Demystifying FinTech

FinTech Supervision Function

1 Background

In line with the FinTech Supervision function's ('Function') mandate to monitor, understand, and assess the developments and implications of the use of innovative technology and digital transformation occurring within financial services especially within the Maltese Financial Services sector, the Function is currently undertaking a FinTech Adoption Study ('FAS') within the context of the Maltese economy. The main objective of the FAS is to assess the adoption of FinTech locally by (i) identifying the FinTech Service Providers[1] operating in Malta, (ii) understanding the market conditions faced by operators within the space and (iii) understanding the externalities brought about by FinTech and its implications to the wider economy.

The FAS is a seminal study which shall attempt to establish the FinTech population in Malta and subsequently enables the Malta Financial Services Authority ('MFSA' or 'Authority') to set a benchmark for the year ending 2021. Understanding FinTech adoption, market conditions and their externalities enables the MFSA and other policy makers to devise effective policies targeting innovation in technology, positive effects on financial stability, competitiveness, and growth in the financial sector. Additionally, the study may serve as the foundations for future academic research in this space.

That said, a key element which captures the scope of the FAS is the definition. Indeed, the first part of the study presents a literature review pertaining to the definition of digital finance and FinTech, and the latter's implications with a view to (i) assess where our current definition stands when compared to other definitions, and (ii) determine the key characteristics of the definition. The paper also identifies the observed market conditions and externalities which serve as the basis for the questions which will be asked within the FAS questionnaire.

Following this Section, Chapter 2 introduces the literature review. Thereafter, Chapter 3 presents the theory definitions pertaining to digital finance and its interlinkage to FinTech. The definitions of FinTech are explored in Chapter 4 whilst the drivers and externalities are discussed in Chapter 5 and 6, respectively. Chapter 7 presents the main conclusions from literature and the criteria which lay the foundations of the MFSA's definition of FinTech.

[1] The MFSA (2020) Regulatory Sandbox Rule 3 defines a FinTech Service Provider as *"a person who is duly licensed or otherwise authorised to provide or who intends to provide a service/s requiring a licence or other authorisation in terms of applicable financial services legislation currently in force in Malta and who utilises FinTech in its operations"* (MFSA, 2020).

2 Introduction

Since the definition of FinTech is a key element within the scope of the FAS, this insight study titled *'Demystifying FinTech'* presents: (i) an exposition on the FinTech definition, (ii) the generic market conditions faced by FinTech Service Providers, and (iii) their respective externalities on the wider economy. In today's new world of technological developments applied in finance, which is often referred to as the *'FinTech Revolution'*, it is important to understand FinTech and its implications. More than 1 trillion dollars in equity were raised by entities that provide FinTech solutions since the 2008 Great Recession. Notwithstanding the 2019 pandemic, at a global level the FinTech market is estimated to reach the USD 309.98 billion mark in 2022 (Jarvis, 2021).

FinTech and digital finance are not a novel phenomenon (OECD, 2018). Interest only gained momentum early 2015 to stay abreast with emerging technological advances (Deloitte, 2017). The term *'FinTech'* is widely applied but to date there is no common consensus on its definition. This study presents a literature review on the applications of the term *'FinTech'* locally and abroad. Although dynamic, the definition of FinTech applied by the MFSA within Rule 3 of the MFSA Act (Chapter 330 of the Laws of Malta) ('Rule 3') conforms to the latest definition adopted by the European Commission FinTech Action Plan (2018), European Banking Authority (EBA, 2018) and the Financial Stability Board (FSB, 2019). Having a definition of FinTech and an understanding of its underlying characteristics enables the Authority to carry out its regulatory and supervisory functions in an effective manner whilst promoting consumer protection, financial market integrity and financial stability. Also, this helps the Authority in identifying potential risks and their implications coming from emerging technology in finance, following the growing trend in FinTech adoption globally.

To provide an in-depth understanding on FinTech, this insight paper starts by presenting the theory pertaining to digital finance. The latter is more related to well-established digital processes, goods and services when compared to the definition of FinTech, thus happening at a broader scale. Therefore, the concept of digital finance is then narrowed down to shed light on the FinTech definition. As a horizontal phenomenon, FinTech refers to novel offerings that are not already widely adopted which may disrupt the financial sector. Therefore, the definition of FinTech puts more emphasis on technologically-enabled innovation within the financial sphere. To provide a more detailed understanding of FinTech, the study also presents theory surrounding the term *'financial innovation'* because it is deemed as a key component of the FinTech definition.

In order to understand the implications of FinTech, the study also presents the market conditions of FinTech. Since it is common that investment in FinTech is driven by risk-bearing capital, it is important to assess the drivers of FinTech. These are represented by demand and supply side FinTech drivers, including their resulting externalities. FinTech may have positive or negative consequences on financial stability. Therefore, research on the benefits and the risks of FinTech on financial stability and the overall financial system is of great importance.

3 What is Digital Finance?

3.1 Overview

Although there is no comprehensive definition of digital finance, it represents the digitalisation phenomenon happening within the financial sector.[2] The term refers to every electronic product within the financial sector, namely internet banking, mobile application services, and contactless cards, amongst others (Banks, 2001). Another viewpoint to the term digital finance is the utilisation of financial services products that are allowed via technology-enabled devices and the internet (Ozili, 2018).[3] Therefore, as depicted in Figure 3.1, digital finance refers to a broader spectrum of digitalisation when compared to FinTech within the financial sector. The former is more linked to well-established digital processes and products, while the latter refers to novel products and business processes that may disrupt the financial sector and are not already widely adopted. The definition of FinTech puts more focus on technological-enabled innovation or development (Gomber *et al.*, 2017). Every FinTech product is classified under digital finance, but not all digital finance products are classified as FinTech.

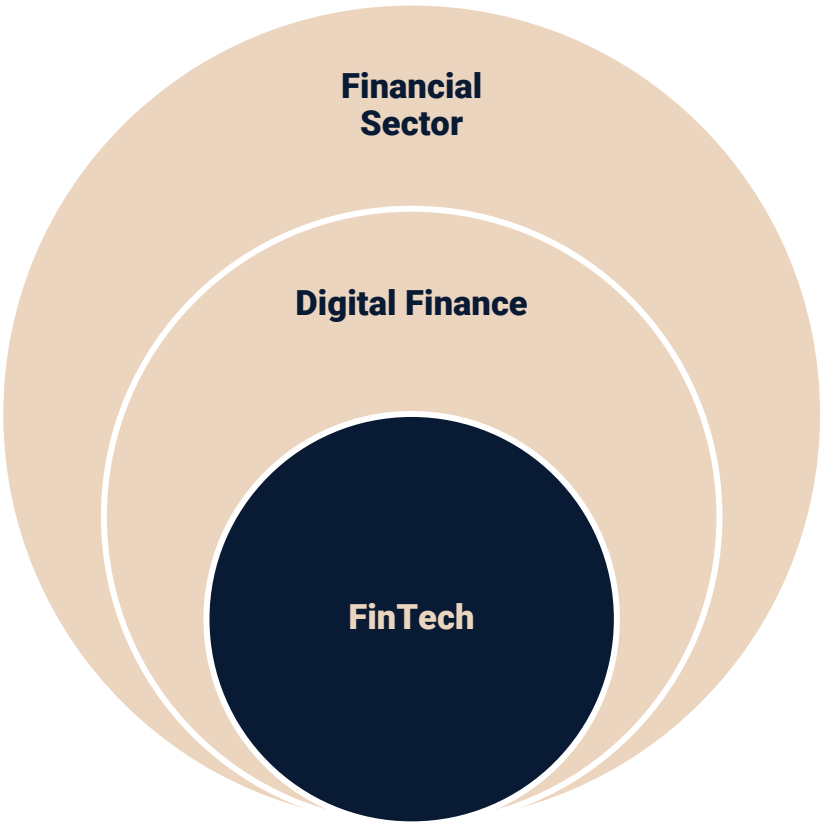

FIGURE 3.1 | FINTECH WITHIN CONTEXT OF THE FINANCIAL SERVICES SECTOR.

[2] The European Commission ('EC') introduced the Digital Finance Package during the third quarter of 2020 with the aim to establish a competitive financial sector across the European Union ('EU'). The Digital Finance Package covers a digital finance strategy, legislative proposals on crypto-assets and digital resilience, and a renewed retail payments strategy (EC, 2020).
[3] Refer to Ozili (2018) for more information on the components of digital financial services.

Zahair (2021) notes that the first Automated Teller Machine ('ATM') in the world was introduced back in 1967, after the switch from analogue to digital finance. Around the 1970s, the first digital stock exchange in the world opened, alongside the Society for Worldwide Interbank Financial Telecommunications ('*SWIFT*').[4] Throughout the 1990s, digital banking started gaining momentum following the introduction of payment service providers, such as PayPal, amongst others (Zahair, 2021). Years later, the onset of the 2008 Great Recession[5] revealed weaknesses in the structure of the banking system and prudential frameworks. In an effort to reform their business strategies and models, banks were faced with increased pressure coming from new competitors that leveraged on technological advancement (Buch and Dages, 2018). Therefore, the global financial crisis served as a catalyst for banks to transform their processes (Imerman and Fabozzi, 2020). This allowed banks to stay abreast with new technology while remaining competitive (Buch and Dages 2018).

Another event that accelerated the adoption of technology-enabled innovation in the financial area is the COVID-19 pandemic. In their study, Fu and Mishra (2021) assess the impact of the COVID-19 pandemic on the adoption of digital finance at a global scale. The authors put forward empirical evidence that the COVID-19 pandemic accelerated the adoption of digital finance. Fu and Mishra (2021) estimate an increase of around 21 to 26 per cent in the daily downloads rates of finance-related mobile applications (Fu and Mishra, 2021). Therefore, the push for digitalising the provision of financial services products and the recent technological advancements helped in expanding digital finance, leading to, amongst others, contactless payments, and the adoption of cryptocurrencies (Zahair, 2021).

3.2 Digital Finance in Malta

Digital finance has also evolved the local financial industry. Figure 3.2[6] portrays an example of digital finance within the Maltese Banking industry.[7] At first glance, it is indicative that technological developments within the local banking industry took place years after the same technology was available abroad. In fact, although the use of traditional ATMs in the world was introduced late back in 1967 (Zahair, 2021), the same ATM technology locally only dates back to a couple of decades ago.

However, there were substantial developments in the local banking sector motivated and enabled by the adoption of innovative technology. From the inception of ATMs, the

[4] Introduced in 1977, SWIFT is a cooperative based in Belgium with the purpose to act as an intermediary between banks globally for cross-border transactions (SWIFT, n.d.).
[5] Numerous publications surround the events that led to the 2008 global financial crisis, also known as *'The Great Recession'* (Grusky *et al.,* 2011; Christiano *et al.*, 2015; Gertlet *et al.,* 2018) and the subsequent lessons learnt from the crisis (Ludwig, 2008; Bordo, 2012).
[6] The timeline is an example that only covers a holistic view of technologically-enabled financial activities with an influence on the banking industry in Malta. Public information on the evolution of digital finance locally is very limited.
[7] It is important to note that within the Maltese financial sector, digital finance did not only occur in the banking industry. Other sub-sectors of the financial sector, such as insurance, also evolved with the adoption of technologically-enabled innovation. The Banking industry was chosen for the example because of its implications within the Maltese financial sector.

introduction of mobile banking, to the installation of the first Bitcoin ATM and supporting virtual cards in Malta, as presented in Figure 3.2.

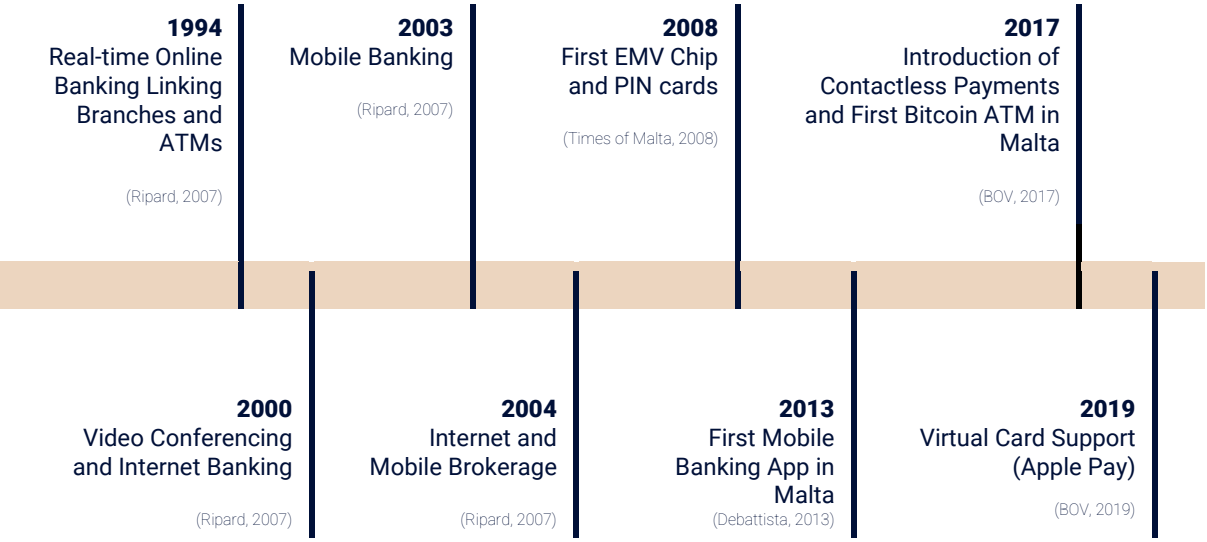

FIGURE 3.2 | TIMELINE EXAMPLE OF TECHNOLOGY-DRIVEN DEVELOPMENTS WITHIN THE MALTESE BANKING SECTOR

With the intention to address innovation in the financial area, Malta strives to establish the foundations allowing entities to develop FinTech solutions with the aim to enhance competition, improving access to financial products and promoting growth in the financial sector while fostering financial stability (PWC, n.d.). The MFSA devised the Virtual Financial Assets ('VFA') framework[8] in 2018 and the MFSA FinTech Regulatory Sandbox[9] in 2020 to encourage innovation and new technologies within the financial services area. The MFSA Strategic Plan 2019-2021 (MFSA, 2021a) draws on the FinTech Strategy[10] (MFSA, 2019), with the intention of Malta becoming an international FinTech Hub (MFSA, 2021a). The MFSA Strategic Plan (MFSA, 2021) aims at supporting and allowing authorised financial services providers to adopt technologically-enabled innovation in products and processes (MFSA, 2021a). The MFSA reiterates its commitment to supporting and promoting FinTech locally in its publication titled *'2022 Supervision Priorities'* (MFSA, 2021b).

[8] For further information on the VFA Act, refer to Chapter 590 of the official laws of Malta (VFA, 2018).
[9] The MFSA FinTech Regulatory Sandbox ('the Sandbox') was introduced to encourage sustainable innovation whilst protecting consumers of financial services. The Sandbox provides a regulatory environment for FinTech operators to test their innovation for a pre-defined period within the financial sector under certain prescribed conditions (MFSA, 2020).
[10] The objective of the MFSA FinTech Strategy (2019) is to promote innovation, better access to financial products, and increase competition while fostering market integrity by allowing FinTech start-ups, information technology entities and authorised financial service providers to create FinTech solutions (MFSA, 2019).

4 What is FinTech?

4.1 Definition of FinTech

Since 2010, entities which offer FinTech solutions internationally raised more than one trillion dollars in equity (Cornelli *et al.*, 2021). Imerman and Fabozzi (2020) describe it as the *'FinTech Revolution'* (Imerman and Fabozzi, 2020). According to Jarvis (2021), in 2018 alone, the global FinTech market reached USD 127 billion. Despite the 2019 pandemic, the global FinTech market is estimated to reach USD 309.98 billion in 2022 (Jarvis, 2021). However, technology-driven innovation in the financial sector is not a novel phenomenon (OECD, 2018). Indeed, FinTech has always existed in parallel with digital finance. Even though FinTech has been around for nearly two decades, interest globally has only spiked early 2015 to keep abreast with emerging technological advances (Deloitte, 2017). Therefore, FinTech has become an important aspect of the global financial industry. This phenomenon promotes further research in the field to gain a deeper understanding of FinTech globally, and within the local context to monitor technological-enabled innovative developments in the financial area.

According to an analysis performed by the Basel Committee (BIS-BCBS, 2018) numerous studies conducted on FinTech across countries do not clearly explain the applied definition of FinTech, albeit having huge implications on the applicability of regulations for markets and financial intermediaries (BIS-BCBS, 2018). To this day, the definition of FinTech allows for different interpretations because of its plurality in classification. Giuseppe *et al.* (2019) state that the common terminology of FinTech refers to a cluster of companies that offer services *"based on new information and digital technologies"* throughout the financial sector. In their study, Arner *et al.* (2015) refer to FinTech as *"the application of technology to finance"* (Arner *et al.,* 2015). Similarly, in its most generic sense, Zetzsche *et al.* (2017) refer to FinTech as *"the use of technology to deliver financial solutions"* (Zetzsche *et al.,* 2017).

In an effort to address the effects of technological innovation in the financial sector, the Bali FinTech Agenda ('BFA'), launched in collaboration between the International Monetary Fund ('IMF') and the World Bank Group ('WBG'), defined FinTech as *"the advances in technology that have the potential to transform the provision of financial services spurring the development of new business models, applications, processes, and products"* (IMF, 2018). In their study titled *'Financial Stability Implications from FinTech'*, the FSB (2017a) classified FinTech activities according to the type of services provided (FSB, 2017a). This classification was based on a 2015 study performed by the World Economic Forum ('WEF') titled *'The Future of Financial Services'* (WEF, 2015). The classification adopted by the WEF (2015) focused at clustering FinTech based on financial market functions. This classification was motivated by consumer demand because technology-based solutions and tools are dynamic, whilst consumer needs remain generally unchanged (WEF, 2015).

To overcome the limitations of the FinTech definition, the OECD (2018) study defines FinTech as *"innovative applications of digital technology for financial services"* (OECD, 2018). The OECD (2018) criticised previous definitions attributed to FinTech provided by the WEF (2015), the US National Economic Council (2017), the FSB (2017b), the International Organisation of

Securities Commissions (IOSCO, 2017), the European Parliament (2016) and the Hong Kong Monetary Authority (HKMA, 2016), arguing that FinTech does not only deal with the application of novel digital technologies to financial services (OECD, 2018). However, it also consists of technological advancement of business models and products that depend on these technologies (OECD, 2017).

The OECD (2018) stresses that it is not enough to categorise the term FinTech based only on the market functions of the financial sector, but it should also be important to consider the technological solutions or tools utilised to provide the financial service. In a more recent study published by the FSB (2019), an updated version of the FinTech definition was adopted, defining FinTech as *"technology-enabled innovation in financial services that could result in new business models, applications, processes or products and could have an associated material effect on financial markets and institutions and how financial services are provided"* (FSB, 2019). A similar version of this definition was also adopted in the European Commission FinTech Action Plan (2018)[11], the European Banking Authority (2018) report on regulatory sandboxes and innovation hubs, and the FinTech Regulatory Sandbox as established under Rule 3.

Giuseppe *et al.* (2019) noted that within the financial sector, FinTech can be perceived to happen at a narrower scale. This puts forward the notion as to why this *"horizontal phenomenon"* happening throughout the financial sector is not classified as a separate industry. However, it is important to distinguish between FinTech Service Providers and other providers that offer technologically-enabled solutions but do not fall under the financial sector.[12] One key difference between FinTech Service Providers and FinTech Suppliers[13] rests with the utilisation of technology during the production processes. For FinTech Service Providers, technology is a productive factor, a tool necessary to provide a financial service within the financial sector. On the other hand, technology for FinTech Suppliers rests with output (Giuseppe et al., 2019). Under the NACE Rev.2, this characteristic distinguishes between the classifications of FinTech Service Providers and FinTech Supplies, such that the former is classified under Financial and Insurance (NACE K) activities and the latter under Information and Communication (NACE J) activities.

Not all international organisations and authorities adopt the exact same definition of FinTech. According to Rupeika-Apoga and Thalassinos (2020), during important international meetings, namely G-20, IMF and WBG, references to FinTech are generally based on the BFA

[11] The aim of the FinTech Action Plan proposed by the EC was to promote integration, safety, and easier access to Europe's financial markets (European Commission, 2018).

[12] There are instances, particularly in the technology industry, where companies offer services and useful application for financial activities but should not be classified as FinTech Service Providers. For instance, FinTech Suppliers who offer services such as digitised identification authentication software and blockchain (Giuseppe *et al., 2019*) that *"could have an associated material effect on financial markets and institutions and how financial services are provided"* (FSB, 2019).

[13] Rule 3 pinpoints that authorisation is another important distinction between FinTech Service Providers and FinTech Suppliers. The former requires authorisation or licensing to provide a service under the local applicable financial service legislation while utilising FinTech in its operations. On the other hand, a FinTech Supplier who intends to provide FinTech solutions does not require any authorisation in terms of any financial services law currently in force in Malta (MFSA, 2020).

(2018) and WEF (2015) publications (Rupeika-Apoga and Thalassinos, 2020). From an overview of the definitions provided by leading international organisations, the authors note that the definitions given to FinTech have two key characteristics. The first characteristic presents the application of novel or innovative technology. The second FinTech characteristic rests with the development of novel or innovative business models, applications, processes, or products based on innovative technology. Rupeika-Apoga and Thalassinos (2020) highlight that the problem lies in identifying which technologies are considered as innovative, and at the same time help to create new business models and product development (Rupeika-Apoga and Thalassinos, 2020).

Within the local context, a similar version to the European Commission FinTech Action Plan (2018), EBA (2018) and FSB (2019) FinTech definition was adopted within the MFSA (2020) FinTech Regulatory Sandbox. Rule 3 presents the definition of FinTech as *"technologically-enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and the provision of financial services"* (MFSA, 2020).

4.2 Role of Financial Innovation

A key component of the FinTech definition is the term *'financial innovation'*. According to Frame and White (2004), financial innovation refers to *"something new that reduces costs, reduces risks, or provides an improved product/service/instrument that better satisfies financial system participants' demands"* (Frame and White, 2004). Tufano (2003) adds that financial innovation includes not only the adoption of novel goods and services, but also the process of research and development of that innovation (Tufano, 2003). Berger *et al.* (2019) summarise the definition of financial innovation as novel or updated financial processes, products and organisational structures that decreases costs and risks to consumers of financial services (Berger *et al.,* 2019).[14]

One of Campbell's (1988) environmental conditions conductive to financial innovation is technology (Campbell, 1988). For instance, Berger *et al.* (2019) makes reference to a past process technology-enabled innovation such as the automated clearing house and a more recent technology-enabled innovation, such as blockchain[15] or distributed ledger technology ('DLT') that somewhat disrupted the financial services area (Berger *et al.,* 2019).[16] The terminology of financial innovation implies the notion that innovative activities require technology, hence the term *'technologically-enabled'* within the MFSA's (2020) definition of FinTech.

[14] For this study, technologically-driven products, processes, structures, or models need to be novel, unique, or exhibit a degree of disruptiveness with an associated material effect on financial markets and the provision on financial services to be considered as FinTech. Novel goods and services, processes, and models can be seen as unique as long as there is a technologically-enabled innovative update or a new product, process, structure, or model at an EU level.
[15] Refer to Nakamoto (2008) for insight on the original white paper of blockchain technology.
[16] It is important to note that when an activity is classified as FinTech, it is not for an indefinite period. The activity remains classified as FinTech as long as it meets the criteria of the FinTech definition.

According to Eurostat (2018), innovation can be approached in several ways. The taxonomy of innovation mainly consists of two types. The first type refers to product innovation. The second type refers to business process innovation. Product innovation describes innovative changes that modifies an entity's product. Business process innovation describes innovative changes that modifies an entity's business process (Eurostat, 2018). The SNA (EC *et al.,* 2009) defines product innovation as *"a new or improved good or service that differs significantly from the firm's previous goods or services* and *that has been introduced on the market"*. In other words, product innovation deals with goods and services (EC *et al.,* 2009).[17]

On the other hand, business process innovation mainly consists of production, distribution, marketing, information and communication systems, administration and management and process development (Eurostat, 2018). Eurostat (2018) defines business process innovation as *"a new or improved business process for one or more business functions that differs significantly from the firm's previous business processes and that has been brought into use in the firm"*.[18] Innovation can potentially involve a mix of product and business process innovations (Eurostat, 2018).

[17] For an explanation on the characteristics of what makes a good and a service, refer to Eurostat (2018).
[18] For more information on the subcategories of business process innovation, refer to Eurostat (2018).

5 FinTech Drivers

Generally, FinTech growth is spurred by risk-bearing capital (Cornelli *et al.*, 2021), and this subsequently motivates research on the drivers underpinning FinTech. De Haan *et al.* (2012) pinpoint that FinTech has three generic and interconnected drivers. Although not exhaustive, Schindler (2017) adds demographics, and macroeconomic and financial landscape changes as drivers to FinTech (Schindler, 2017).

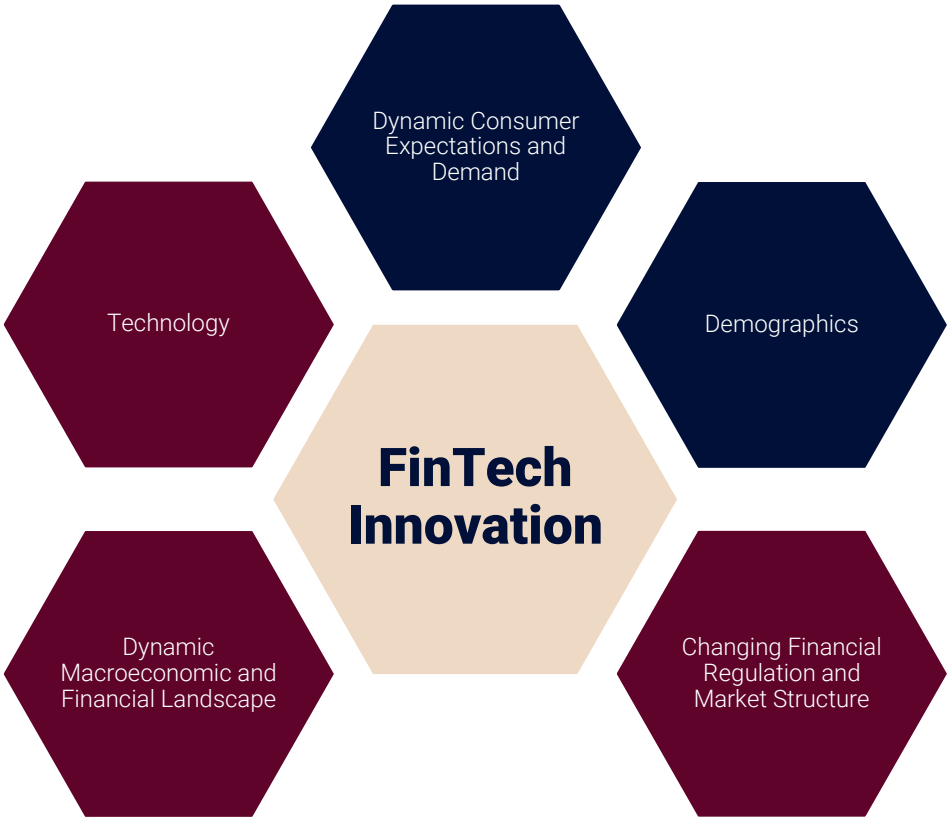

FIGURE 4.1 | MAIN DRIVERS of FinTech
Source: De Haan et al. (2012), Schindler (2017)

Figure 4.1 depicts the interconnectedness between the five main FinTech drivers. The availability of new and innovative technology is key for FinTech, allowing entities to provide new products and process that were not possible before. However, FinTech supply-side drivers will fail with non-existing demand. At the same time, demographic changes fuel FinTech as financial institutions respond to new demand. Due to the complex interconnected web inherent within the financial system, technology-enabled financial innovation may result in exposure to positive and negative externalities (De Haan *et al.,* 2012). Further detail on the five factors identified above are provided in the following Sub-sections.

5.1 Demand-Side

The first demand-driven FinTech driver relates to changing consumer wants and expectations (De Haan *et al.*, 2012). A FinTech product will not be successful in an event where there is no demand for it. At the same time, amongst other factors, consumers expect a cost-effective, and convenient FinTech product.

Schindler (2017) notes that another demand-driven FinTech driver relates to demographics. In his study titled *'FinTech and financial innovation: Drivers and Depth'*, Schindler (2017) pinpoints that the adoption of financial products related to mobile banking and payments were motivated by demographics. A 2016 report conducted by The Federal Reserve ('FED') concludes that as smartphones become more available and adaptable, they grew to become instrumental for interactions between consumers and financial institutions. Also, the FED (2016) survey finds that the younger generation utilise banking services through their smartphones to a higher extent than those aged 60 and over (FED, 2016). In this context, the demand for smartphone usage plays an important role as a motivator for FinTech innovation.

5.2 Supply-Side

The first supply-side FinTech driver relates to evolving technology (De Haan *et al.*, 2012). New technological innovations, such as big data, Artificial Intelligence ('AI'), Machine Learning ('ML') and DLT are evolving and changing the dynamics of business models within the financial services area. At the same time, enhanced connectivity increases accessibility and competition in relation to financial services products (De Haan *et al*., 2012).

The dynamic nature of the macroeconomic and financial landscape is also observed as another supply-side driver to FinTech (Schindler, 2017). For instance, the collapsing housing market during the 2008 Great Recession led to a substantial increase in housing ownership by banks and other financial institutions, ultimately leading to innovation from securitising rental income because of their estate ownership (Yoon, 2013). Banks and other financial institutions provided new financial products which potentially would not have been offered before had the housing market never collapsed (Schindler, 2017). The availability of innovative technology provides financial institutions with the capacity to offer these new products.

The third supply-side FinTech driver relates to evolving financial regulation and market structure (De Haan *et al.*, 2012). Based on a sample of 68 countries between the years 2010 and 2019, Cornelli *et al.* (2021) note that countries with better regulatory quality and enhanced innovation capacity lead to higher capital investment for entities that offer FinTech products. In this regard, Cornelli *et al.* (2021) highlight that regulatory sandbox tend to increase the number of entrants within the FinTech area, noting a statistically significant relationship between regulatory sandboxes and investment in FinTech. In fact, Cornelli *et al.* (2021) find a positive correlation between regulatory quality, the depth of financial markets and innovation capacity (Cornelli *et al.* 2021).

6 FinTech Externalities

6.1 Positive Externalities

FinTech can be observed to benefit or undermine financial stability[19] (FSB, 2017a). Although scarce, more studies are exploring the relationship and trade-offs between FinTech and financial stability (DTCC, 2017; Daud *et al.,* 2021). In a recent study titled *'FinTech and financial stability: Threat or opportunity?'*, the relationship between FinTech and financial stability was assessed for 63 countries utilising a dynamic panel of System Generalised Method of Moments ('GMM') between the years 2006 to 2017.[20] Daud *et al.* (2021) concluded that financial stability is promoted with FinTech adoption via the application of AI, cloud technology[21] and data technology. The authors further pinpoint that the positive effects of FinTech on financial stability are enhanced with higher bank concentration (Daud *et al.,* 2021). However, the Depository Trust and Clearing Corporation ('DTCC')[22] suggested that the implications of a FinTech product on financial stability should be assessed on a case-by-case basis. This is because the application of FinTech solutions cover a wide range of areas, each with unique characteristics and context (DTCC, 2017).

Notwithstanding the impact on financial stability, FinTech can also induce other positive externalities, ranging from protection to consumers, to safeguarding market integrity, increasing competition, and promoting financial inclusion. Additionally, FinTech may encourage the financial sector to become more decentralised and diversified. This in turn may result in reduced barriers to entry for entities providing a FinTech product. The FSB (2017a) report presents an instance where start-ups or small firms may utilise robo-advise[23] together with established entities to reduce fixed costs (FSB, 2017a). Technology-enabled financial innovation such as ML, robo-advise, AI and cloud computing, specifically targeting productivity, can also promote efficiency. These technologies could endorse automation, update current processes, and improve legacy systems. The availability of data decreases information asymmetries, resulting in more transparent processes. This in turn paves the way for new financial products, increasing access to financial services (FSB, 2017a).

[19] Refer to the BIS Working Paper published by Jeanneau (2014) for a discussion on the definition of Financial Stability (Jeanneau, 2014).
[20] It is worth noting that the sample adopted by the study does not include FinTech data on Malta. Therefore, the results omit the contribution of Malta in the FinTech space.
[21] In 2021, the European Banking Federation ('EBF') published a position paper with the aim for regulation on Digital Operational Resilience ('DORA') for the financial sector across Europe (EBF, 2021).
[22] The DTCC is a clearing agency responsible for security custody and book-entry services for securities transactions in the U.S. market (DTCC, 2017).
[23] The FSB (2017a) report defines robo-advisors as *"Applications that combine digital interfaces and algorithms, and can also include machine learning, in order to provide services ranging from automated financial recommendations to contract brokering to portfolio management to their clients. Such advisors may be standalone firms and platforms, or can be in-house applications of incumbent financial institutions."* (FSB, 2017a).

6.2 Negative Externalities

FinTech can also undermine financial stability.[24] On a macro and micro level, FinTech can pose different risks. On a macro level, certain FinTech across time can result in financial instability because they magnify the shocks to the financial system. For instance, established and large entities offering risky FinTech products that suffer significant losses may spread these losses across the financial sector, increasing contagion risk. FinTech lending platforms could also result in procyclicality risk, leading to unexpected increases in non-performing loans. This trend could emerge due to herding algorithms that mimic each other. Herding algorithms could also lead to swings in asset prices. The higher accessibility to financial services products could also make debt easier to access which may promote higher risk-taking. Therefore, macro level risks increase the magnitude of adverse shocks on the financial system (FSB, 2017a).

According to the FSB (2017a), micro level risks can be classified as financial or non-financial risk. FinTech drivers accelerate growth within the financial services area but may leave entities not enough time to adjust their risk appetite. Therefore, entities offering a FinTech product end up underestimating the degree of risk, ending up vulnerable to different forms of financial risk. Micro financial risks could take the form of maturity mismatch, liquidity mismatch and over-leveraging (FSB, 2017a). Maturity mismatch refers to loans with their financing period extended. Liquidity mismatch refers to the liquidity degree of assets and liabilities. Over-leveraging refers to extensive borrowing.

Non-financial risk can take the form of operational risk, which involves governance, cyber and data risks, third-party reliance, and regulatory risk (FSB, 2017a). Governance risk refers to the lack of oversight on entities that provide financial services outside the regulatory perimeter. The lack of oversight or scrutiny on third party providers can be detrimental to the financial system as they grow. Cyber and data risks are also a threat to the financial system as the systems of financial institutions become more interconnected. A system vulnerability could end up disrupting other financial institutions which in turn have adverse effects on the financial system. The same applies for third-party reliance in cloud technology[25]. A disruption in the service could have negative implications and ripple effects on cloud-based financial systems (FSB, 2017a). Data breaches could also disrupt financial institutions due to financial losses, reputational damage, operational downtime, legal action, and loss of sensitive data. In situations where FinTech products are not covered by established legislation due to their novel solution, existing regulatory frameworks would require review.

[24] Currently there are no studies locally which quantitively suggest that FinTech negatively influences financial stability.
[25] In 2021 a position paper highlighting the requirements for standardisation of compliant application of public cloud technology in the EU was published (ECUC, 2021).

7 Conclusion

This paper presents the theory surrounding FinTech, initially introducing literature surrounding digital finance, narrowing it down to the definition of FinTech, the common market conditions faced by FinTech Service Providers and their respective externalities on the wider economy. Compared to FinTech, digital finance is observed to happen at a wider scale. Digital financial is more related to well-established digital processes and products, while FinTech refers to novel solutions that are not already widely adopted, which may disrupt the financial sector.

Due to technological developments happening in finance and the growing trends in the area of FinTech, it is important to keep abreast with these innovations whilst understanding the potential benefits and risks from these solutions. Such benefits include (i) enhanced financial stability with the application of AI, cloud and data technology, (ii) consumer and investor protection, (iii) safeguarding market integrity, (iv) higher degree of market inclusion, (v) increased market competition, (vi) greater level of efficiency and (vii) lower entry barriers motivated by a more decentralised and diversified financial sector.

Notwithstanding the benefits of FinTech adoption, it may also present micro and macro risks to the financial system. From a macroeconomic standpoint, since generally FinTech offerings are driven by risk-bearing capital, shocks to the financial system may be magnified. From a microeconomic standpoint, FinTech drivers may accelerate growth such that entities offering FinTech products or processes may not have enough time to adjust their risk appetite. This leads to financial risk, namely maturity mismatch, liquidity mismatch and over-leveraging. At the same time, FinTech adoption may also result in non-financial risks, namely, governance, cybersecurity, third-party reliance, and regulatory. However, provided the unique characteristics and context of every FinTech offering, the DTCC (2017) stresses that their consequent effects on financial stability should be evaluated on a case-by-case basis.

The concept of FinTech is not novel (OECD, 2018). Rather, it gained popularity only recently (Deloitte, 2017). This study covers the theory surrounding the FinTech definition both within a local and foreign context. Notwithstanding the dynamic nature of the FinTech definition, according to the Rule 3, the Authority defines FinTech as *"technologically-enabled financial innovation that could result in new business models, applications, processes or products with an associated material effect on financial markets and the provision of financial services"* (MFSA, 2020). This definition is similar to that adopted by the European Commission FinTech Action Plan (2018), EBA (2018) and FSB (2019).

Building on the literature surrounding FinTech and its definition, this insight paper presents the characteristics that define FinTech. In order to classify as FinTech, a solution should: (i) provide, create, or support the provision of financial products or processes, (ii) rely fully or partially on novel or emerging technology, (iii) be new, unique or disruptive, and (iv) provide identifiable value added by addressing an issue or bring benefits to the consumers or the financial sector. In this regard, having one definition of FinTech enables the Authority to be aligned and clearly lay the foundations for embracing the financial services of tomorrow whilst ensuring consumer protection, financial market integrity and financial stability.

8 References

Arner, D.W., Barberis, J. and Buckley, R.P. (2015). *The evolution of Fintech: A new post-crisis paradigm*. *Geo. J. Int'l L.*, *47*, p.1271.

Banks, E. (2001) *e-Finance: the electronic revolution*, 1st edn. Wiley, Chichester

Berger, A., Molyneux, P. and Wilson, J. (2019). *The Oxford Handbook of Banking*. 3rd ed. *Oxford University Press*.

BIS-BCBS (2018), *Sound Practices. Implications of fintech developments for banks and bank supervisors, Basel Committee on Banking Supervision* – BIS February 2018, http://www.bis.org/bcbs/publ/d431.pdf

Bordo, M., & James, H. (2012). *The Great Depression and the Great Recession: what have we learnt?*. Fourth PR Brahmananda Memorial Lecture in Mumbai. Reserve Bank of India.

BOV. (2017). BOV cards become contactless. Retrieved 22 March 2022, from https://www.bov.com/news/bov-cards-become-contactless

BOV. (2019). Apple Pay. Retrieved 22 March 2022, from https://www.bov.com/content/apple-pay

Buch, C. and Dages, B.G. (2018). *Structural changes in banking after the crisis. CGFS Papers, 60.*

Campbell, T. S. (1988). *Money and Capital Markets* (Glenview, IL: Scott, Foresman).

Christiano, L. J., Eichenbaum, M. S., & Trabandt, M. (2015). *Understanding the great recession. American Economic Journal:* Macroeconomics, 7(1), 110-67.

Cornelli, G., Doerr, S., Franco, L., & Frost, J. (2021). Funding for fintechs: patterns and drivers.

Daud, S. N. M., Khalid, A., & Azman-Saini, W. N. W. (2021). FINTECH AND FINANCIAL STABILITY: THREAT OR OPPORTUNITY?. *Finance Research Letters*, 102667.

De Haan, J., Oosterloo, S., & Schoenmaker, D. (2012). Financial Markets and Institutions. *Cambridge University Press Textbooks.*

Debattista, M. (2013). A year of successful mobile banking. Retrieved 22 March 2022, from https://timesofmalta.com/articles/view/A-year-of-successful-mobile-banking.467997

Deloitte (2017). *Fintech by the numbers*. [online] Deloitte Turkey. Available at: <https://www2.deloitte.com/tr/en/pages/financial-services/articles/fintech-by-the-numbers.html> [Accessed 12 January 2022].

DTCC, 2017. *Fintech And Financial Stability Exploring How Technological Innovations Could Impact The Safety & Security Of Global Markets*. [online] Dtcc.com. Available at: <https://www.dtcc.com/-/media/Files/PDFs/Fintech-and-Financial-Stability.pdf> [Accessed 31 January 2022].

EBF, 2021. *EBF Position Paper on the European Commission's proposal for a Regulation on digital operational resilience for the financial sector (DORA)*. [online] European Banking Federation. Available at: <https://www.ebf.eu/wp-content/uploads/2021/05/EBF-Position-Paper_DORA.pdf> [Accessed 2 February 2022].

EC (2009), *System of National Accounts 2008*, United Nations, New York, https://unstats.un.org/unsd/nationalaccount/docs/sna2008.pdf.

EC (2020). *Digital finance package*. [online] European Commission - European Commission. Available at: <https://ec.europa.eu/info/publications/200924-digital-finance-proposals_en> [Accessed 4 January 2022].

ECUC, 2021. *Requirements for standardisation of compliant use of public cloud technology in regulated European financial institutions*. [online] Ecuc.group. Available at: <https://ecuc.group/papers/ecuc_position_paper_may_2021.pdf> [Accessed 2 February 2022].

European Banking Authority (2018). *Report FinTech: Regulatory sandboxes and innovation hubs*. [online] Eba.europa.eu. Available at: <https://www.eba.europa.eu/sites/default/documents/files/documents/10180/2545547/154a7ccb-06de-4514-a1e3-0d063b5edb46/JC%202018%2074%20Joint%20Report%20on%20Regulatory%20Sandboxes%20and%20Innovation%20Hubs.pdf> [Accessed 11 January 2022].

European Commission (2018). Communication From The Commission To The European Parliament, The Council, The European Central Bank, The European Economic And Social Committee And The Committee Of The Regions - FinTech Action plan: For a more competitive and innovative European financial sector. [online] Eur-lex.europa.eu. Available at: <https://eur-lex.europa.eu/resource.html?uri=cellar:6793c578-22e6-11e8-ac73-01aa75ed71a1.0001.02/DOC_1&format=PDF> [Accessed 10 January 2022].

European Parliament (2016). DRAFT REPORT on FinTech: the influence of technology on the future of the financial sector (2016/2243(INI)). [online] Europarl.europa.eu. Available at: <https://www.europarl.europa.eu/doceo/document/ECON-PR-597523_EN.pdf?redirect> [Accessed 7 January 2022].

Eurostat (2018), Oslo Manual 2018: *Guidelines for Collecting, Reporting and Using Data on Innovation*, 4th Edition, *The Measurement of Scientific, Technological and Innovation Activities*, OECD Publishing, Paris/Eurostat, Luxembourg, https://doi.org/10.1787/9789264304604-en.

FED. (2016). Consumers and Mobile Financial Services 2016. Retrieved 11 February 2022, from https://www.federalreserve.gov/econresdata/consumers-and-mobile-financial-services-report-201603.pdf

Frame, W. S. and White, L. J. (2004). *"Empirical Studies of Financial Innovation: Lots of Talk, Little Action?" Journal of Economic Literature*, 42(1), 116–44

FSB (2017a). *Financial Stability Implications from FinTech*

FSB (2017b). *FinTech Issues Group Interim Report* [SCAV/2017/11-REV/PLEN/2017/25].

FSB (2019). *FinTech and market structure in financial services: Market developments and potential financial stability implications* - Financial Stability Board.

Fu, J., & Mishra, M. (2021). *Fintech in the time of COVID-19: Trust and technological adoption during crises.* Swiss Finance Institute Research Paper, (20-38).

Gertler, M., & Gilchrist, S. (2018). *What happened: Financial factors in the great recession. Journal of Economic Perspectives*, 32(3), 3-30.

Giuseppe, D.A., Munafò, P., Schena, C., Tanda, A., Arlotta, C. and Potenza, G. (2019). *The development of fintech. Opportunities and risks for the financial industry in the digital age-With preface to the series dedicated to fintech. Opportunities and Risks for the Financial Industry in the Digital Age-With Preface to the Series Dedicated to FinTech (March 15, 2018). CONSOB FinTech papers*, (1).

Gomber, P., Koch, J.A. and Siering, M. (2017). *Digital Finance and FinTech: current research and future research directions. Journal of Business Economics*, 87(5), pp.537-580.

Grusky, D. B., Western, B., & Wimer, C. (Eds.). (2011). *The great recession*. Russell Sage Foundation.

HKMA (2016). *Whitepaper On Distributed Ledger Technology*. [online] Hkma.gov.hk. Available at: <https://www.hkma.gov.hk/media/eng/doc/key-functions/finanical-infrastructure/Whitepaper_On_Distributed_Ledger_Technology.pdf> [Accessed 14 January 2022].

Imerman, M.B. and Fabozzi, F.J. (2020). *Cashing in on innovation: a taxonomy of FinTech. Journal of Asset Management*, 21(3), pp.167-177.

IMF (2018). *The Bali Fintech Agenda*. IMF Policy Paper, (October), 43.

IOSCO (2017). *IOSCO Research Report on Financial Technologies* (Fintech). [online] Iosco.org. Available at: <https://www.iosco.org/library/pubdocs/pdf/IOSCOPD554.pdf> [Accessed 7 January 2022].

Jarvis, D. (2021). *Four fintech trends to watch in 2022 and beyond* - FinTech Futures. [online] FinTech Futures. Available at: <https://www.fintechfutures.com/2021/12/four-fintech-trends-to-watch-in-2022-and-beyond/> [Accessed 11 January 2022].

Jeanneau, S. (2014). Financial Stability Objectives and Arrangements–What's New?. *BIS Paper*, (76e).

Ludwig, E. A. (2008). *Lessons Learned from the 2008 Financial Crisis*. Group of Thirty.

MFSA (2019). *MFSA FinTech Strategy*. [online] Mfsa.mt. Available at: <https://www.mfsa.mt/wp-content/uploads/2019/07/MFSA-Fintech-Strategy.pdf> [Accessed 19 January 2022].

MFSA (2020). *MFSA Rule 3: The MFSA FinTech Regulatory Sandbox*. The Malta Financial Services Authority.

MFSA (2021a). *MFSA Strategic Plan 2019-2021*. [online] Mfsa.mt. Available at: <https://www.mfsa.mt/wp-content/uploads/2019/09/MFSA-Strategic-Plan.pdf> [Accessed 19 January 2022].

MFSA (2021b). *MFSA Supervision Priorities 2022.* [online] Mfsa.mt. Available at: <https://www.mfsa.mt/wp-content/uploads/2021/12/MFSA-Supervision-Priorities-2022.pdf> [Accessed 19 January 2022].

Nakamoto, S. (2008). *"Bitcoin: A Peer-to-Peer Electronic Cash System,"* available at: https://bitcoin.org/bitcoin.pdf.

OECD (2017), *OECD Digital Economy Outlook 2017*, OECD Publishing, Paris, https://doi.org/10.1787/9789264276284-en.

OECD (2018). *Financial markets, insurance and private pensions: Digitalisation and finance.*

Ozili, P. K. (2018). *Impact of digital finance on financial inclusion and stability*. Borsa Istanbul Review, 18(4), 329-340.

PWC, n.d. *What does FinTech mean for financial services organisations: innovation, disruption, opportunity - or all of them?*. [online] PWC. Available at: <https://www.pwc.com/mt/en/sectors/fintech.html> [Accessed 19 January 2022].

Ripard, J. (2007). Internet banking as popular as the ATM. Retrieved 22 March 2022, from https://timesofmalta.com/articles/view/internet-banking-as-popular-as-the-atm.187584

Rupeika-Apoga, R. and Thalassinos, E.I. (2020). *Ideas for a regulatory definition of FinTech*.

Schindler, J. W. (2017). FinTech and financial innovation: Drivers and depth.

SWIFT (n.d.). *SWIFT history*. [online] SWIFT. Available at: <https://www.swift.com/about-us/history> [Accessed 12 January 2022].

Times of Malta. (2008). BOV issues first EMV chip card. Retrieved 22 March 2022, from https://timesofmalta.com/articles/view/bov-issues-first-emv-chip-card.210762#:~:text=Bank%20of%20Valletta%20said%20yesterday,EMV%20chip%20and%20Pin%20cards

Tufano, P. (2003). *"Financial Innovation,"* in G. M. Constantinides, M. Harris, and R. Stulz, (eds.), Handbook of the Economics of Finance: Vol. 1A Corporate Finance (Amsterdam: North-Holland), 307–35.

US National Economic Council (2017). *A Framework For FinTech*. [online] Obamawhitehouse.archives.gov. Available at: <https://obamawhitehouse.archives.gov/sites/obamawhitehouse.archives.gov/files/documents/A%20Framework%20for%20FinTech%20_FINAL.pdf> [Accessed 7 January 2022].

VFA (2018). *Virtual Financial Assets Act*. [online] LEĠIŻLAZZJONI MALTA. Available at: <https://legislation.mt/eli/cap/590/eng/pdf> [Accessed 19 January 2022].

WEF (2015). *The Future of Financial Services - How disruptive innovations are reshaping the way financial services are structured, provisioned and consumed*. WEF, (June), 1-178.

Yoon, A. (2013). Blackstone Tries Bond Backed by Home-Rental Income. Retrieved 11 February 2022, from https://www.wsj.com/articles/SB10001424052702303843104579170020082914900

Zahair, A. (2021). *The History of Finance and What the Digital Future Holds - Wealth and Finance International. [online] Wealth and Finance International.* Available at: <https://www.wealthandfinance-news.com/the-history-of-finance-and-what-the-digital-future-holds/> [Accessed 12 January 2022].