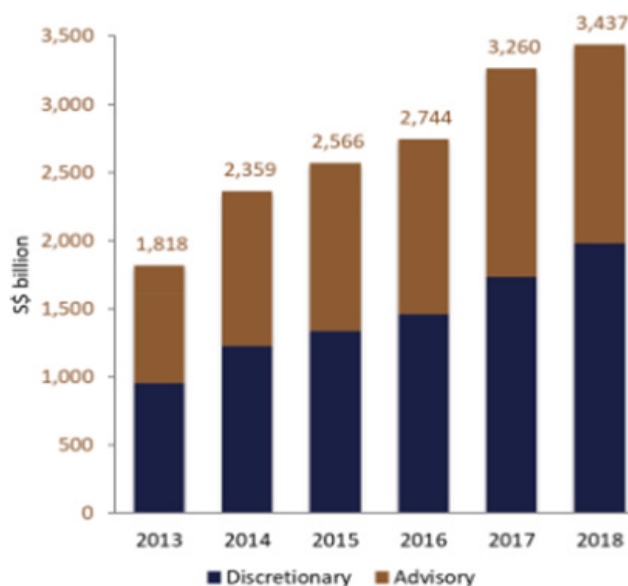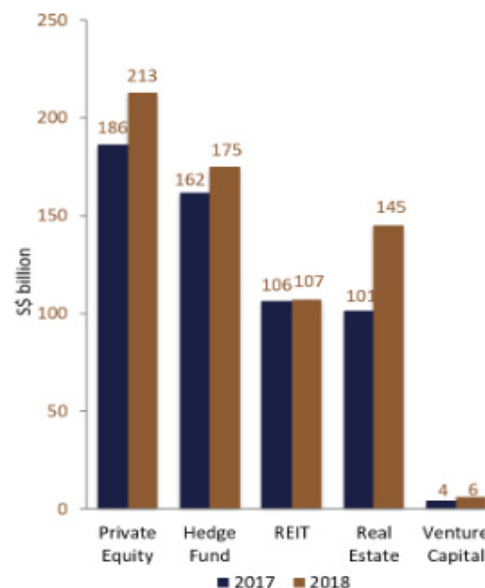
Figure 6. 16
Assets Under Management

Figure 6.17
Alternative Sectors

Source: Monetary Authority of Singapore (2018).

Figure 6.18
Hedge Fund Investments by Asset Class
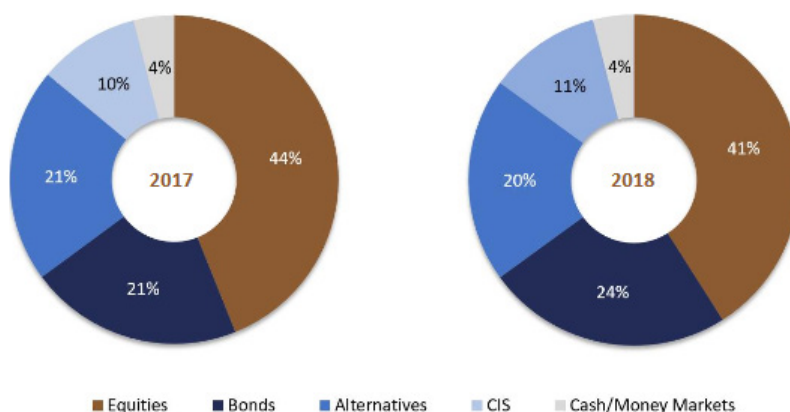
Source: Monetary Authority of Singapore (2018).

6.2.6   Money Market Funds (MMFs)

Considering the above requirements, the Singaporean authorities consider money market fund investments to be shadow banking, as they believe that the risks are insufficiently addressed by the regulatory or supervisory framework. Singapore points out that MMFs should be identified as shadow banking only to the extent as they intermediate credit (i.e., placing assets backed by liabilities or pooled equity into credit instruments) and where there are little or no prudential regulatory standards and supervisory oversight. Looking at the features of their asset composition, which are fixed income and mixed-income funds for which AUMs are invested mostly in equity, MMFs are categorised as EF 1. MMFs also contribute to vulnerabilities through maturity transformation (SR 1)., liquidity transformation (SR 2) and leverage (SR 4). This is because they invest in short-term debt instruments, but shares are quickly redeemed on demand (FSB, 2017).

Given the latter condition, the MAS eliminates MMFs as shadow banking they are still under government supervision (Hofmann, 2018). In general, MMFs in Singapore invest in short-term, high-quality fixed income instruments with a maturity between three to six months and not exceeding twelve months. Several investment types are included, such as corporate and government bonds, commercial bills and deposit financial institutions to attract investors wanting a better return. There are four instruments that are used in money market operation, such as (1) direct borrowing or lending, (2) foreign exchange swaps, (3) repurchase agreements (or repos) and (4) MAS bills.

As MMF investments account for only a small portion of the total for the fund management industry in Asia, including Singapore, there is only a very small possibility of MMFs generating systemic risks as they are not permitted to offer constant-net-asset-value (CNAV) MMFs (which are susceptible to runs) to the public. Money markets operate by pricing over-collateralised debt to mimimise the cost of lending. Debt that is over collateralised, short debt maturities, reference pricing, coarse ratings, opacity and symmetric ignorance contribute to the liquidity of money market, but everything that is added to the liquidity will push risk. If the principal collateral is disabled and common trust is impaired, there can be severe consequences, including the complete loss of liquidity of money market instruments (Holmstrom, 2015).

6.2.7   Structured Finance Vehicles (SFVs)

Singapore considers SFVs to be shadow banking only to the extent that they intermediate credit (i.e., placing assets backed by liabilities or pooled equity into credit instruments) with no or only a few prudential regulatory standards or supervisory oversight. SFVs in most jurisdictions involve securitisation that are classified under Economic Function 5. Financial institutions usually use SFVs to transform maturity and liquidity of financial products which may in turn lead to the creation of systemic risks.

Figure 6.19
Total Asset of SFVs in Singapore in 2012

Incidence of entities and their total assets (USD m)

	AU	ID	IN	JP	KR	MY	SG	TH
Total Assets	130,029	205	33*	278,046	123,825	4,534	4,546	29

* Data in respect of SPVs set up by 14 Asset Reconstruction companies registered with Reserve Bank of India

Figure 6.20
Singapore's Shadow Banking Map
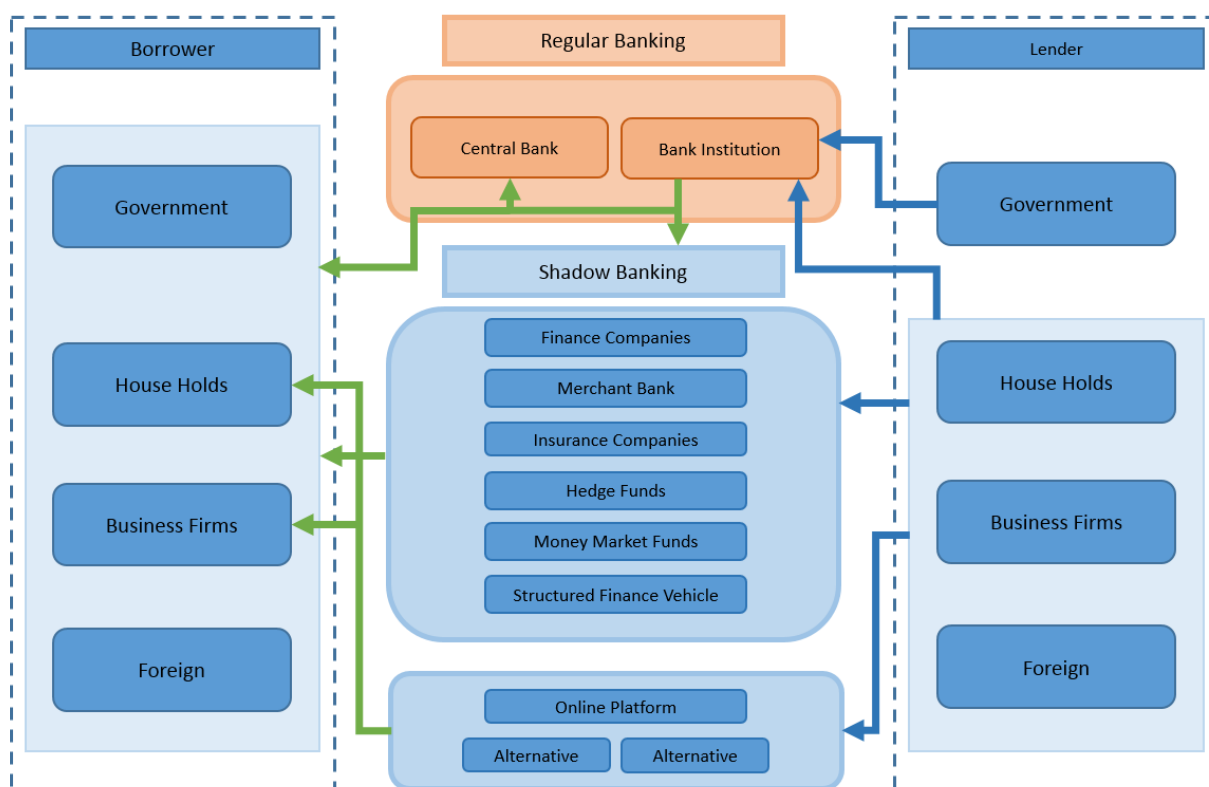
Source: Documented by author.

Figure 6.20 depicts the shadow banking map for Singapore. It presents Singapore's financial system and captures the flow of funds from the ultimate lender on the right-hand side of the figure to the borrower on the left-hand side. Several types of credit intermediaries are examined to highlight the linkages between institutions in Singapore's financial markets. All types of lenders, such as households, business firms and foreign investors, can save their surplus funds in traditional bank institutions and allocate their money as investments in shadow banking entities (asset managers) or online platforms. This kind of operation also finds support from the MAS, whose survey of asset managers showed that 78% of assets under management were sourced from outside Singapore.

In many instances, the ultimate borrowers are mainly business firms that will benefit from the presence of shadow banking as they can borrow funds to finance their business operation or expansion. Regarding online platforms, business customers, such as SMEs, obtain financing from crowdlending operations as well as personal loans from private customers or households to finance various spending needs in short-term liquidity. The primary function of the financial system is to connect borrowers and lenders and creating a well-functioning economic system. The existence of the financial system allows funds to be directed and allocated to productive activities which can promote the efficient disbursement of capital in the overall economy.

6.3   Prospects for New Forms of Financial Intermediation

In parallel with the rapid growth in the digitisation of the economy in the 2000's, shadow banking activities have been hastened by the emergence of financial technology (FinTech). Thompson (2017) states that online services are much more likely to be offered by non-bank intermediaries than traditional banks, even though the burgeoning shift in consumers' preference ought to encourage traditional financial institutions to copy non-bank intermediaries and provide their own competitive services involving FinTech. For instance, as reported by Thomson Reuters (2017), traditional fund managers keen to maintain their high performance in relation to their competitors may want to increase leverage in their operations. Tools for doing so include employing artificial intelligence, data analytics and robo-advisers to identify investment opportunities and other approaches to automate their operations, processes and digital distribution. Allied Market Research projects P2P lending to grow at a compound annual growth rate of 51.5% by 2022. This innovation has been highlighted by MAS - that unambiguous regulation can bring about implications and alter the business model of fund managers in the future.

The issue of new forms of financial intermediation is closely related to the government of Singapore's goal to establish a "smart financial centre" with the application of digital and advanced ICT to the finance sector. According to the consultancy firm EY, Singapore was ranked fourth among the world's top FinTech hubs. To bolster that claim, Singapore accounts for 39% of all FinTech firms at the ASEAN level. A survey on the growth of the FinTech market size from EY in 2016 reported a size of GBP0.6 billion (SGD1.06 billion), with investment of GBP44.0 million (SGD77.8 million) and provision of around 7,000 jobs. Singapore's FinTech Association has grown into one of the largest FinTech associations in the world, consisting of over 300 corporate members and broad partnerships with 30 countries. According to Dorfleitner (2017), financing, asset management, payments and other FinTech are classified as four segments of that industry. This statement is also supported by a report by EOB (2017), that such complex services are provided by organisations focusing particularly on activities beyond deposit and saving money, such as loans, investments, financial advisory and asset management services. A general scope for the classification of FinTech is provided in Figure 6.21.

Figure 6.21
Broader FinTech Classification
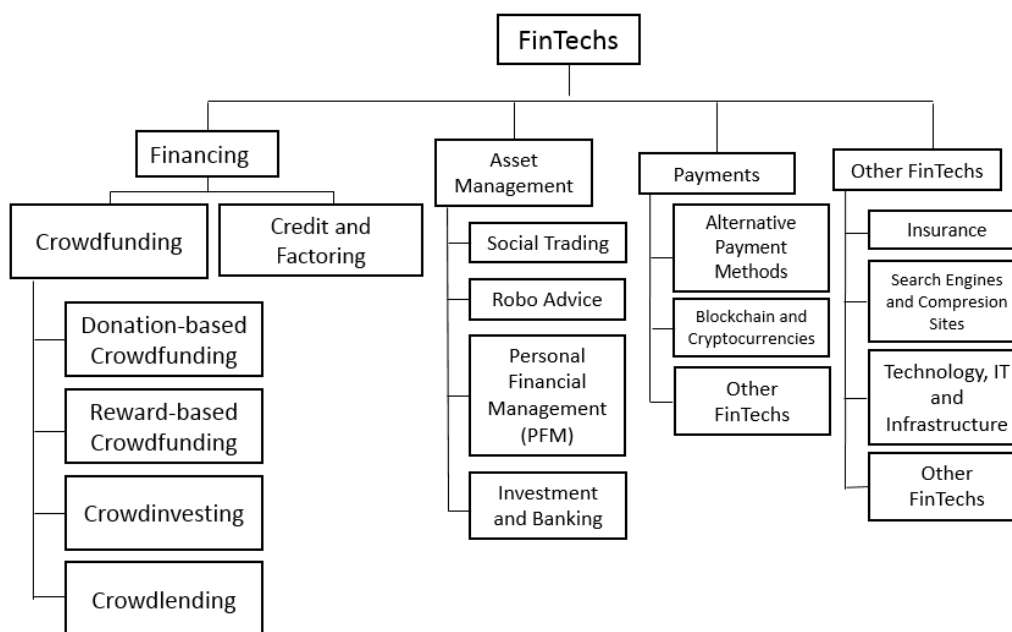
Source: Dorfleitner (2017).

Figure 6.22
Main Form Investor Exposure to Lending Value Chain
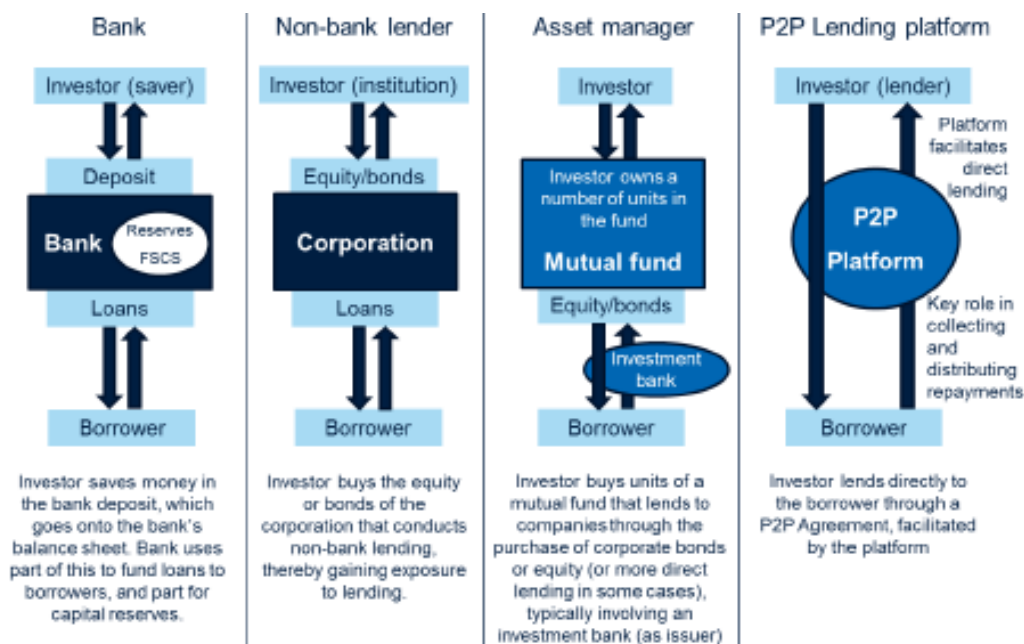
Source: Oxera Economic Council (2016).

Figure 6.22 depicts four main forms of the credit value chain, which reflect the responsibility of direct lending (P2P) in servicing loans from the investor to the individual rather than through financial securities or asset managers. P2P lending provides direct lending from lenders (investors) to borrowers (individuals or SMEs). In other words, this platform provides loans and sets up direct contracts between the investor and borrower

without financial intermediation companies or asset managers. Compared to asset managers who essentially focus on corporate bonds in large companies and have big amounts of managed funds, P2P lending has focused on small loans to individuals or SMEs.

The collective arrangement of FinTech and the increasing role of online platforms or financial technology-related non-bank entities in extending credit or facilitating credit creation (FinTech credit) continue to be a common theme across jurisdictions. It is manifested by the existence of digital infrastructures, such as crowdfunding platforms and peer-to-peer (P2P) lending, which tend to be used by the unbanked portion of society. These innovations create new types of agreements and procedures in the classic areas of banking, such as lending, investment strategies and payments. As stated by Navaretti et al. (2017), the actual and potential areas of expansion of FinTech cover three fields: transaction execution (payments, clearing and settlement), fund management (deposit lending, capital raising and investment management) and the insurance industry. Users can obtain various advantages from the digitisation process in financial services, such as facilitating and simplifying simple access transactions *via* the internet or mobile apps, cost reductions, higher speed of automated processes, higher transparency and convenience (Nino et al., 2017). P2P lending provides a new and effective form of financial intermediation which benefits SMEs, consumers and property loan activities (Oxera Economic Council, 2016).

The FinTech regulatory landscape in Singapore is under the oversight of the MAS' FinTech and Innovation Group. The FinTech industry follows Know Your Customer (KYC) procedures to identify business clients' identities, which then permit the Finance Ministry and GovTech to assess the potential risks to business relationships arising from illegal or fraudulent transactions. Table 6.5 provides further explanations about the financial landscape in Singapore.

Table 6.5
The Financial Landscape in Singapore

Dedicated FinTech teams	FinTech industry enablers/utilities	FinTech regulation/ standards	FinTech regulatory sandbox
FinTech and Innovation Group of the MAS	• National Know Your Customer (KYC) utility is a collaboration between the Ministry of Finance and GovTech • Successfully completed its blockchain inter-bank payments proof-of-concept project • The Application Programming Interface (API) playbook recommends guidelines for developing financial services APIs • Industry-wide projects such as decentralized recordkeeping in trade finance supported by the Financial Sector Technology and Innovation scheme • Reducing financial requirements for crowdfunding platforms	• Consultation Paper on digital advice issued by MAS • Regulation on P2P lending and equity crowdfunding • Consultation Paper on payment roadmap issued by MAS	FinTech regulatory sandbox by MAS

In a report by <u>Fintech Singapore</u> at the end of 2017, the type of FinTech entities in Singapore reflected diverse trends and comprised 210 FinTech companies with high-growth potential in the future. A breakdown of these companies is provided in Figure 6.23. In particular, 32 are active in payments, 41 in investment/wealth management, 23 in blockchain/cryptocurrency-related activities, 20 in Insurtech, 16 in lending, 12 in remittances, 12 in Regtech, 11 in internet comparison sites, 9 in crowdfunding, 9 in data management, 6 in digital banking, 6 in personal finance, 6 are involved the provision of chatbots, 4 in currency exchange and the remaining 3 provide application programming interfaces (APIs).

Figure 6.23
Breakdown of 210 Singaporean FinTech Companies with High-Growth Potential
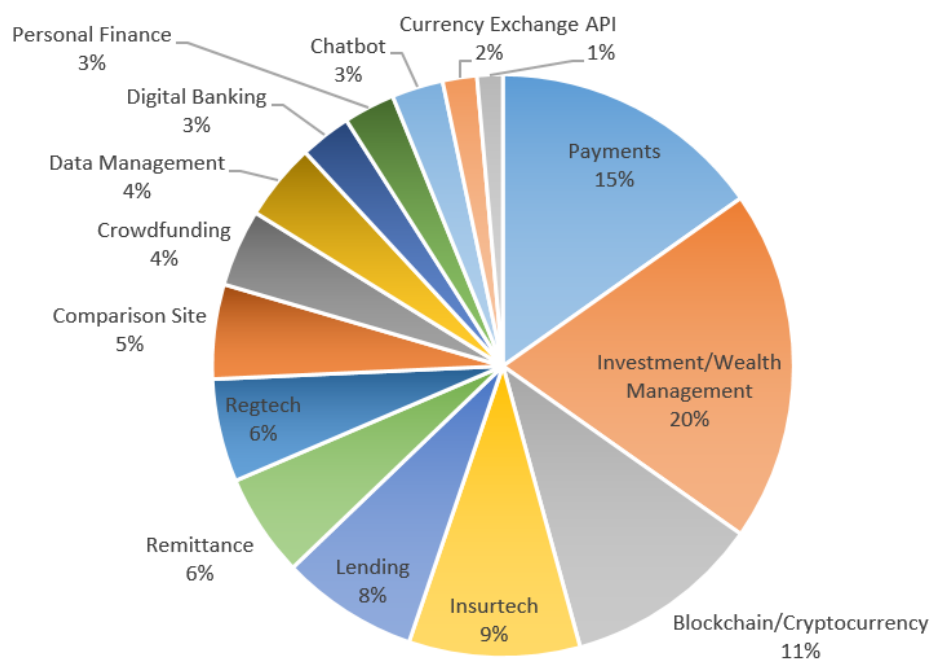
Source: <u>FinTech Singapore</u> (2017).

P2P lending offers an investment opportunity to the investor in the form of delivering funding loans and receiving the cash-flow of the lending business. The risks inherent in P2P lending are typically similar to other investments, such as portfolio corporate bonds. It also involves the buying and selling of mortgages. The direct lending approach is used to limit the liquidity of P2P lending investment. Although the platforms accommodate liquidity investments in regular times by the secondary market, the underlying risks remain higher (Oxera Economic Council, 2016). On the other hand, sophisticated businesses are hampered by a lack of cash flow or working capital that affects their business growth. As usual, the bank's funds for lending mainly come from three sources: deposits, equity and debt. Nowadays, though, traditional incumbents are more selective and less generous in providing credit to finance. Peer-to-peer lending then appears to solve this capital business stagnancy by offering a direct approach to lending and borrowing facilities for customers. In Singapore's cash-intensive economy, this is a boon to the development of alternative credit systems, particularly online lending platforms.

Singapore's digital financial services have the goal of financing small- and medium-sized enterprises (SMEs) based on credit scoring from applications to their platform providers. This digital lending consists of **alternative lending** and **alternative financing**. In case of the former, alternative lending targets business customers as well as private borrowers. As reflected in Figure 6.24, total transaction values in the alternative lending segment reached USD247.3 million in 2019 and is expected to gradually grow until 2023. This market is divided into two loan categories. The first is crowdlending, which arranges a bank-independent loan for SMEs, while the second is marketplace or P2P lending, which provides personal loans through private or institutional investors. Detailed descriptions about crowdlending and marketplace or P2P lending are as follows below:

Figure 6.24
Transaction Values in Alternative Lending Segments
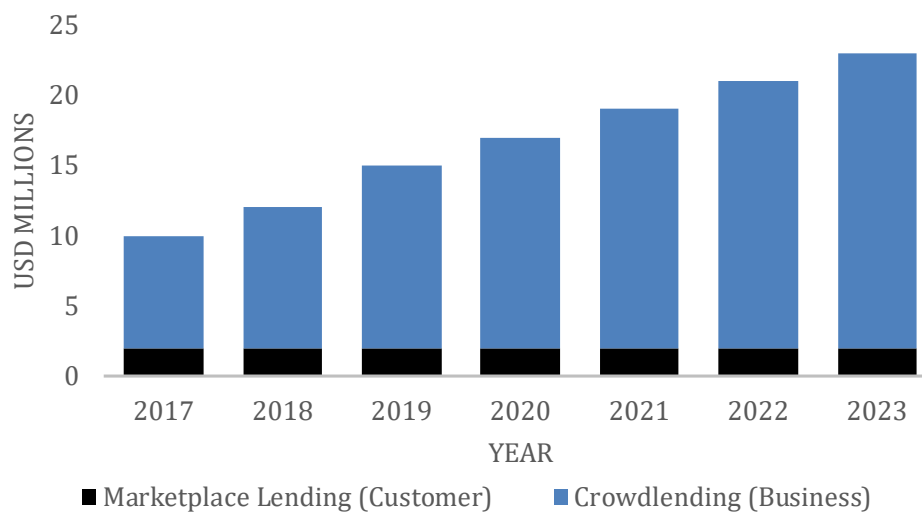
Note: The figure shows the forecasted value of transactions in the selected market (market segment, region) for each year. The figures do not refer to the actual revenue that is generated by the processing companies.
Source: Statista (2019)

SMEs can obtain loans on crowdlending platforms, which come from single or multiple types of financing provided by private or institutional investors via the online brokering platform. The mechanism of credit application begins when the applicants register on the platform and fills out a financing request. Subsequently, the applications are scrutinised by the platform's credit analyst based on an internal credit scoring system to assess whether they meet the financing requirements. Basically, the criteria of online platforms tend to be easier than those for traditional banking systems, since no collateral is required. However, other requirements may need to be considered, such as investment turnover. These financing requests can be invested in private or institutional investors with an appropriate interest rate as recommended by the credit rating company. The growth of business financing in crowdlending mechanisms is reflected in the transaction value of USD232.5 million in 2019, with an average funding per campaign of USD84,988, and the number of transactions is expected to reach some 3,400 over the next four years as illustrated in Figures 6.25 and 6.26 respectively.

Figure 6.25
Total Average Funding Per Loan in Crowdlending Segment
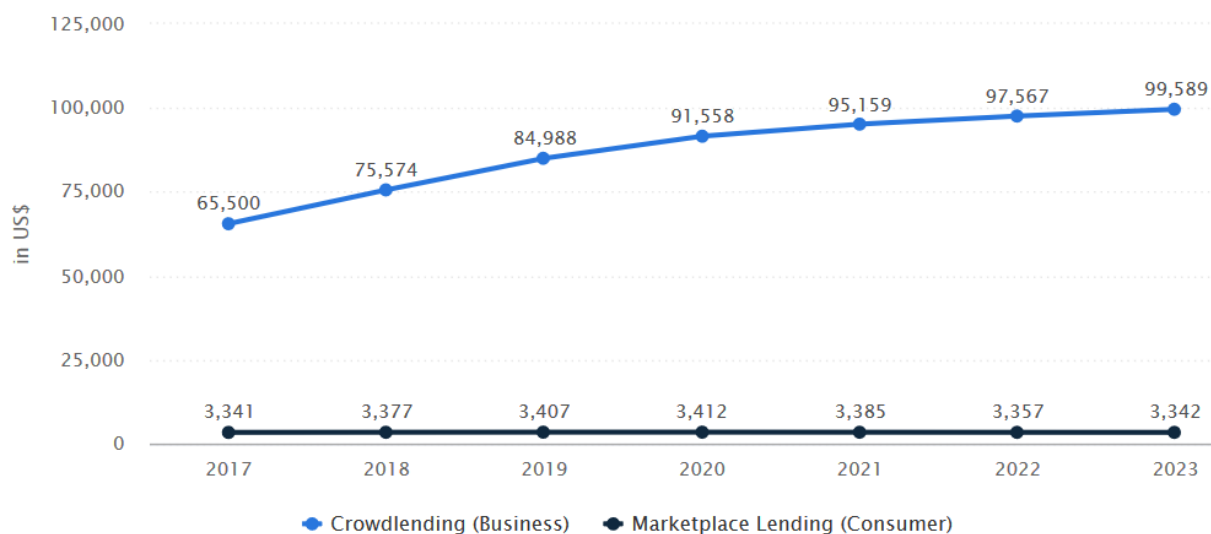
Note: The figure shows total average funding per successfully funded loan in the selected market. The value is expected to show an annual growth rate for 2020-2023.
Source: Statista (2019)

Figure 6.26
Number of Loans in Crowdlending Segment
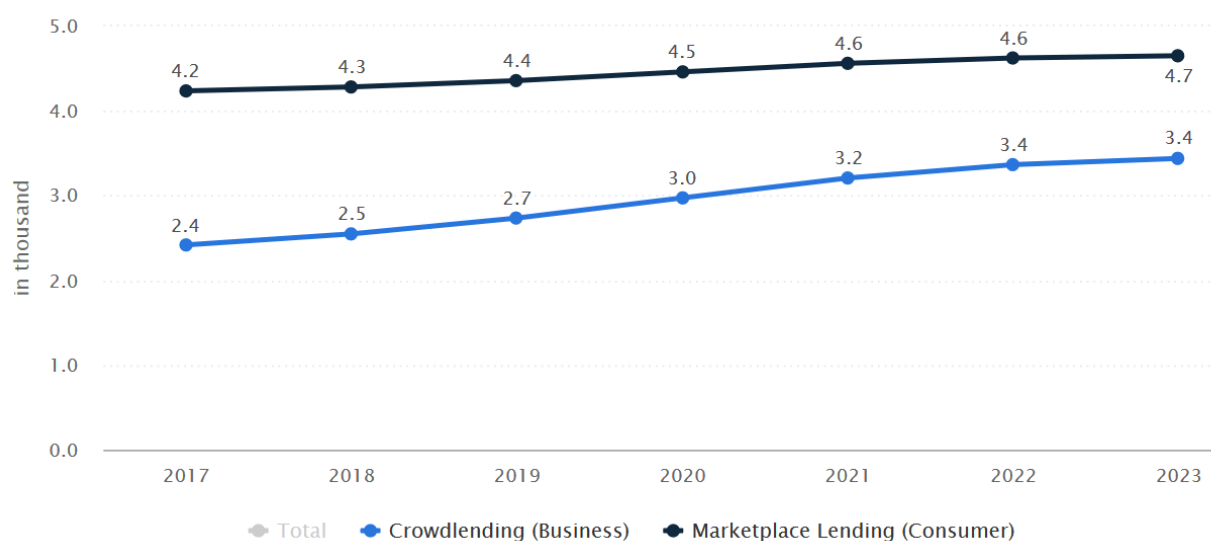
Note: The figure shows the number of successfully funded alternative loans (within the last 12 months) in the selected market and region. The value is expected to show an annual growth rate for 2020-2023.
Source: Statista (2019)

In contrast to the previous platform, marketplace lending encourages private users to place loan requests on an online platform to collaborate with private investors at a suitable interest rate. Online portals such as Lending Club, Zopa, auxmoney and Prosper employ credit score systems and a list of financial request applications before assigning a fixed lending rate.

More than one investor can participate in the credit request. The other uniqueness of online platforms that can be an attractive benefit for many users is the assessment process, which is more flexible than traditional bank loans even though banks collaborate with the platform providers. This flexibility is reflected in prerequisite characteristics, risk audit and less exposure to users which are normally associated with credit lending. Tools that are being used as a benchmark are the outstanding amount and short-term instalments or consumer loans which are agreed upon during the period.

Several activities in online marketplace lending for consumer cover personal loan applications and private investors and P2P loans, which charge an interest rate based on a borrower's credit score by the platform providers. As a result of these activities, the total transaction value in the marketplace lending segment reached USD14.8 million in 2019 and the number of transaction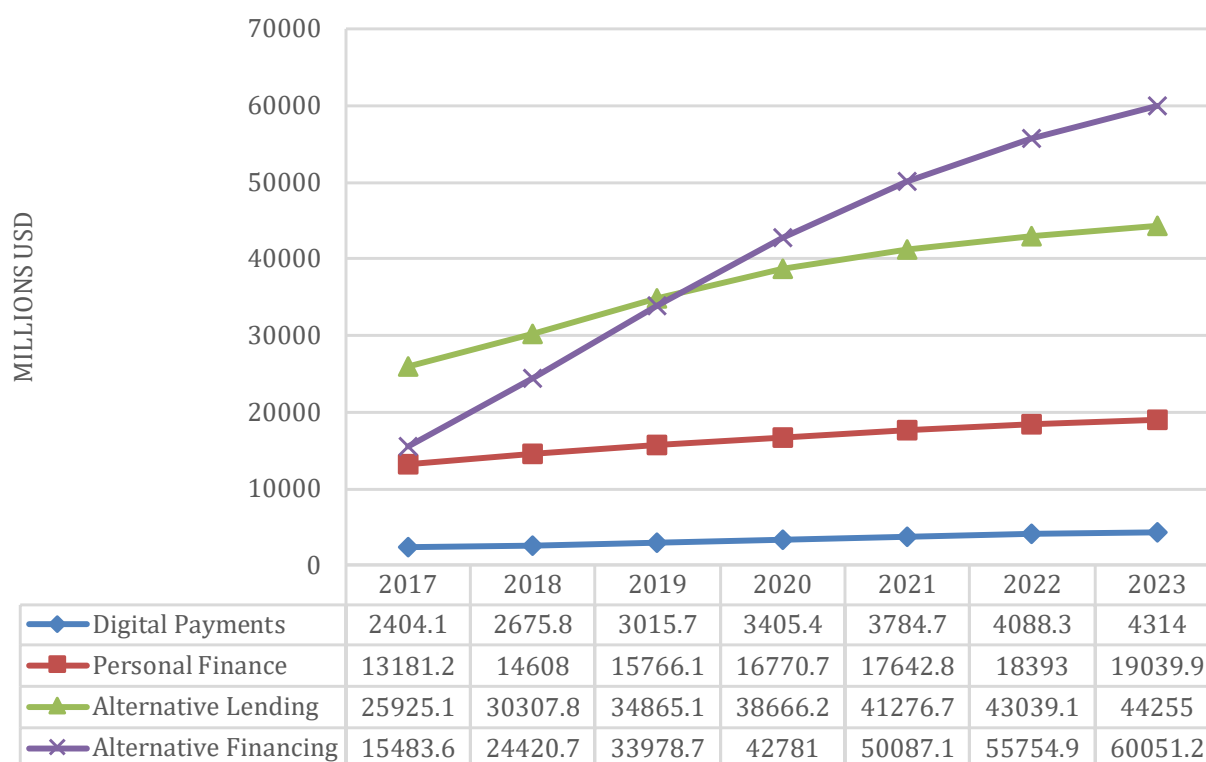s is predicted to reach 4,700 in 2023. In the ongoing development of FinTech activities, there is no evidence that these sectors present a compelling financial stability risk in their current form.

The other type of digital financing in Singapore that falls under alternative financing targets the market for business customers that is not considered by the banks. This alternative financing mechanism is commonly known as crowdfunding, which is a process of sourcing money from individuals or groups of investors for funding projects, start-ups or social campaigns. There are three general methods of crowdfunding, comprising equity-crowdfunding, reward-crowdfunding and donation-crowdfunding (Nino et al., 2017). Focusing on the Singaporean FinTech system, crowd investing and crowdfunding models have a different focus in financing businesses, particularly for start-ups exchanging investment for company shares (equity-based) and entertainment firms (reward-based). The equity-based model requires a capital service license to operate in Singapore. This is because of the liability process faced by investors in case they lose their investment if a company does not perform well. A problem appears when a crowd of people invest in unlisted company shares at an early-stage and allow the investor to compete by creating incentives (Nino et al., 2017). The other crowdfunding model is reward based. Here, an investor gains rewards based on the proportionate amount of money they invested with entrepreneurs if they meet project goals. The total transaction value in the alternative financing segment reached USD7.5 million in 2019, with more than 50% of this amount dominated by crowd investing. The average funding per campaign in the crowd investing sector amounted to USD148,979 in 2019. Figure 6.27 shows that the average transaction value per user in the digital payments segment in 2019 was USD3,016.

Figure 6.27
Transaction Value per User

	2017	2018	2019	2020	2021	2022	2023
Digital Payments	2404.1	2675.8	3015.7	3405.4	3784.7	4088.3	4314
Personal Finance	13181.2	14608	15766.1	16770.7	17642.8	18393	19039.9
Alternative Lending	25925.1	30307.8	34865.1	38666.2	41276.7	43039.1	44255
Alternative Financing	15483.6	24420.7	33978.7	42781	50087.1	55754.9	60051.2

Note: The figure shows the average annual transaction value per user (or potential user) of the selected market (market segment, region) for each year. The value is expected to show an annual growth rate for 2020-2023.

Source: Statista (2019)

The substantive volume of traditional insurance in Singapore has been categorised as shadow banking by the MAS. In order to foster innovation in the insurance sector, the Singaporean government, through the MAS and insurance providers, issued InsureTech technological innovations, whereby two parties agree using automated insurance contracts using blockchain technology (Nino et al., 2017).

Other significant future planning in Singapore occurs in wealth management. The Boston Consulting Group (BCG) projected Asian wealth to grow at 14% per annum between 2017 and 2022, compared to 11% in the rest of the world, with countries such as China and India spearheading that growth. In order to play a role in that development, Singapore started automatic sharing of information with 64 countries that serve to indicate the greater degree of transparency and changing attitudes of wealth management clients. Therefore, the continued expectation of growth rests on wealth management advisors that help shape and change future generation regarding planning and investing (Ng Yao Loong, 2018).

MAS (2018), along with their partners, developed the Financial Services Industry Transformation Map (ITM), in which the wealth management sector plays a major role. Some priorities, such as the transformation of wealth management, are pushed forward by developing strong pools of expertise, broadening product and service offerings and promoting technological innovations. Singapore also offers attractive platforms to facilitate

investment by creating a vibrant private equity and venture capital (PE/VC) eco-system. The average AUM grew by 16.9% per annum over two years, led by PE/VC.

Despite the potential advantages of FinTech mentioned above, there are also many concerns for both investors and borrowers about the future platform lending marketplace. Investors are concerned that minimal regulation and loan performance uncertainty could hamper FinTech revenue growth and lead to reputational risk. For borrowers, cybersecurity and credit risk could be two important issues, since conducting investment transactions on an online platform opens them up to both of these possibilities (Nino et al., 2017). On the macro level, more advanced FinTech can have several effects on financial services, such as fractional-reserve banking systems accompanied by maturity transformation leading to bank runs. FinTech also raises a new issue regarding trust, the future of money and the future role of central banks. In the case of non-bank P2P lending, it potentially poses asymmetric information problems as financial authorities demand to obtain the necessary information about their intermediation activities from the company's balance sheets (Nakaso, 2016). With respect to the mandate of the central bank to maintain the future stability of the currency, they may need to adopt an optimum framework of a "decentralized system" as part of the adoption of distributed ledger technology (DLT) and the blockchain. The sluggishness of the central bank in accepting technological developments and only providing banknotes as payment instruments could keep economic development constrained (Nakaso, 2016).

6.4   Regulation

Before delving deeper into regulation, this study will discuss improvements to risk-return diversification for investors and their resulting economic impact. According to Adrian (2015), shadow banks can be a source of systemic risk as the lack of regulation means a loss of control to prevent the build-up of leverage and interconnections between banks and other financial intermediaries to shadow banks. The direct links between shadow banks and systemic risk is attributed to several causes, including the collateral chain, the high level of leverage, loan guarantees, and agency problems related to securitisation and regulatory arbitrage. All these factors lead to interconnectedness that has implications for the distribution of funding and credit risk (Jokivuolle, 2018; Upper, 2018). To this must be added the indirect exposure through similar asset holdings that makes asset prices prone to valuation effects (Upper, 2018).

The existing regulatory framework already contains the main elements of a FinTech-related economic perspective, but it needs to be developed further to adjust to business models, real practices and market growth (Oxera Economic Council, 2016). Policymakers and FinTech providers need to frame future developments in regulations with several main areas in mind, such as ensuring effective communication with investors involving clear standardisation information across the platforms, utilising appropriate credit-risk management, implementing additional codes of conduct standardisation and equal treatment for any type of investor and regulatory prohibition of maturity transformation.

As mentioned before, the harmful regulatory arbitrage can be classified into three categories. First, the shadow bank entity operates the channelling process to a regular bank off-balance sheet. Second, a traditional institution seeks the cheapest option in jurisdiction to disclose their exposure. Finally, incentives used by a bank to minimise

risk indicators, reduce capital and liquidity requirements (Nouy, 2017). Hence, the policymakers' challenge in the continuous development of this sector is to maximise the benefits of shadow banking while minimising systemic risks. The MAS currently monitors shadow banking activity by using a range of data sources, including regulatory returns and proposed complementary regulation of shadow bank interactions with conventional banks, MMFs, securitisation processes, securities lending and repo activity and the shadow bank entities themselves (MAS, 2011). Such steps to limit regulatory arbitrage of shadow banks has similarities with regulations for finance companies and banks. Another example reflects the same risk of capital market intermediaries and insurance companies.

Online platforms have several design features to prevent and, if needed, manage the possibilities of loan default risk, liquidity risk and platform risk, all of which can be experienced by an investor not only in normal market conditions but also potentially during severe market dislocations (Oxera Economic Council, 2016). To begin with, credit risk assessment and interest rate management by means of credit-score models ensure that returns are appropriate given risk levels. In other words, rates offered are priced to at least cover expected losses. Second, the key benefit from P2P lending arises from the diversification of risk management that spreads the total invested amount into several kinds of loans. In P2P lending, economic agents are able to choose the deals that they want to invest in and the interest rate they want to earn. Another function that is designed to better manage risk for investors in P2P platforms is through the provision of liquidity in secondary markets. Many P2P platforms facilitate long-duration loans which enable investors to sell their portfolios to other investors. This mechanism creates possibilities for investors to sell their remaining loans to other investors to enable them to access their funds before the loans are repaid. The implementation of P2P platform incentives to manage risk, due to both a direct impact on revenue and reputational effects, may affect their viability in the longer term. Based on the earlier discussion, the possibility of P2P lending contains contagion risk, where a relatively small shock on one platform may cascade to many more P2P platforms — this possibility may not be as worrying in the context of Singapore, considering the small share of online shadow bank to Singapore's other presence in global finance.

Singapore imposes stringent regulations on the financial sector, the main provisions for which are stated in the Securities and Futures Act (SFA) Section 82(1). The latter sets up the businesses permissible based on the key regulated activities. SFA also manages the activities that include investment funds, especially for holders of capital markets service licenses and representatives, collective investment schemes and business trusts by issuing guidelines and codes of conduct of business. Many countries around the world, including Singapore in 2014, have adapted the regulatory sandbox as part of introducing and managing financial innovations. In general, the regulations are adapted to fit local needs and provide new products for financial markets at lower cost and quicker access in a controlled environment. They also protect customers from entering risky transactions too eagerly and without due care and encourage innovators to raise funds. The testing ground of the regulatory toolbox uses real customers and is protected by additional – complementary – safeguards that are used for assessments. This assessment help to identify how the products fit in with the existing regulations, which ensures customers are protected. Furthermore, all the entities in Singapore that are engaged in moneylending activities are subject to authorisation from the Register of Moneylenders following the Moneylenders Act 2010 (Singapore Statue Online, 2019).

As technology companies in Singapore enter the sandbox, two basic criteria are evaluated. First, the suggested financial service should include new technology or improve the use of existing technology in an innovative way. Second, it should overcome existing problems or bring advantages to customers or industries. A collaborative approach rather than competition is taken across the ecosystem.

Based on the advantages of a developed finance ecosystem and technological advances, MAS' Managing Director Ravi Menon revealed that Singapore's monetary authority instigated a broader strategy to become a "Smart Nation". Towards that aim, the MAS strives to improve digital government services through better utilisation of data and other new technologies. Even though Singapore's monetary authority is pleased with the existence of FinTech players, MAS forbids shadow banking activities using electronic funds to grant loans from the payment system start-ups (Menon, 2018). The monetary authority intends to scale up FinTech operations based on risk perspectives and unified regulations at the banks' level.

Singapore's government has offered additional high-level support by introducing a FinTech patent scheme known as the FinTech Fast Track Initiative to boost the creation of vigorous ecosystems for innovation through research and development. Another implementation following the Payment Service Bill that became law was the operation of aggregate mobile wallets in which more than SGD5 million must be fully secured. FinTech cannot lend that amount to somebody else unless it obtains a banking license to take in deposit and provide loans to agents in the economy. This principle of ringfencing or the process whereby a portion of a company's assets or profits is separated without the intention of it being used, is similar to the current practice with other entities, such as security dealers. It also reflects procedures such as selling shares by customers and insurers who must segregate between their own and shareholders' funds.

6.5   The Impact of Monetary Policy on Shadow Banks through the Asset Price Channel in Singapore

This chapter aims to achieve three main purposes. The first objective is to uncover a coherent view of shadow banking activities in Singapore. In order to accomplish this goal, we investigate and then present a map of shadow banking activities in Singapore. In so doing, this study uses the activity-based definition of shadow banks. Moving on, the second objective is to explore the prospects for new financial intermediaries through the existence of financial technology. The first two objectives are investigated in a qualitative approach that is based on related preliminary research to build the shadow banking map in Singapore.

6.5.1   Data Description

The high supply and demand of shadow banking products create new forms of financing, making the price involved very sensitive for households, SMEs or large companies. The determination of the appropriate interest rates in the transmission mechanism of shadow banking is crucial. Although insurance funds are the largest NBFIs in Singapore, they are not categorised as narrow shadow banking (OFI) according to the FSB. This is because the activities they are engaged in are not considered to create systemic risk. Thus, the market behaviour of a shadow banking entity can be assessed

through the asset management industry, which accounts for the second largest share of NBFI assets in Singapore. The growth of the asset management industry in Singapore proceeded quickly and haphazardly, leading to a lack of market transparency and needed regulation. Therefore, returns from net asset value (NAV) are argueably more accurate and useful to capture shadow banking developments in the respective country.

Temasek Holdings is a global investment company headquartered in Singapore that we choose to represent non-bank financial intermediaries for this study. Based on data from Bloomberg, Temasek Holding PTE Ltd is the biggest asset management company in Singapore, with current total equity assets under management of USD107.1 billion invested in 404 securities. By industry sector, the largest exposures are financials (37.4%) and communications (30.5%). Considering its limited data, aggregate size, popularity and close relationship to the credit markets, seven of Temasek Holdings' funds returns which are registered in Securities Companies, serve as the best proxy for Singapore's shadow banking asset price. We also deem them to be an appropriate indicator of the market-based interest rate that is determined by market supply-demand forces. The model is then adapted along two different lines. The first model will be used to compute the impact of monetary policy on shadow banking returns, while the second model investigates the monetary impact on asset growth of shadow banks by category, i.e., equity, fixed income and money market funds (MMF). By doing so, we hope to find more robust results that could hence become a useful resource for financial regulators.

Moving on to the third goal, we employ the following model approach to assess the impact of monetary policy on shadow banking returns through the asset price channel. The dependent variable is either the net asset value (NAV) of Temasek Holdings (Model 1) or total asset growth of each type of retail fund product (Model 2). More specifically, we try to estimate the impact on three types of asset classes, which are equity (e.g., stock), fixed income asset (e.g., bonds) and cash equivalent assets like MMFs. We analyse three types of funds of Temasek Holdings' asset, namely Fullerton China focusing on shared fund to capture equity funds, Fullerton-Asian High Yield Class D-USD Fund to capture fixed-income funds and Fullerton SGD Cash Fund to represent money market funds.

We select data on the daily returns on Temasek Holding's NAV from 1 January 2016 to 30 April 2019, for a total of 868 daily yields. Bloomberg provides data on just seven funds under management of Temasek Holding Asset Management, which is why we use the total assets of these seven funds to generate a standardised weighted NAV. The weighted average provides us with the daily yield from which we can calculate an effective annual return. In addition, the exogenous control variables include the Singapore Interbank Offered Rate (SIBOR) interbank money market rate as well as the policy rate to measure the price-based monetary policy tool. The benchmark interest rate to represent the administrative monetary policy tool are the lending and deposit rates which use the MAS' standing facility. The facility's lending rate is 0.5% above the reference rate, while the deposit rate is 0.5% below the reference rate, subject to a floor of zero. We also include an exogenous control variable, which is the nominal effective exchange rate (NEER). The latter is included to measure the extent to which the exchange rate determines the returns on shadow banking. To avoid the consequences arising from the high correlation coefficient between the interest rates, we include them one at a time into the model to see which one has the most significant effect on our dependent variable. We use the natural logarithm of the NEER data.

We investigate the autocorrelation and partial autocorrelation functions of Temasek Holding's returns and the exogenous control variables at levels: the autocorrelation and partial autocorrelation functions of Temasek Holding's returns and assets have a decaying pattern, which shows that returns are non-stationary in levels and contain a unit root. We also check the autocorrelation and partial autocorrelation function at first differences and the results show that all variables are stationary in first differences and do not contain a unit root.

Table 6.6
Data Description

Variable Name	Description	Proxy Indicator		Source
Dependent Variable				
Return	Asset Price (Model 1)	Weighted Daily Net Asset Value	$(NAV_t - NAV_{t-1})/NAV_{t-1}$	Bloomberg
- **Equity** - **Fixed** - **MMF**	Volume of total assets of each product (Model 2)	Total asset growth for each asset type	$(X_t - X_{t-1})/X_{t-1}$	Bloomberg
Exogenous Variable				
- **Lending** - **Deposit**	Administrative monetary policy tool: benchmark interest rate	- Lending rate - Deposit rate	Daily MAS standing facility deposit rate and borrowing rate	https://mas.gov.sg
- **MMF** - **Policy**	Price-based monetary policy tool	- Singapore Interbank Money Market Rate - Policy rate	- SIBOR - Daily policy rate	
Control Variable				
NEER	Exchange rate	Nominal Effective Exchange Rate (NEER)	Local currency	IMF's International Financial Statistics (IFS) dataset

6.5.2 Empirical Model

Following Zhang and Wan (2017), this study uses the Exponential Generalized Autoregressive Conditional Heteroskedasticity (EGARCH) model. The reason for using the EGARCH model instead of other empirical models is twofold. First, these models are better suited for high-frequency data that are affected by heteroskedasticity than the simple GARCH model. Two, the empirical results suggest that the EGARCH model fits the sample data better than a GARCH model in capturing the volatility of shadow banking asset price returns.

Before doing the EGARCH regressions, we conduct tests for the order of the appropriate ARIMA (p,d,q) model as the first step of EGARCH estimation. Then we continue with the robustness tests, such as the serial autocorrelation LM test, to ensure that the data are free from autocorrelation, and a heteroskedasticity test to ensure that the residual errors are normally distributed. The autocorrelation and partial autocorrelation functions of Temasek Holding's returns have a random pattern, which indicates that returns are stationary at levels and do not contain a root unit. The model specification is as follows:

$$r_t = \sum_{i=1}^{s} \phi_i r_{i-1} + Z_m' X_t^m + u_t. \quad u_t \sim N(0, \sigma_t^2) \qquad \text{(11)}$$

$$ln(\sigma_t^2) = \omega + \sum_{j=1}^{q} \beta_j ln(\sigma_{t-j}^2) + \sum_{i=1}^{p} \alpha_i \left| \frac{u_{t-i}}{\sigma_{t-i}} \right| + \sum_{k=1}^{r} \gamma_k \frac{u_{t-k}}{\sigma_{t-k}} + Z_v' X_t^v \qquad \text{(12)}$$

where the endogenous variable, r_t, is Temasek Holding's interest return, equation (11) is the mean equation of the shadow banking interest rate series, equation (12) is the variance equation, the term $\sum_{i=1}^{s} \phi_i r_{i-1} + Z_m' X_t^m$ represents the time-varying mean and σ_t^2 is the time-varying variance. The mean is assumed to show persistence in the shadow banking interest rate as well as in exogenous factor that should affect shadow banking. The exogenous control variable, X_t^m, include the interbank money market rate and the policy rate as price-based monetary policy, the policy rate and the benchmark interest rate, while the administrative monetary policy tools are the lending and deposit rate. X_t^v is the exogenous variable for the variance equation and γ_k is the asymmetric impact of positive or negative innovations on the standardised residuals.

6.5.3 Empirical Results

6.5.3.1 Temasek Holdings' Return

In this section we present our empirical results by first determining the lag structure of the underlying models and subsequently the best-fitting model. The best model is chosen by considering the significance of various estimated models from the statistical probability of a sequence of F-tests, the significance of the AR or MA coefficients used, the maximised value of the log-likelihood function and the minimised value of the AIC and SIC criteria. We choose the best model coming from either the GARCH or Exponential-GARCH (EGARCH) specification under the assumptions that the errors follow a normal (Gaussian) distribution. Before evaluating the best model, we must ensure that all significant AR and MA coefficients are included. The best ARIMA representation for Temasek Holding's returns is the ARIMA(2,1,2) model. Finally, we ensure that there is no serial correlation in the model, and that there is heteroskedasticity in the ARCH effect test, so that the ARCH-GARCH method can be used.

Table 6.7
Empirical Result of Model 1 for Singapore

Variable	Policy Rate	Deposit Rate	Lending Rate	Interbank Rate
	ARIMA(2,1,2)	ARIMA(2,1,2)	ARIMA(2,1,2)	ARIMA(2,1,2)
Mean Equation Results				
Constant	7.66E-05	7.14E-05	7.47E-05	7.16E-05
Exogenous	–0.259**	–0.004	–0.171	–0.030
NEER	1.305*	1.303*	1.300*	1.303*
AR(1)	0.251*	0.250*	0.250*	0.250*
AR(2)	–0.895*	–0.900*	–0.897*	–0.900*
MA(1)	–0.265*	–0.265*	–0.265*	–0.265*
MA(2)	0.887*	0.892*	0.891*	0.892*
Diagnostic tests				
R-squared	0.021	0.021	0.022	0.021
Adjusted *R*-squared	0.015	0.014	0.015	0.014
Log-likelihood	2424.527	2424.424	2424.619	2424.424
F-statistic	3.137	3.103	3.168	3.102
Akaike info criterion	–5.590	–5.589	–5.590	–5.590
Schwarz criterion	–5.551	–5.551	–5.551	–5.551

Table 6.7 shows the estimated models for each exogenous variable (policy rate, deposit rate, lending rate and interbank rate). Based on the estimation results, all the exogenous variables have a negative relationship, with only the policy rate having a significant effect on Temasek Holdings' returns. The small contribution of the monetary policy tools may be due to other factors. The negative association between Temasek Holdings' returns and the price-based monetary policy tools means that any increase in the policy rate will drive Temasek Holdings' returns down. The latter result is in accordance with the theory of the transmission mechanism through the asset price channel, where monetary policy influences changes in asset prices. For the administrative monetary policy tools, results suggest that the elasticity of the policy rate gets reflected in effective changes in monetary policy to retail-market rates. This argument might possibly explain the insignificant result for interbank interest rates and monetary policy tools that are not effective in driving the shadow banking market, because there is a lack of connection between them. For administrative monetary policy tools, we find that the elasticity of the policy rate implies effective transmission of monetary policy to retail-market rates.

In addition, to ensure that our model is robust, we conduct a diagnostic test of heteroscedasticity, namely the ARCH-LM test, to ensure that the classical assumptions about the residuals hold in the estimation of the model. Any increase in the nominal effective exchange rate (NEER) signifies a depreciation of the Singapore dollar that will affect Temasek Holdings' returns. This result is in line with Zhang and Wan (2017), who

found that lending rates as administrative monetary policy tools affected retail interest rates in China, based on Yu'E Bao interest rates. On the other hand, the results differ from He and Wang (2012) and Porter and Xu (2013), who argued for using the seven-day repo rate as the market-determined interbank interest rate rather than the SHIBOR.

6.5.3.2 *Temasek Holdings' Assets*

In order to analyse the impact of monetary policy on Temasek Holdings' assets under management, we follow the same steps as above. Table 6.8 separates the estimation results into different types of assets, which are equity, fixed income and total assets. The main exogenous variable for all asset types turn out to be insignificant except for the interbank money market rate (MMR) through SIBOR. Interestingly, changes in interbank rates have a positive relationship and significantly impact equity asset volumes with a magnitude of 0.048%. The explanation for this result is related to the prior argument that Singapore's interbank rate is well-established and effective in influencing inflows into Temasek Holdings' equity fund.

The interbank rate is also used as the rate of interest which is charged on short-term loans between Singaporean banks and underlies liquidity operations that are conducted by commercial banks. This market is an essential channel for liquidity and transparent trading, ensuring a stable pricing mechanism. The sensitivity of equity fund assets to equity prices motivates the monetary authority to formulate liquidity provisions in controlling the continuity of financial markets. Hence, a short-term monetary policy level that can transmit the benchmark monetary policy signal is required to reduce market volatility.

The absence of any effects coming from the lending rate, deposit rate or policy rate might be due to an imperfect transmission among monetary policy rate tools, specifically on the fixed income asset class. Table 6.8 illustrates that none of the benchmark interest rates or price-based monetary policy tools affect the growth of fixed-income asset holdings.

Table 6.8
Empirical Results of Model 2 for Singapore

| Dependent Variable	Equity				Fixed-Income				Total Assets			
	Lending Rate	Deposit Rate	Policy Rate	MMR	Lending Rate	Deposit Rate	Policy Rate	MMR	Lending Rate	Deposit Rate	Policy Rate	MMR
	ARIMA(2,1,2)	ARIMA(2,1,2)	ARIMA(2,1,2)	ARIMA(2,1,2)	ARIMA(3,1,3)	ARIMA(3,1,3)	ARIMA(3,1,3)	ARIMA(3,1,3)	ARIMA(2,1,1)	ARIMA(2,1,1)	ARIMA(2,1,1)	ARIMA(2,1,1)
Mean Equation Results												
Constant	-0.001	-0.001	-0.001	-0.001	-0.000	-0.000	-0.000	-0.000	-0.005	-0.005	-0.003	-0.005
NEER	0.365	0.366	0.443	0.444	0.111	0.109	0.108	0.109	0.091	0.097	0.627	0.056
Exogenous	-0.129	-0.132	0.000	0.048*	0.054	0.047	-0.000	0.006	0.716	0.802	-0.006	-0.009
AR(1)	1.191	1.191	1.198	1.197	0.496	0.496	0.500	0.500	0.994	0.994	1.012	0.993
AR(2)	-0.956	-0.956	-0.966	-0.965	0.480	0.481	0.485	0.483	-0.027	-0.027	-0.021	-0.027
AR(3)					-0.887	-0.886	-0.885	-0.886				
MA(1)	-1.198	-1.197	-1.208	-1.208	-0.543	-0.543	-0.546	-0.546	-0.996	-0.996	-1.029	-0.995
MA(2)	0.984	0.983	0.998	0.998	-0.441	-0.442	-0.445	-0.443				
MA(3)					0.919	0.919	0.918	0.919				
Diagnostic Tests												
R-squared	0.021	0.021	0.023	0.026	0.019	0.019	0.019	0.019	0.022	0.023	0.051	0.021
Adjusted R-squared	0.013	0.013	0.014	0.018	0.007	0.007	0.007	0.007	0.007	0.008	0.036	0.006
Log-likelihood	1897.422	1897.410	1898.074	1899.270	2334.758	2334.740	2334.714	2334.785	620.990	621.052	625.861	620.660
Akaike info criterion	-5.417	-5.417	-5.419	-5.422	-6.615	-6.674	-6.674	-6.615	-3.705	-3.705	-3.734	-3.703
Schwarz criterion	-5.371	-5.371	-5.373	-5.376	-6.651	-6.615	-6.618	-6.651	-3.636	-3.636	-3.665	-3.634

6.5.4   The Monetary Policy Framework in Singapore

The MAS as the monetary authority of Singapore has a mandate to maintain price stability and support the sustained growth of the economy through its monetary policy. Amongst monetary policy frameworks, Singapore is quite unique in its use of the exchange rate, more specifically known by Singapore dollar nominal effective exchange rate (SGDNEER), rather than an interest rate as the effective tool for maintaining price stability. The main reason for this is the fact that imported goods dominate domestic expenditure and the exchange rate, therefore, has a stronger influence on inflation. As stated by McCandless and Weber (1995), the growth of money is highly correlated with inflation, which have an impact on Singapore's M3 measure of the money supply.

Figure 6.28 illustrates monetary policy implementation in Singapore. The MAS monitors the daily movement in the NEER to ensure currency fluctuations fall within the foreign exchange crawling policy band.

The main objective of Singapore's monetary policy is price stability to support sustainable economic growth. The MAS intervenes in the foreign exchange market to maintain the Singapore dollar exchange rate, in the form of the nominal effective exchange rate (NEER), within the policy band. The implementation of the exchange rate-based monetary policy proceeds as follows. The MAS monitors the daily movements in the NEER to ensure currency movements fall within the crawling policy band. Foreign exchange interventions, both in the spot and forward markets, are implemented during undesirable foreign exchange market conditions, especially when the NEER fluctuates widely and is in danger of breaching its foreign exchange crawling policy band.

Figure 6.28
Implementation Cycle of Monetary Policy
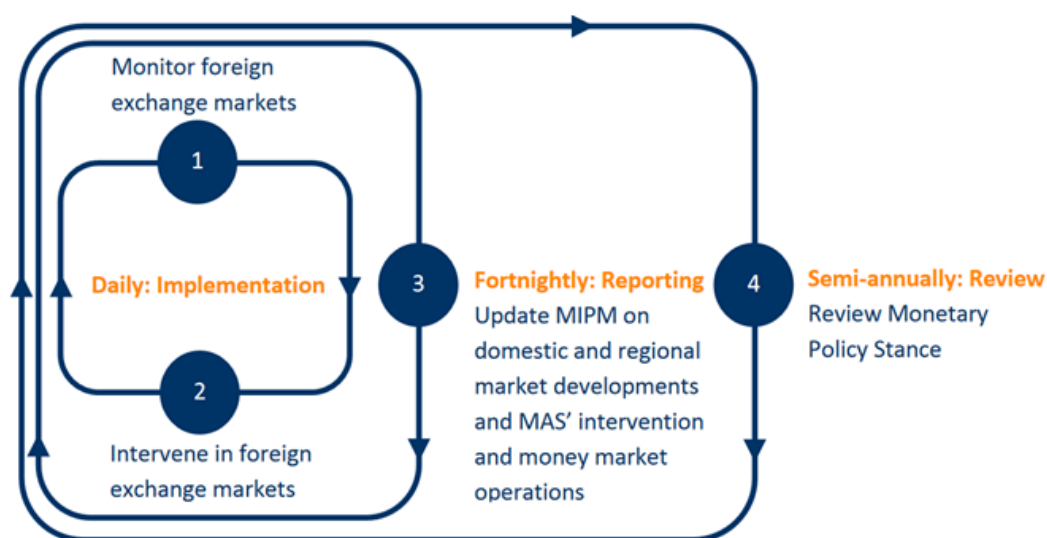
Source: MAS (2013)

Second, the MAS' Market Management Department (MDD) will report its intervention and money market operations at the fortnightly Money and Investment Meeting (MIPM), which is equivalent to the Monetary Policy Commitee of other central banks. In addition to reporting its operations, MDD also supplies updates on domestic

and regional market volatility. Finally, MAS provides monetary policy formulation as a separate function to prevent monetary policy decisions from interfering with short-term implementation considerations. The Economic Policy Group continually evaluates the exchange rate to avoid misalignment in the Singapore dollar currency value. After each review, a Monetary Policy Statement (MPS) is released with information on the newest movements of the exchange rate and to provide updates on exchange rate policy management.

6.6   Conclusion

Looking at the growth of the Singaporean economy and the use of M3 as the broad money aggregate, the structure of Singapore's shadow banking system is quite different from that of the US and Europe, which are both relatively complex, both in terms of activities and entities. In this regard, Singapore is more similar to Hong Kong, which has the largest share of OFIs in the financial sector. The entities categorised as shadow banks, according to the FSB definition, are collective investment schemes, hedge funds, money market funds and structured finance vehicles. The main reason behind the emergence of these types of shadow banks over others is mainly due to the stringent lending regulations in the banking sector. The latter creates obstacles for corporates and private customers in obtaining funds for their operational business and daily needs. The other reason is that these institutions can be a lucrative way for investors to place their money in Singapore's financial sector. This study also includes some analysis as to what extent online platforms, such as P2P lending, are involved in shadow banking activities.

The MAS defines shadow banking as any activity that creates risks that can trigger systemic economic crises and cannot be addressed by regulations. Related to this issue, Financial Technology (or FinTech) is growing rapidly. Firms in this area have the potential to operate as shadow banks or non-bank financial intermediaries (NBFI) in conducting credit intermediation. The relatively simpler credit requirement and assessment process by FinTech online platforms make these firms an attractive and cost-efficient option. Singapore is attempting to make the FinTech revolution part of its Smart Financial Centre objective rather than a source of technology disruption by collaborating and synergising with all stakeholders. Peer-to-peer lending is projected by Allied Market Research to grow at a compound annual growth rate of 51.5% by 2022. These innovations have been met with clear regulations by the MAS which can have other implications and alter the business model of fund managers in the future.

To assess the effect of changes in monetary policy on shadow banking in Singapore, we use the effective annual returns of one of the largest asset management firms in Singapore, namely Temasek Holdings, as a proxy for the shadow banking interest rate in Singapore. We included exogenous control variables that involve interest rates: the interbank rates to measure the price-based monetary policy tool, the policy rate, the lending rate and the deposit rate to capture administrative monetary policy tools as well as the nominal effective exchange rate (NEER). The results suggest that only the policy rate has a significant negative effect on Temasek Holdings' returns, equal to 2%. The small contribution of monetary policy tools may come from other factors. The negative association between Temasek Holdings' returns and price-based monetary policy tools means that any increase in the policy rate will lower Temasek Holdings' returns. This argument might be able to explain the insignificant result of interbank interest rates and

monetary policy tools which are not effective in influencing the shadow banking market since there is a lack of connection between them. For administrative monetary policy tools, results suggest that the elasticity of the policy rate transmits effective changes in monetary policy to retail-market rates.

Alterations in the interbank interest rate have significant positive effects of 2.6% on Temasek Holdings' equity assets under management. This result means that a 1% increase in SIBOR increases equity assets by 1%, which is in line with the argument that Singapore's interbank rate is well-established and effective in influencing inflows into Temasek Holdings' equity assets. On the other hand, this finding cannot be generalised due to data limitations. As a consequence, we are only able to use one asset manager in our sample, even though it is the largest asset management company in Singapore.

6.7   Policy Recommendations

The rapid growth and development of the Singaporean economy has been accompanied by the rapid development of financial technology and activities. The stringent lending regulations in the banking sector have encouraged economic agents to increasingly look to NBFIs because of their accessibility and straightforward credit terms. Therefore, the rapid growth of financial technology would result in more NBFIs and credit intermediation activities. Instead of regarding NBFIs and financial technology as problems in the economy, it is preferable if the monetary authority could build a synergistic relationship between financial insitutitons/intermediaries and shadow banks. Moreover, the authority needs to implement regulations and specific controls for the intermediary activities in shadow banks to avoid systemic economic crises as shadow banking activities in Singapore are quite extensive.