The FinTech Market in Germany

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written in collaboration with
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Executive Summary

In this study, conducted on behalf of the Federal Ministry of Finance, we provide the first comprehensive analysis of the German FinTech industry. We quantify the market volume of the industry between 2007 and 2015. On the basis of this data, we also predict the future development of eight segments of the FinTech market, offering detailed forecasts for the years 2020, 2025, and 2035. The most important results of the study are:

- A total of 433 FinTech businesses with operations in Germany were identified; 346 of those are active. The other 87 businesses either did not begin their operations before 2016 or else are no longer active.
- A general definition of "FinTech" is not possible. For this reason, we defined various subsections of the market. Our study focuses particularly on financing and wealth management segments. These segments include web portals for such activities as crowdlending, crowdinvesting, social trading, and robo-advice.
- In 2015, the total market volume of FinTech businesses in Germany in the financing and wealth management segments was 2.2 billion EUR. A significant part of the financing segment is crowdfunding (270 million EUR). Wealth management is dominated by social trading and robo-advice platforms (360 million EUR).
- FinTechs in the payment solutions market had a transaction volume of 17 billion EUR.
- Approximately 1.2 million Germans used independent personal financial management systems to manage their personal finances in 2015.
- Almost all FinTech segments observed very high growth rates in recent years. The robo-advice market recorded the largest compound annual growth rate, and its market share grew almost tenfold between 2007 and 2015. However, the social trading and crowdinvesting segments also had compound annual growth rates in triple digits.
- We estimate the total volume of the potential addressable markets of the financing and wealth management segments in Germany to equal almost 1.7 trillion EUR in 2015. This figure comprises a market volume of approximately 380 billion EUR for the financing sector and about 1.3 trillion EUR for the wealth management sector. In a real case scenario, we forecast growth in the total market volume of FinTechs of approximately 58 billion EUR in the year 2020 and 97 billion EUR in 2025. In 2035 the market could realistically reach a volume of up to 148 billion EUR.

- Almost 87% of the surveyed financial institutions currently cooperate with a FinTech business and strive for cooperation with or a participation in a FinTech business in the future.
- The FinTech industry does not currently represent a systemic risk to the German economy. However, if the dynamic growth of the FinTech industry is to continue and its huge potential for growth is realized, systemic risks might arise.
- After the UK, Germany is the second largest FinTech market in Europe. Internationally, Germany is rapidly catching up.

FinTech is a very fast-moving and dynamic industry, in which there is a multitude of different business models. As with other industries having a large share of start-up companies, it is assumed that not all of the recent innovations in the existing market are viable. However, the future undoubtedly holds new ideas and business models that will serve to replace the companies that should vanish in the future.

In this study, then, we provide a comprehensive overview of current trends and the drivers of growth that have affected the FinTech industry in the past, as well as the factors that could spur and hinder growth within it in the future.

About the Authors

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Table of Contents

I. List of Figures

II. List of Tables

1 Introduction

The Internet and digitization have already turned many elements of the economy upside down. The financial sector is no exception. In recent years "FinTechs"—i.e. businesses that use innovative technologies to provide financial services—have attempted to inaugurate a financial revolution.

The FinTech industry is very dynamic and fast moving. With every year more and more companies are entering the market with innovative business models. However, as with start-ups in other industries, FinTech companies often fail after a short time. In order to assess the importance of FinTechs for the financial sector and for the economy as a whole, it is necessary to consider comprehensive data regarding market size and market structure. Such data for the German market has not previously been made available. This study, conducted on behalf of the Federal Ministry of Finance, accordingly presents the results of empirical research on the German FinTech industry between 2007 and the end of 2015. In addition, there is a forecast of how the market will develop in the next five, ten, and twenty years. The study thus provides the first comprehensive analysis of both the past history and the future development of the German FinTech industry.

Given the risks commonly associated with the FinTech industry, an investigation of its market size and market potential is of great importance. With their innovative business models, FinTechs can help to reduce the funding gaps of small and medium-sized enterprises (SMEs) in Europe. It is a challenge for many companies to secure adequate funding for investment and growth, especially since the advent of Basel II and Basel III. On average, the cost of borrowing has increased for SMEs as a result of the implementation of Basel II (Müller et al., 2011; Schindele and Szczesny, 2015).[1] With the planned Capital Markets Union, the European Commission seeks not only to facilitate SMEs' access to capital, but also to increase investment flows throughout Europe. FinTechs could play an important role in this endeavor. The European Commission (2015a; 2015b; 2016) has recently announced its intention to revise the Prospectus Directive and to support FinTechs that offer crowdfunding solutions for financing projects and businesses.

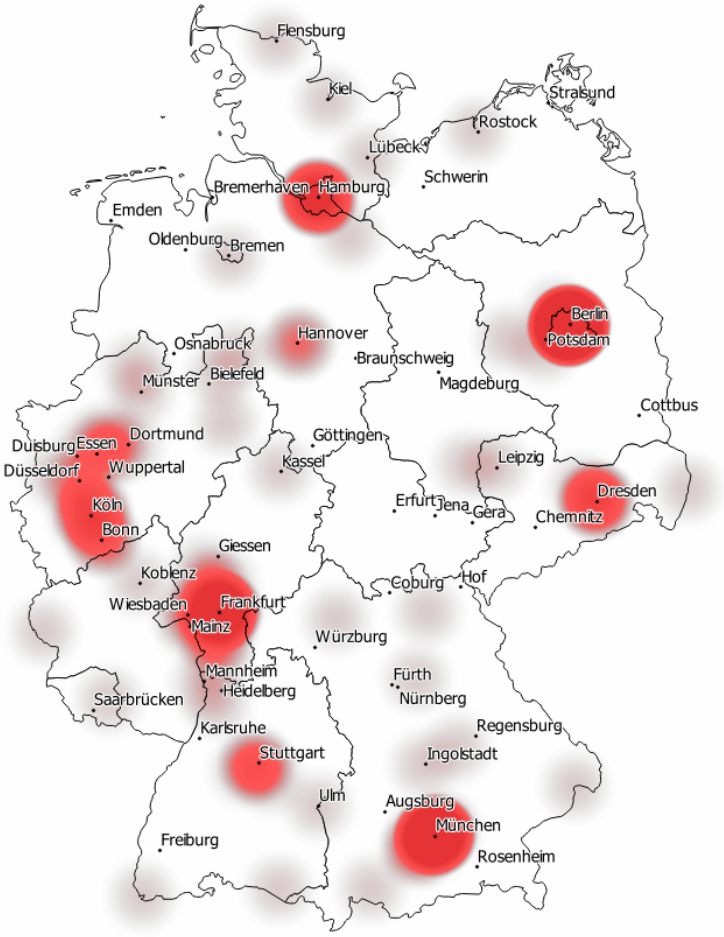
[1] As part of the implementation of Basel III, an SME correction factor was introduced in the Capital Adequacy Directive and its corresponding Capital Adequacy Regulation to compensate for the higher capital requirements for banks for SME loans (EBA, 2016).

The expansion of the FinTech industry is also associated with certain risks. In order better to assess the risks posed by FinTech and its possible systemic penetration of the finance industry, reliable figures regarding its market size in Germany are essential. The data collected in this study can aid in such analysis.

This study of the FinTech market in Germany begins with the definition of "FinTech" and the identification of relevant segments of the industry. There is then a description of the methodology used to determine the current size of the German FinTech market. Data collection and the calculation of the relevant market volumes are particularly important. The current state of the FinTech market in Germany is established on this basis. In February 2016, a total of 433 FinTech companies offering products and services in Germany were identified. The German FinTech market thus ranks in second place behind the UK within Europe (Haddad and Hornuf, 2016). Figure 1 shows the geographic distribution of these FinTech businesses. The map shows that there are numerous concentrations of FinTech businesses throughout Germany. Particularly in Berlin, Munich, Frankfurt und Hamburg,[2] there are already numerous companies that combine innovative technologies with financial services.

[2] The order is based on the number of established FinTech companies in each region.

Figure 1: Geographic Distribution of German FinTech Companies



Estimates are provided for the market sizes of the individual segments and the overall market level. The most important drivers of growth and the development of individual segments are described. Finally, there is a forecast of the market volume of the FinTech industry for the next five, ten, and twenty years. The market sizes of the respective segments are determined by means of potential addressable markets. The study represents three possible outcomes by describing real case, optimistic, and pessimistic scenarios.

2 Definition of FinTech and Description of the FinTech Industry

Currently there is not a universally accepted definition of the term "FinTech." The following section provides a brief survey of its use within existing scholarly literature. A definition is formed by means of a general description of the characteristics of FinTechs and an enumeration of the individual segments that make up the FinTech market.

2.1 Definition of FinTech

The term "FinTech," which is the short form of the phrase *Financial Technology*, denotes companies or representatives of companies that combine financial services with modern, innovative technologies.[3] As a rule, new participants in the market offer Internet-based and application-oriented products. FinTechs generally aim to attract customers with products and services that are more user-friendly, efficient, transparent, and automated. Traditional banks have not yet exhausted the possibilities for improvements along these lines (EBF, 2015; Mackenzie, 2015).

In addition to offering products and services in the banking sector, there are also FinTechs that distribute insurance and other financial instruments or provide third-party services. In a generous sense of the term, "FinTech" encompasses companies that simply provide the technology (such as software solutions) to financial service providers. However, such companies are not dealt with in detail in this study.

It is not possible to define the term "Fintech" on the basis of its use in legislation or legal documents. FinTech companies are subject to differing kinds of legal and regulatory obligations due to their highly various business models and the extremely diverse products and services they offer. Thus companies in the crowdinvesting industry that offer profit-participating loans, non-securitized participation rights or silent partnerships to secure corporate financing fall under the scope of German Investment Act (Companisto and Seedmatch, for example). However, issuers on the same crowdinvesting platforms are subject to the Securities Trading Act if

[3] Kawai (2016), General Secretary of the International Association of Insurance Supervisors, a member organization of the Financial Stability Board, offers a working definition of "FinTech" as follows: it is a "technologically enabled financial innovation. It is giving rise to new business models, applications, processes and products. These could have a material effect on financial markets and institutions and the provision of financial services."

shares are sold to the crowd (for example, the earlier business model employed by Bergfürst) (Klöhn and Hornuf, 2012).

In the end, it is not possible to construct a restrictive definition of "FinTech" that applies to all of the entities traditionally associated with the term. While most companies in the FinTech industry have certain features in common, there are always enough exceptions to render them inadequate for producing a general definition. For example, many of the FinTech companies are in their start-up phase. However, since not all FinTech companies are start-ups, this category cannot be an essential part of a FinTech definition. The same applies to the participation of a large number of investors in a funding opportunity (the "crowd") or the use of social-media components. Although these two features are integral to the operation of many segments of the FinTech industry, such as in crowdfunding or social trading, there are others, such as innovative payment services, where they have no importance at all. For this reason, rather than trying to provide a restricted or legal definition, the following section will provide a summary of the various major segments of the FinTech industry.

2.2 Segments of the FinTech Industry

Companies in the FinTech industry can be divided into four major segments in accordance with their distinctive business models. By analogy with traditional value-adding areas of a universal bank, FinTechs can be distinguished on the basis of their involvement in *financing, asset management,* and *payment transactions*, as well as *other FinTechs*, a loose assortment of companies that perform other functions. Figure 2 illustrates this categorization and provides a detailed representation of the subsegments of the industry. In what follows, the subsegments are described in greater detail. Their market volumes will be estimated in chapter 4.

The finance sector includes a FinTech segment that makes financing available for both private individuals and for businesses. This segment can be further divided into FinTechs whose offerings are based on the participation of a large number of contributors (the *crowdfunding* subsegment) and those that offer factoring services or credit without the participation of the crowd (the *credit and factoring* subsegment).

Crowdfunding describes a form of financing in which a large number of contributors (often called "backers") provide the financial resources to achieve a common goal. In the place of a traditional bank, a crowdfunding portal acts as intermediary (Belleflamme et al., 2014, Klöhn and Hornuf, 2012). Crowdfunding portals can be subdivided into four further subsegments on

the basis of the kind of consideration given to investors for their investments. While investors participating in *donation-based crowdfunding* receive no remuneration for their contributions (though they may derive indirect personal benefits through the act of donation; Andreoni, 1989), in *rewards-based crowdfunding* they receive some form of non-monetary consideration. Such consideration can take the form of the right to pre-order a product or some other form of prestige, such as having the investor's name included in the credits of a funded film (Bradford, 2012). Generally, there are no costs to individuals for initiating projects in the rewards-based and donation-based crowdfunding subsegments. Some portals charge a fee of between 5% and 11% of the total amount of funding in the case of a successful campaign. Other portals gain revenue through voluntary donations from investors and the initiators of the projects.[4]

In the third subsegment, *crowdinvesting*, investors receive a share of equity, debt or hybrid ownership. The contracts used in crowdinvesting often simulate certain aspects of equity participation using a mezzanine instrument (Klöhn et al., 2016a). As a rule, crowdinvesting portals profit from the fees they receive from successfully financed companies. In Germany, this fee is 8% of the financed amount on average (Hornuf and Schwienbacher, 2014). Recently crowdinvesting portals have also gained revenue from the future success of financed companies by requiring investors to deduct a certain share of a company's potential profits, its enterprise value and exit proceeds (carried interest) (Klöhn et al., 2016a).[5] Generally speaking, portals handle relatively small sums in crowdinvesting campaigns. Klöhn et al. (2016b) show that by the middle of 2015 amounts of more than 1 million EUR had been collected from only five of the 174 crowdinvesting campaigns that had taken place in Germany by that date. However, these five successful campaigns correspond to 29% of the total volume of financing from successful campaigns.

The fourth subsegment, *crowdlending,* contains platforms that enable private individuals and businesses to secure loans from the crowd. In return for the provision of the loan, investors receive a pre-determined interest rate (Bradford, 2012). In Germany, the market leaders in the crowdlending industry are financed by two types of fees. On the one hand, borrowers are charged a fee that depends on their creditworthiness and the duration of the loan. On the other

[4] For example, the crowdfunding platform Startnext financed itself through voluntary contributions.

[5] In accordance with the "Pooling and Carry Agreement" used by Companisto, the platform currently receives 10% of all proceeds distributed to investors, with the exception of proceeds from the loan and from the fixed interest payment.

hand, lenders are required to pay a certain percentage of the amount invested (often 1%) or one percentage point of the interest rate.

In addition there is the *credit and factoring* subsegment. FinTech businesses in this subsegment, generally in cooperation with a partner bank (or else a number of partner banks), extend credit to private individuals and businesses without recourse to the crowd. Loans are sometimes given over short-term periods of a few days or weeks via mobile phone. In addition, these FinTechs offer innovative factoring solutions, such as selling claims online or offering factoring solutions without a minimum requirement. As a rule, companies in the credit and factoring subsegment automate many of their processes, thereby enabling cost-effective, fast and efficient services.

The *asset management* segment includes FinTechs that offer advice, disposal and management of assets, and aggregated indactors of personal wealth. This segment is also divided into further subsegments. *Social trading* is a form of investment in which investors (or "followers") can observe, discuss, and copy the investment strategies or portfolios of other members of a social network (Liu et al., 2014; Pentland, 2013). Individual investors are supposed to benefit from the collective wisdom of a large number of traders. Depending on the business model of a social trading platform, users can be charged for spreads, order costs, or percentages of the amount invested.

In addition, innovative software solutions and computer systems play an important role in the business models of many FinTechs in the asset management segment. The *robo-advice* subsegement refers to portfolio management systems that provide algorithm-based and largely automated investment advice, sometimes also making investment decisions (ESA, 2015). Robo advisers' algorithms are generally based on passive investing and diversification strategies (Sironi, 2016). They consider the investor's risk tolerance, the preferred duration of the investment, as well as other goals (Fein, 2015). The German Federal Financial Supervisory Authority (*Bundesanstalt für Finanzdienstleistungsaufsicht – BaFin*) (BaFin, 2016a; 2016b) also distinguishes between "automated investment advice," in which a one-off investment recommendation is given, and "automated financial portfolio management," which is characterized by ongoing recommendations. Since these two services often overlap, they are conflated in this study. Robo advice providers are often financed by a fee withheld from investors that is proportionate to the sum of their investment. A performance-dependent fee is also charged.

The *personal financial management (PFM)* subsegment includes FinTech companies that offer private financial planning, in particular the administration and presentation of financial

data using software or app-based services. PFMs enable clients to visualize the assets they have deposited with different financial institutions as well as loans borrowed from different lenders in one application. The app or software often requires a one-off or annual fee from users. In order to integrate the accounts of different providers into a PFM system, PFMs interface with the portals of financial institutions, which are frequently open-access, using application programming interface (API) technology (Glushko et al., 1999, Dapp, 2015, Nienaber, 2016). In many PFM systems, however, manual entry of the account data is also required.

There are also FinTech companies that offer innovative concepts for advising or managing assets that cannot be included in the social trading, robo-advice or PFM subsegments. These may be organized into two main groups. First, there is online-based asset management, in which human investment advisors actively interact with customers, though as with robo-advice they also automate or partially automate many processes. Secondly, there are deposit brokers, which arrange daily or fixed-term deposits in other EU countries and offer the opening of accounts as well as management on a German website. As a result of the EU-wide deposit guarantee scheme (Directive 2014/49 / EU), using this business model it is possible to exploit interest rates from different countries. These FinTechs are included in the *investment and banking* subsegment. Also included in this subsegment are FinTechs that offer traditional banking products, such as a cash account with certain IT functionalities. By making efficient use of technologies and by abandoning cumbersome branch networks, these FinTechs can offer traditional banking products more cost-effectively and quickly, as well as more user-friendly functionalities.

The *payments* segment is an umbrella term that applies to FinTechs whose applications and services concern national and international payment transactions. Under this umbrella is included the *blockchain and cryptocurrency* subsegment, which includes FinTechs that offer virtual currencies (cryptocurrency) as an alternative to typical fiat money. As with legal means of payment, it is possible to save, use, and exchange cryptocurrencies (BaFin, 2016c). Banks are not needed to serve as intermediaries. One of the best-known cryptocurrencies is Bitcoin. Bitcoin, which has undergone large fluctuations in value in the past,[6] has not yet been able to establish itself as a serious competitor with official currencies issued by central banks. There are more than 700 other virtual currencies that have not yet reached the level of market capitalization of Bitcoin (CoinMarketCap, 2016). As with most other digital payment sys-

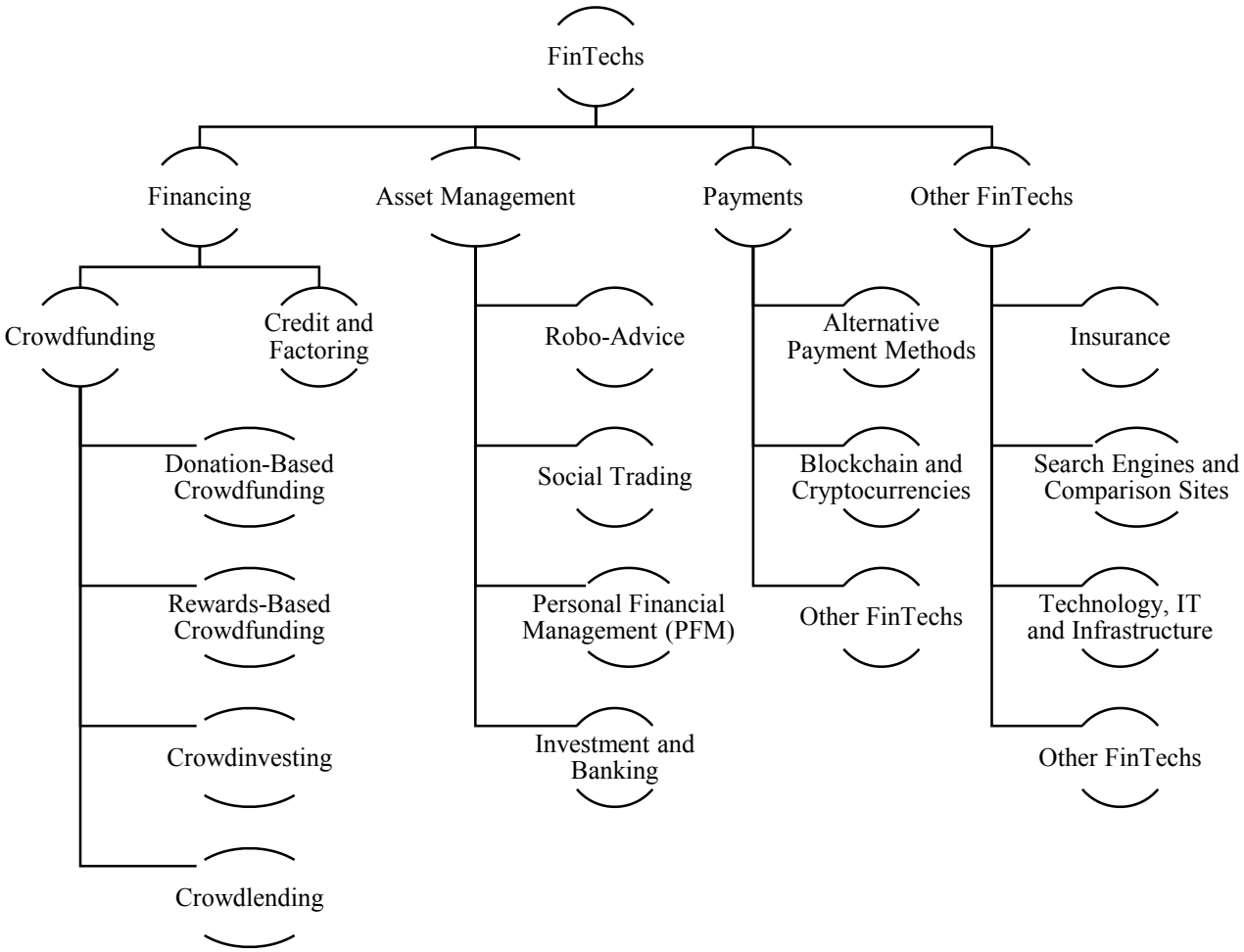
[6] For example, in October 2013 the average price for a Bitcoin on the largest virtual currency exchange was around 122 USD. A few months later, at the beginning of December 2013, the price had already risen to 1,151 USD (BlockchainInfo, 2016).

tems, a blockchain is used to secure Bitcoin's transactions. With this technology, all transactions are registered and stored on a variety of servers. This makes it very difficult to falsify the information (Grinberg, 2011; Böhme et al., 2015). Even companies that do not themselves offer cryptocurrencies but solely blockchain technology for financial services, are included in the blockchain and cryptocurrency subsegment.

FinTechs that offer alternative payment methods are included in the *alternative payment methods* subsegment. Companies that offer mobile payment solutions belong to this subsegment. In the scholarly literature, the term "mobile payment" generally encompasses various functionalities that are handled via mobile phones (see Mallat, 2007; Mallat et al., 2004; Merritt, 2010). This includes the use of the mobile phone to make payments or bank transfers. Companies that offer eWallets or cyberwallets are also included in the alternative payment methods subsegment. An eWallet is a system in which both digital currencies and payment information for various payment systems can be stored. The payment information can then be used during the payment process without re-entering it using a mobile phone or the Internet. This enables very fast and user-friendly transactions (Mjølsnes and Rong, 2003; Mallat, 2007). Other innovative solutions for bank transfers or other payment methods are also included in the alternative payment methods subsegment. Some FinTechs in this subsegment, for example, offer the transfer of money between two individuals (peer-to-peer transfer). The money is often transferred in real time and thus is faster than in the traditional banking industry (Merritt, 2010).

The *other FinTechs* segment describes FinTech businesses that cannot be classified by the other three traditional bank functions, i.e. financing, asset management and payment transactions. FinTechs that offer insurance or facilitate its acquisition are included in the *insurance* subsegment. These FinTechs are often also called *InsurTechs*. Among other things, they offer peer-to-peer-insurance, wherein a group of policyholders come together and assume collective liability in the case of damages. If no loss occurs within the group, there is partial reimbursement of the insurance premium (Wolff-Marting, 2014). Furthermore, FinTechs of the *search engines and comparison sites* subsegment, which enable the Internet-based search and comparison of financial products or financial services, are included in other FinTechs. FinTechs that provide technical solutions for financial services providers are included in the *Technology, IT and Infrastructure* subsegment.

Figure 2: Segments of the FinTech Industry



3 Methodology

The design of this study and the methodology used are described below. The first step was to identify the relevant German FinTech companies and to assign them to the various segments. FinTechs that had their company headquarters in Germany in April 2016 or were involved in significant activity in Germany are regarded as relevant. The FinTech businesses included on the websites crowdfunding.de, paymentandbanking.com, crunchbase.com, letstalkpayments.com and ventureradar.com comprise the main focus of this study. The database thus compiled was supplemented by FinTech companies that had already been mentioned on blogs and in the press for start-ups. There are websites that imitate the appearance and character of FinTech companies though they do not offer FinTech services, being merely sales or marketing channels for real estate or insurance brokers. Such "false FinTechs" were not considered in this study.

Then, in a second step, the relevant market volumes of the identified FinTech businesses were determined. To collect these market volumes, FinTech companies were contacted via email with a personalized questionnaire tailored to their respective business models. Businesses without valid email addresses were not included in the survey since in such circumstances it could be assumed that they had either not yet begun or had concluded their operations. A total of six different questionnaires were developed in which companies were asked about their annual market size and volumes from the year 2005[7] to the end of 2015. In addition, we asked FinTechs to forecast the relevant market figures for the years 2016 and 2020. In another questionnaire, nine traditional and 33 innovative financial institutions were questioned about their FinTech activities, and finally the domestic activities of 57 internationally active FinTechs (so-called global players) were examined. A response rate of almost 25% was achieved across all segments. This result is quite satisfactory given the fact that the return rate is regularly between 5% and 20% for postal surveys in which there are no measures taken to ensure participation (Diekmann, 2011, p. 516).

In a third step, the data obtained from the surveys was supplemented by publicly available information. In order to estimate the relevant market sizes, a large number of sources were used, including the websites of the respective FinTech companies. The datasets available from previous research were also used and evaluated (Klöhn und Hornuf, 2012; Dorfleitner et al.,

[7] In the course of the survey it turned out that the relevant volumes could not be determined for any subsegment prior to the year 2007.

2016a). Additional data was collected from industry associations, market studies, the company register and insolvency notices. If publicly available sources could only be used to determine the total market volume of a platform aggregated over several years or else the volume of a single year, the historical growth rates of the other FinTechs from the respective subsegment were used to approximate the annual development. In fact, most major German FinTech companies were already covered by steps two and three.

If the relevant market volume of a FinTech company could not be determined by publicly available data, an estimate of this volume was made in a fourth step. As a rule, it was possible to get figures that could give an indication of the size of a given company, such as the number of its employees. Employees in this context are all the people that FinTech businesses had on their websites or listed as employees in the survey. In this database, it was not possible to distinguish between full and part-time employees or to convert part-time occupations into full-time equivalents. On the basis of the number of employees or some other relevant parameters—such as the number of clients or users—it was possible to create a multiplier for comparing a given business with other FinTechs in the relevant subsegment and ultimately to approximate its market volume. In individual cases, the market sizes of previous years were determined by the historical growth rates of the FinTech companies included in the respective subsegment. This procedure was carried out mainly with respect to small FinTech companies, since the volumes of the market leaders were generally available. Consequently, the overall volumes are only slightly influenced by this approach, which is accompanied by uncertainties due to the lack of relevant data.

For the subsegments PFM and payments, the estimate of the overall market could not be based on individual FinTechs due to a lack of data. Instead, the overall market was approximated using various publicly available sources.

In order to obtain a comprehensive and realistic picture of the FinTech market in Germany, information regarding the relevant volumes is aggregated and analyzed both in terms of the overall market level and on the basis of the subsegments. In this context, there is a description of the compound annual growth rates (CAGR) for the respective subsegments as well as the possible drivers and hindrances of growth. In addition, there is analysis of the technological and regulatory obstacles that restrict FinTechs in their operations. This creates a starting point for forecasting the future development of the German FinTech industry.

Many of the results from this study are based on surveys conducted with the cooperation of FinTech companies. Although the authors of this study have scrutinized all of the statements

submitted by the start-ups, no definitive statements can be made about the truth content of individual responses.

4 The FinTech Market in Germany

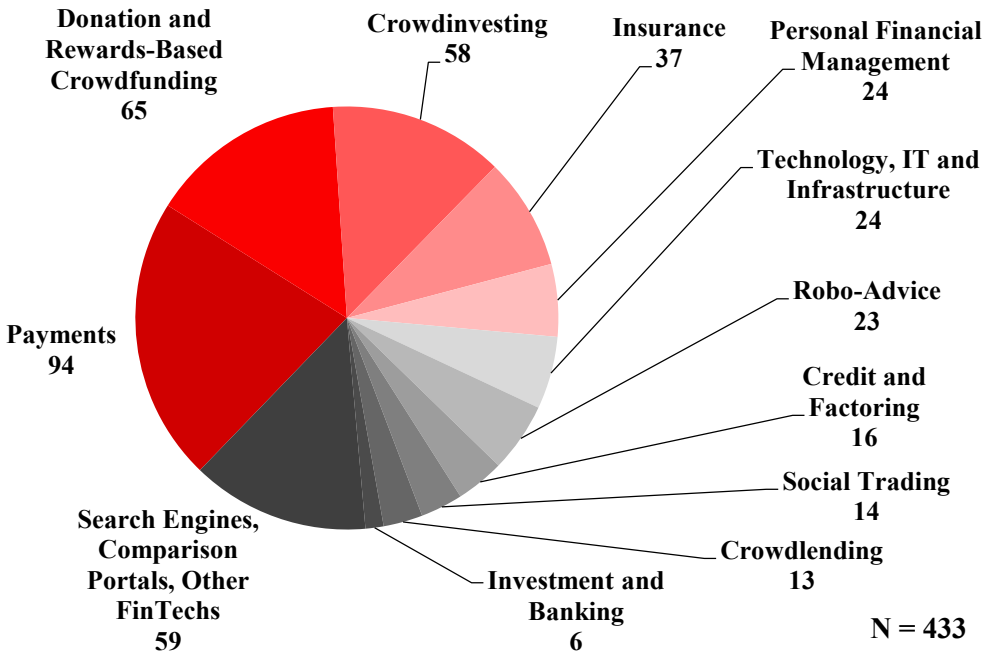
In the following, we provide overview of the entire German FinTech market. Subsequently, general trends of the FinTech industry are described, and market sizes and developments within the respective subsegments are analyzed.

4.1 Current Market Environment

The **total market volume** of the FinTech companies in the crowdfunding, loan and factoring, social trading, robo-advice, and investment and banking subsegments amounted to **approximately 2.2 billion EUR** in 2015. Over the past six years, **the average annual growth rate in these subsegments has been approximately 150%.** The transaction volume of FinTechs in the payments subsegment was estimated to be 17 billion EUR in 2015, and around 1.2 million people used independent PFM systems to manage their personal finances in that same year. The market volume of other FinTechs has not been investigated in comparable detail in this study because the business models of these FinTechs are very diverse and relevant volumes cannot be meaningfully compared or aggregated.

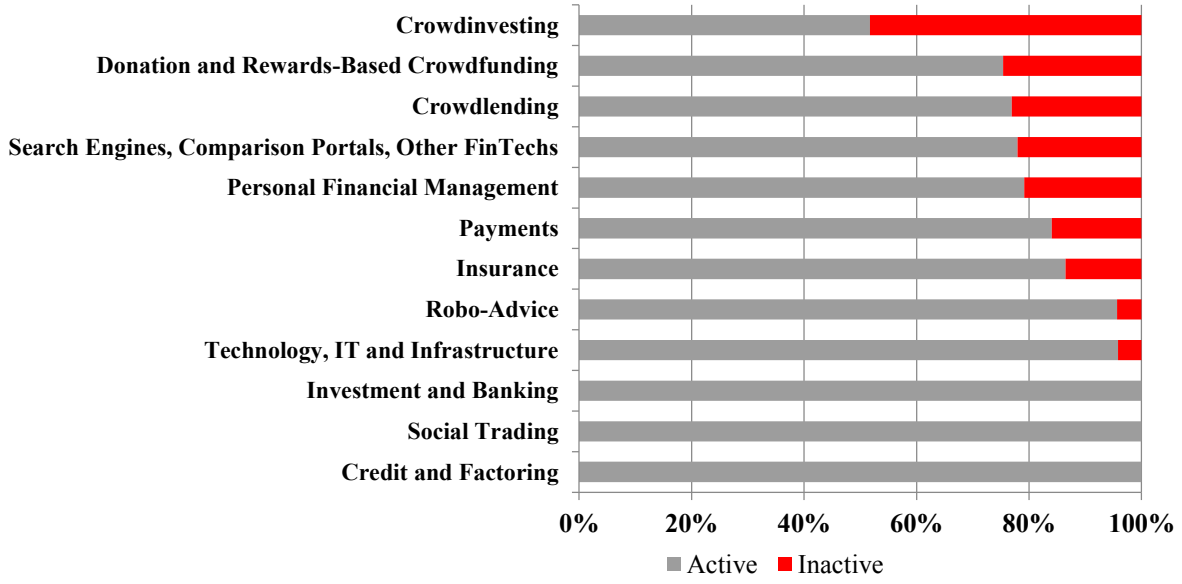
A total of 433 FinTech companies were identified. As shown in Figure 3, these companies are divided into the segments and subsegments of the FinTech market as defined above. Most of the companies are active in the payments segment, followed by 65 companies from the donation and rewards-based crowdfunding subsegments. The other FinTechs segment follows in third place with 59 FinTechs (this does not include the insurance subsegment). Included in this segment are companies with extremely diverse business models, such as analytical tools for the legal implementation of crowdfunding portals, Internet platforms promoting investor education, and portals designed to evaluate and rank financial institutions. The crowdinvesting subsegment contains a total of 58 businesses. Another 37 FinTech businesses are active in the insurance subsegment. Finally, there are the PFM as well as the technology, IT and infrastructure subsegments, which respectively have a total of 24 FinTechs. This latter group contains FinTechs that deal in white label solutions for other FinTechs. In this study these businesses were not considered separately since they themselves generated no volume of consumers; to consider the users of white label solutions would simply result in doubling their effect on market volumes within the FinTech industry as a whole. Another 23 FinTech businesses are active in the robo-advice subsegment, 16 in credit and factoring, 14 in social trading, 13 in crowdlending, and 6 in investment and banking.

Figure 3: Overview of FinTech Companies



Many of the 433 German FinTech companies that were identified merely have a virtual presence on the Internet and could not (yet) show evidence of operations. In addition, there are companies within the survey that have merged with or acquired other FinTechs during the period of observation. For example, the crowdinvesting portals Mashup Finance and Bankless24 are counted as independent businesses in the survey, although both businesses have merged with the Austrian Portal Conda in recent months. Other FinTech businesses are no longer active in the market as a result of insolvency or dissolution. Accordingly, the number of FinTechs in individual subsegments decreased. 346 FinTechs remain with active business operations. Figure 4 depicts the share of FinTech businesses in the sample that were in the market at the end of 2015. It is important to note that nearly 50% of the portals in the crowdinvesting subsegment have ceased their operations.

Figure 4: Percentage of FinTech Businesses Active in 2015



The following empirical investigation focuses on the financing, asset management and payment segments, as well as the insurance subsegment. A total of 309 FinTechs were analyzed in the course of this investigation.

4.2 General Market Trends

The FinTech businesses that operate in the defined segments and subsegments can generally take advantage of the same opportunities. But they often also have to deal with similar challenges. In order to avoid needless repetition in the description of the subsegments, the general market trends and the drivers of growth shall be briefly summarized in this section.

Some countries have already engaged in large-scale efforts to promote the FinTech industry. The Bank of England in Great Britain conspicuously leads the field in this regard. Since 2016 FinTechs in the UK have been able to participate in the so-called regulatory sandbox. This sandbox allows FinTechs to test their business models in the market for three to six months free from many of the regulatory demands to which they would normally be subject (FCA, 2015). Comparable regulatory sandboxes were proposed in other markets, including Singapore (MAS, 2016) and Switzerland (FINMA, 2016). The EU has also announced its intention to update its Prospectus Directive and to promote crowdfunding platforms (European Commission, 2015a; 2015b; 2016), making the implementation in the largest member state Germany not impossible.

How successful this approach will be in the end depends on the actual regulatory measures adopted and thus must await future analysis. It can nevertheless be stated that the sandbox-approach has potential disadvantages, not only from the perspective of consumers (as a result of fewer regulatory protections), but also for FinTech businesses. The sandbox-approach entails the delayed entrance into the "proper market," which businesses must nevertheless encounter when they exceed certain limits. At the same time, clear legal regulations offer FinTechs the security to be able to develop their business models in a steady fashion in the course of different stages in their growth. This can be particularly advantageous for FinTechs in the start-up phase. In the spirit of Akerlof (1970), unequal regulatory burdens could, moreover, lead to an adverse selection process, since it would arguably be the weaker companies that stand to gain the most from such protective legislation.

A driver of growth for the German FinTech market could be the so-called "Brexit" vote, in which the British recently decided to leave the EU. The Brexit could affect the development of German FinTech centers in Berlin, Munich, Frankfurt and Hamburg. As a result of the Brexit vote, FinTech companies based in the UK are at risk of losing access to the European Single Market. This would in all probability have significant consequences not only for the financial sector but also for other areas of the economy as well.

Up until now FinTechs based in London could use EU passporting in order to gain access to markets in continental Europe. For example, the prospectus of Penell GmbH and that of AK Immobilien Projektentwicklungs GmbH were approved by the Luxembourg Financial Market Supervisory Authority and subsequently notified by BaFin and the FMA. Through EU passporting, companies that have received approval for a securities prospectus in the UK need only a notification, rather than a new authorization of the prospectus, in order to be able to offer their services in the other EU countries. In order to continue to profit from EU passporting or EU funding and other benefits, some FinTechs could move their headquarters from London to the start-up metropolis of Berlin or else to countries with strong technological or financial infrastructure, such as Ireland or Luxembourg.

In comparison with the established banks, for whom a change in location might necessitate the disclosure and taxation of silent reserves and various other significant transaction costs, FinTechs and their founders are often much freer. In deciding whether or not to move their operations, the perception of regulatory uncertainty as a result of the Brexit could be decisive. Young businesses already benefit from a stable regulatory environment in the EU and from secure access to the pan-European market. The costs for the adjustment of contracts and busi-

ness models can be relatively high for FinTechs in the start-up phase (European Parliament, 2016) and in extreme cases can lead to the closing of operations. The Singaporean Digital Bank WB21 Pte. and six other businesses have already decided to move their business operations from London to Berlin (Geiger, 2016). Even if a move to Germany does not seem attractive for every FinTech business, Great Britain may nevertheless have lost much of its attractiveness as a FinTech hub due to rising regulatory uncertainty. This effect could actually be exacerbated through capital controls or comparable national measures. All things considered, the effects of Brexit on FinTech businesses can so far hardly be estimated and depend for the most part on the future political decisions of the UK and the EU.

Another challenge for many FinTechs is the legal identification and legitimation of (potential) customers. As a rule the products produced by FinTechs are entirely web-based. FinTechs accordingly have a corresponding interest in authenticating the customers involved in accessing their products and to avoid any sort of media discontinuity. It is currently legally permissible, for example, to carry out a web-based video identification procedure for the purpose of the opening of an account (Rundschreiben 1/2014 (GW), III., from March 5, 2014). In this procedure, the customer holds his or her identity document in front of a web or smartphone camera. A trained employee then verifies the authenticity of the identity card and matches it with the user's face prior to carrying out a transaction.

In the circular from June 2016 (Rundschreiben 04/2016 (GW)), the BaFin initially adjusted the requirements for video identification procedures. Among other things, after the opening of an account a reference amount for the new account should be transferred. Above all for people who would like to open an account for the first time or so far only own an account in a foreign country, this reference transfer would have constituted an obstacle. Additional legal uncertainty about the implementation of video identification would have emerged, moreover, if the employee of the FinTech business, in accordance with the circular, had had to search the Internet and social networks for personal information pertaining to the potential client. The statements from the circular of 04/2016 (GW) were suspended until December 31, 2016 and the circular of 01/2014 will continue to be used during the transition period. According to the BaFin (2016d), the implementation of the Fourth Money Laundering Directive, a draft of which was intended to be presented to the cabinet by the end of 2016, is a forward-looking response to the challenges presented by data security and the digitization of customer identification. The security standards enacted in the Money Laundering Act should also be used to decide which parties of the financial sector and non-financial enterprises can use which procedures for the purpose of securely identifying customers.

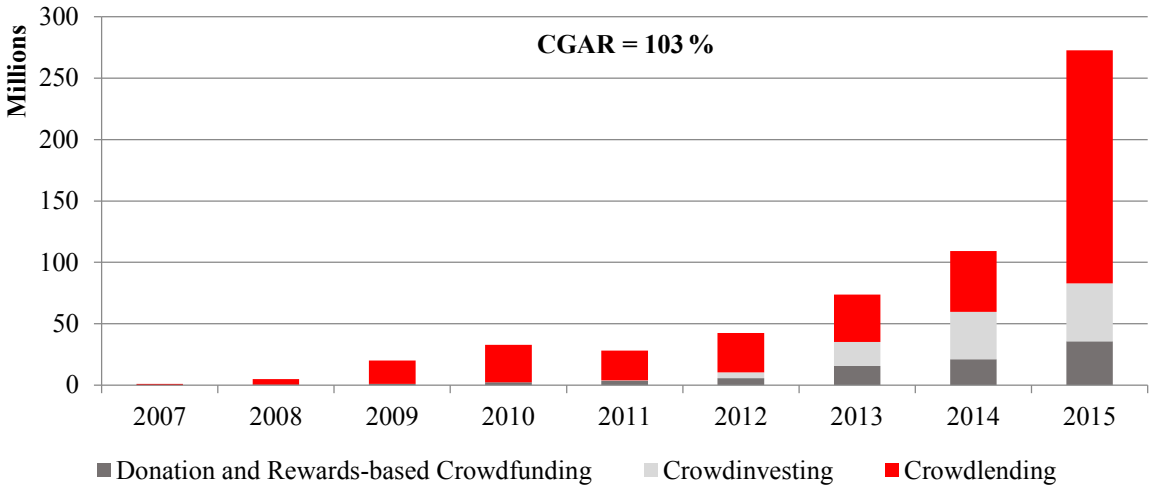
Finally, the requirements of the revised Payment Services Directive (PSDII, Directive 2015/2366/EU) that were adopted by the European Parliament in October 2015 offer relief to many FinTechs. There are two aspects of the Directive that are of especial importance for FinTechs. Firstly, financial institutions are obliged to provide "open access" to third-party providers (i.e. providers of account information and payment solution services) with the consent of the customer. Open API interfaces enable these third parties to gain access to the account information of clients of traditional financial instructions that they previously had not had access to. Through this open-access legislation, traditional banks could lose their competitive advantage, since in the future FinTechs will also be able to process the account information on behalf of its customers and do such things as offer suitable payment methods or PFM systems. Since January 2016, the member states of the EU have had two years implement the Directive into national law. Furthermore, the Directive now includes the providers of account information and payment solution services. This is of particular concern to FinTechs in the PFM and payments subsegments, which could in some circumstances face increased operating costs due to the new regulatory requirements.

4.3 Crowdfunding

Crowdfunding consists of the donation and rewards-based crowdfunding subsegment, the crowdinvesting subsegment, and the crowdlending subsegment. In 2015 the **total volume** of German crowdfunding markets amounted to approximately **272 million EUR**. Over the entire period from 2007 to 2015, nearly 585 million EUR in financing was handled on crowdfunding platforms. The majority of this volume was financed through crowdlending. Crowdinvesting, which was the second-largest subsegment, accounted for 17% of the total market volume in 2015. Platforms for donation and rewards-based crowdfunding only accounted for 13% of the financed volume in 2015 (Fig. 5).

There are 87 crowdfunding platforms from the various subsegments that are currently active in the market. In terms of the number of established platforms, crowdlending is the smallest crowdfunding subsegment, having only nine established portals. The largest subsegments are the donation and rewards-based crowdfunding subsegments, in which 49 businesses are currently active, followed by crowdinvesting, which has 29 platforms.

Figure 5: Successfully brokered capital in the crowdfunding subsegments in EUR

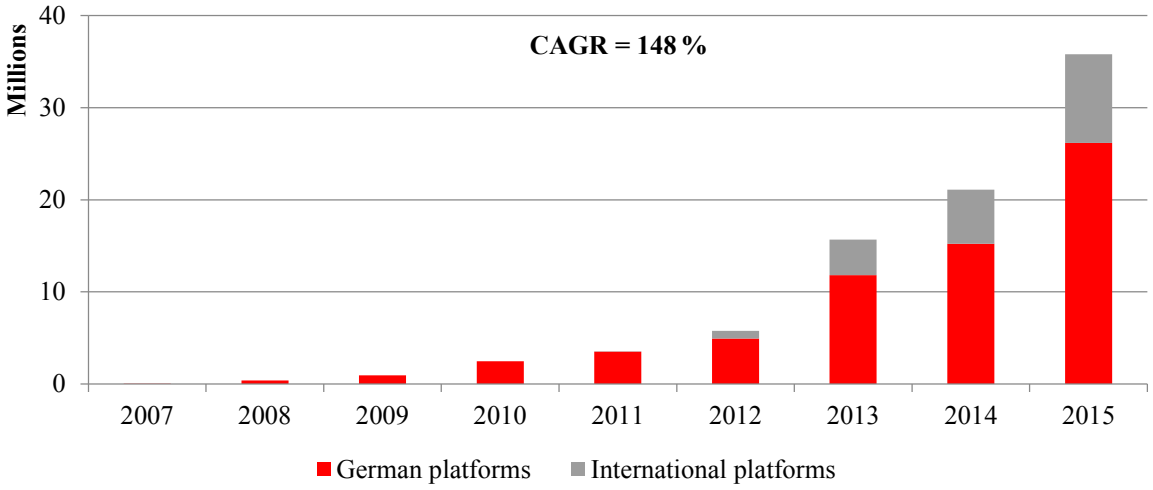


The **average annual growth rate** in crowdfunding amounted to **103%**. After high three-digit growth rates in 2008 and 2009, growth slowed in the following years. Between 2010 and 2014, the annual growth rate was between -15% and 75%. In 2015, the overall market again recorded growth of more than 150%. In what follows, the developments in the individual crowdfunding subsegments are described in detail.

4.4 Donation and rewards-based crowdfunding

The German market for donation and rewards-based crowdfunding in 2015 had **a total market volume of nearly 36 million EUR**. The total amount transacted by active portals in the donation and project-financing market during the entire observation period amounted to 85 million EUR. The first projects were financed on the platform Betterplace in 2007. Since 2010, rewards-based crowdfunding—including in particular the platforms Startnext and mySherpas—have been of increasing importance. Over the course of the observation period there have been a total of 65 donation and rewards-based crowdfunding portals active in Germany, of which 49 are still active in the market. In addition to crowdfunding portals based in Germany, the market volumes of projects initiated by German companies on international platforms such as Indiegogo, Ulule and Kickstarter are also taken into account in this analysis. In 2015, international platforms accounted for 25% of the German market volume.

Figure 6: Successfully brokered capital in the donation and rewards-based crowdfunding subsegments in EUR



The German market for donation and rewards-based crowdfunding is currently dominated by three market leaders, Betterplace, Startnext and VisionBakery. Together these three platforms accounted for over 62% of the total financed volume in 2015. Even if the market volumes of the international platforms are left out of the reckoning, these three platforms accounted for 85% of the total market volume.

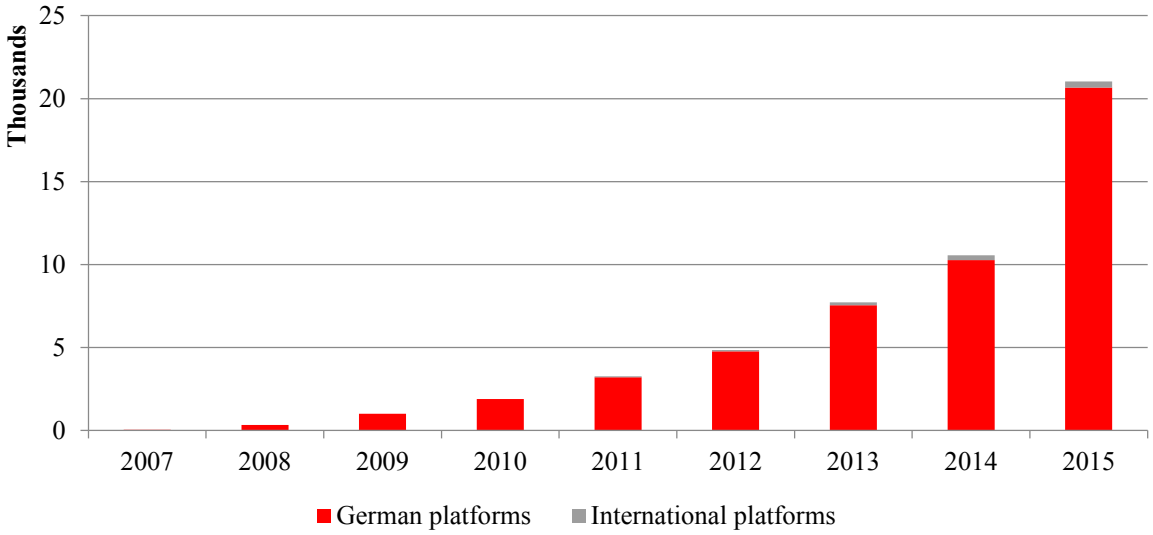
Donation and rewards-based crowdfunding represents the smallest crowdfunding subsegment in Germany. Although in comparison with the crowdinvesting subsegment more projects were financed, the average volume of financing for projects in the donation and rewards-based crowdfunding subsegment was much lower. Accordingly, the donation and rewards-based crowdfunding market is also smaller overall than the crowdinvesting or crowdlending subsegments. The **average annual growth rate** in donation and rewards-based crowdfunding was **148%**. After especially high growth rates were recorded in the early years of the industry, the growth of the market proceeded to slow in 2011 and 2012. However, in 2015 the market for donation and rewards-based crowdfunding surged again, posting a growth rate of approximately 70%.

Since May 2015 the world´s largest platform for rewards-based crowdfunding, Kickstarter, has been active in the German market. The steep increase in the rate of growth is to some extent attributable to Kickstarter's entry into the market and additional media attention. Although it had already been possible for German project initiators to secure financing through Kickstarter on its US website, there had been administrative hurdles that were removed with the creation of a German offshoot. For example, it is no longer necessary for project initiators to present an American bank account and to write project descriptions in English.

Aside from the curiosity and interest of technologically precocious individuals (so-called early adopters), in the early years of the donation and rewards-based crowdfunding subsegment market growth was primarily due to the nascent industry's large media presence. The first participants in the industry were primarily motivated by altruistic aims, such as promoting social or creative projects and artists. This is still the case today on the largest German platform, Startnext, which most often finances projects in the area of music and film (Startnext, 2016). Similarly, on the American equivalent Kickstarter, music and film are the most popular project categories (Kickstarter, 2016). A major advantage for rewards-based crowdfunding and the most important driver of growth is its innovative form of financing, which provides a signal of market potential, reducing the information asymmetry between entrepreneurs and consumers. The number of cases of fraud has so far been sufficiently low that it is not expected to hinder the growth of the donation and rewards-based crowdfunding segment. A mere 0.01% of the projects successfully funded on Kickstarter and Indiegogo bore traces of fraudulent intentions on the part of those who initiated them (Cumming et al., 2016). On the other hand, there are often delays in deliveries within the rewards-based crowdfunding subsegment. When products are sent to upfront buyers or the supporters of projects, they arrive after a considerable delay approximately 75% of the time (Mollick, 2014). This may result in a general diminution of customer satisfaction within the subsegment.

The number of projects financed in the donation and rewards-based crowdfunding subsegment grew significantly in each year of the observation period. Between 2011 and 2013, the number of successful crowdfunding projects per year was still below the 10,000 mark. In 2015, more than twice as many projects were financed through the crowd.

Figure 7: Number of successfully financed projects in the donation and rewards-based crowdfunding subsegments



The average financing volume of projects in the donation and rewards-based crowdfunding subsegment during the observation period remained within a range of 1,100 EUR to 2,100 EUR. However, the volumes varied significantly on individual platforms. A closer inspection reveals that the average volume of financed projects on the biggest platforms, such as Start-next and VisionBakery, range between 5,000 EUR and 8,000 EUR, which is markedly higher than the mean value for the overall market. On international platforms an even higher average sum was raised for projects.[8] Many smaller crowdfunding portals specialized in certain kinds of projects, such as the promotion of science or of sports.[9] The comparatively low financing volumes on these specialized platforms could either be attributable to different financial goals set for the projects, or else these projects may simply have lacked the desired level of support.

The number of people employed in the relevant platforms in Germany in 2015 is estimated to be approximately 230. This corresponds to an average of approximately five employees per platform.

Nine platforms in the donation and rewards-based crowdfunding subsegment took part in our survey. These crowdfunding platforms comprised 26% of the total market volume in 2015. None of the surveyed crowdfunding platforms indicated that they had special licenses or authorizations. Since a trustee usually carries out the management of customer deposits and

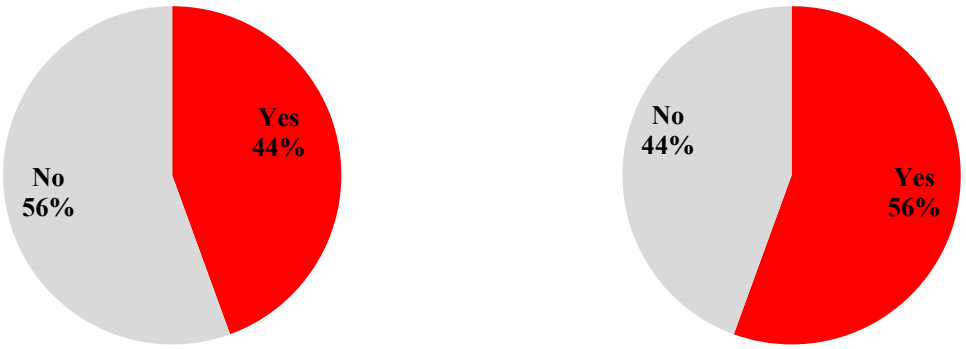
[8] For example, the average sum obtained for a successfully financed campaign on Kickstarter was over 15,000 USD (Kickstarter, 2016).
[9] See for example Sciencestarter for the crowd financing of scientific projects or Monaco Funding for crowd financing of athletes.

there is no requirement for repayment or profit sharing, special licenses are usually not necessary for the dononation and rewards-based crowdfunding business model (BaFin, 2016e).

Perceived Regulatory and Technological Impediments

Four out of nine platforms in the donation and rewards-based crowdfunding subsegment have complained that technological inadequacies have hindered their economic performance (Fig. 8). In particular, companies complained of the scarcity of open API interfaces between banks and the technological difficulties associated with performing the elaborate legitimation process that the initiators of projects are required to go through. Five of the surveyed platforms also complained of regulatory burdens. The process of legitimating project initiators was seen as a major obstacle in this context as well.

Figure 8: Technological and regulatory impediments in the donation and rewards-based crowdfunding subsegments



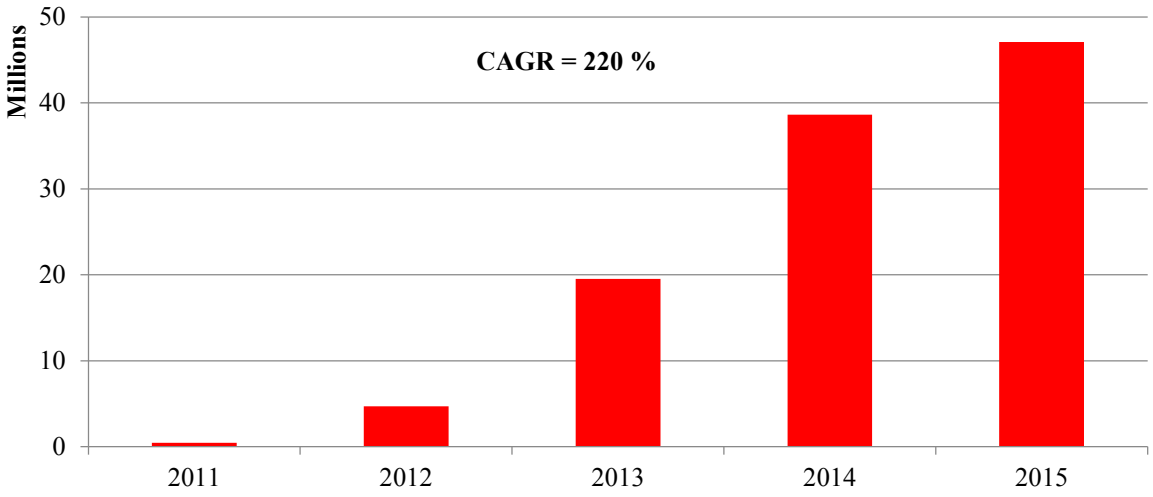
Technological impediments (N=9) Regulatory impediments (N=9)

4.5 Crowdinvesting

The German crowdinvesting market could reach **a total market volume of 47 million EUR** in 2015. Over the course of the entire observation period, portals that were active in the market raised 110 million EUR of financing (Fig. 9). The first two crowdinvesting campaigns began on August 1, 2011 on the platform Seedmatch and were successfully financed by the crowd in three months. In the same year, Innovestment also hosted a successful financing of a start-up. By the end of the observation period a total of 58 crowdinvesting platforms had been founded in Germany, of which 36 had hosted at least one successful financing. 29 of these portals had a website or a valid email address. Some of these portals terminated their business activities before they could complete a financing campaign and establish themselves in the

market. While Companisto established itself as the second largest portal in the market in 2012, Seedmatch continually lost market share. The crowdinvesting market is highly concentrated, with the two market leaders, Seedmatch and Companisto, having brokered 46% of the volume of financing between them from 2011 to 2015.

Figure 9: Successfully brokered capital in the crowdinvesting subsegment in EUR



Crowdinvesting is the second largest subsegment in crowdfunding. In comparison to the crowdlending subsegment, crowdinvesting had a smaller total investment volume from a significantly smaller number of financings. The **average growth rate** in the crowdinvesting subsegment was around **220%**. While in the early years its growth rate typically hovered in the 3-digit range, the growth rate in 2015 was a mere 22%. A reason for the lower growth rate may be the low returns on investment from this subsegment. Hornuf and Schmitt (2016) have determined that investors could so far have lost 23.2% of their invested capital up until January 1, 2016, assuming they naively contributed the same amount to every offered financing opportunity. Fixed interest rates as well as real estate and film financings were, however, not considered in this analysis. Whether the average return on investment will turn out to be positive in the end depends to a large extent on the repayment and default rates of the outstanding financings.

The growth in the market during the first few years of crowdinvesting is mainly due to positive media coverage as well as to curious early adopters and investors who wanted to try out a new asset class and expected a comparatively high return. The financing contracts that the crowdinvesting portals developed at that time were often silent partnerships and non-securitized participation rights. According to the German Investment Act, these forms of investment could only be offered without a prospectus if there was a 100,000 EUR cap on in-

vestment (Klöhn and Hornuf, 2012; 2015). Since projects brokered by the market leaders quickly reached this limit (Hornuf und Schwienbacher, 2016a), the portals soon sought after another possibility for achieving higher volumes without being obligated to provide a prospectus. On November 29, 2012, Seedmatch first offered a profit-participating loan, which at that time was not yet legally classified as an investment and so could be offered without a prospectus and not face any capital restrictions. The platform Companisto soon joined Seedmatch in providing a contractual framework based on the model of the profit-participating loan (Klöhn et al., 2016a).

The largest campaign featuring the model of the profit-participating loan was completed on March 31, 2015. The campaign, which solicited funds for the real estate project Weissenhaus, attracted 7.5 million EUR from investors. With the introduction of the German Small Investor Protection Act (*Kleinanlegerschutzgesetz*), the emission volume for profit-participating loans and subordinated profit-participating loans without a prospectus was restricted to 2.5 million EUR (Klöhn et al., 2016b). During the observation period only four projects exceeded the 2.5 million EUR limit imposed by the small-investor legislation (one of them, however, had a prospectus in accordance with the German Securities Prospectus Act (*Wertpapierprospektgesetz – WpPG*)).[10] The decline in growth of the crowdinvesting market has very little to do with the introduction of the new legislation, however, and much more to do with the lack of return that investors have hitherto been able to reap from their investments.

In the last two years, growth came primarily from the diversification of funding projects. While initially only start-up companies were financed, financing was increasingly extended to real estate and ecological projects as well as films. Instead of the purely success-dependent return, fixed-rate remunerations were increasingly offered in the crowdinvesting industry. Only fixed interest rates were ever offered for real estate and ecological projects (Klöhn et al., 2016a).[11]

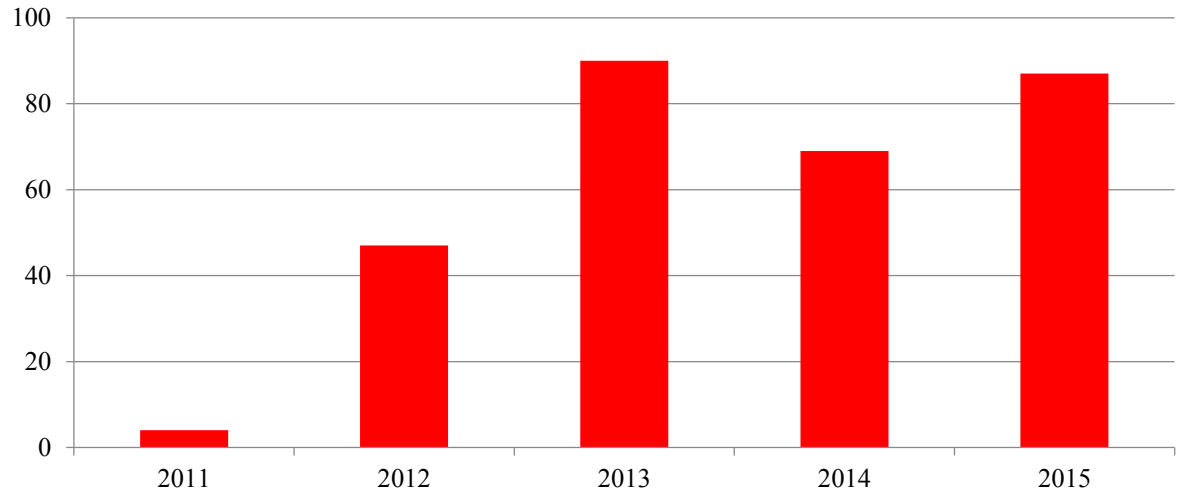
The number of projects financed annually rose to 90 in 2013. Since then, however, there has been no growth in the number of financed projects. The diversification of the kinds of projects financed has not checked the stagnation in the crowdinvesting market. In 2014 the number of successful financing campaigns even decreased for the first time, there having been a total of

[10] These campaigns were for Urbanara Home AG (Portal: Bergfürst), Protonet 2 (Portal: Seedmatch), SpreeSide Residenz (Portal: FunderNation) and Weissenhaus (Portal: Companisto).

[11] In the real estate sector, the term *PropTech* was coined in analogy to the term FinTech. In fact, real estate crowdfunding is associated with both FinTechs and PropTechs. There is, however, no further overlap between them. There will accordingly be no further mention of PropTechs here. Real estate crowdfunding is subsumed by the crowdinvesting subsegment in this study and therefore is not explicitly discussed further.

only 67. The question therefore arises as to whether there is a lack of potentially successful companies and projects in Germany that, for lack of capital through other sources, are dependent on crowdinvesting portals for financing. The historical development of crowdinvesting campaigns is shown in Figure 10.

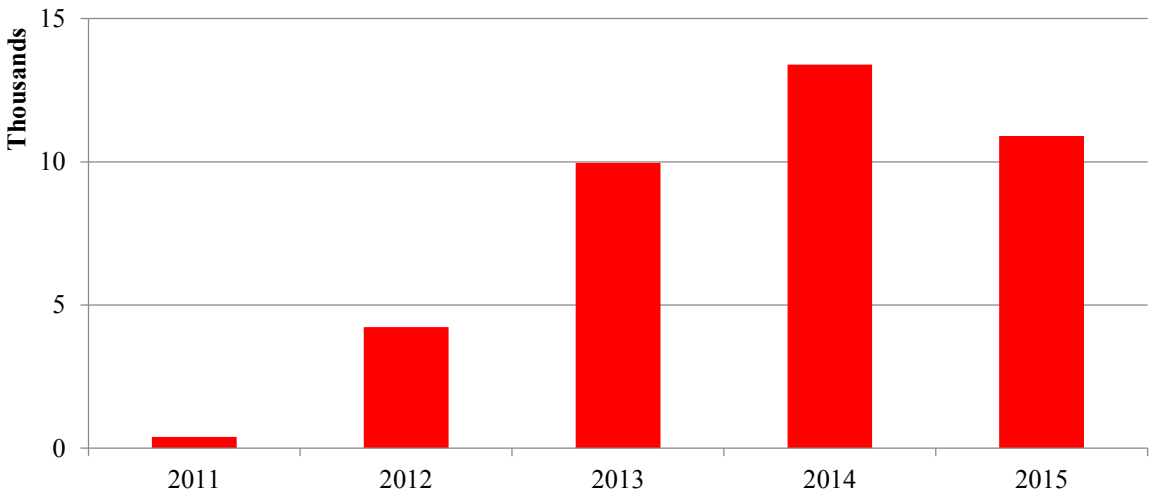
Figure 10: Number of successfully financed campaigns in the crowdinvesting subsegment



Since the total volume of financings rose steadily until the end of the observation period while the number of successfully funded projects stagnated or even declined, the average volume of financing for individual projects in recent years consequently rose. The year 2012 had the lowest average amount of funding secured through crowdinvesting campaigns (100,202 EUR), while it was at its peak in 2014 (559,843 EUR). In 2015 successful campaigns garnered an average of 541,299 EUR.

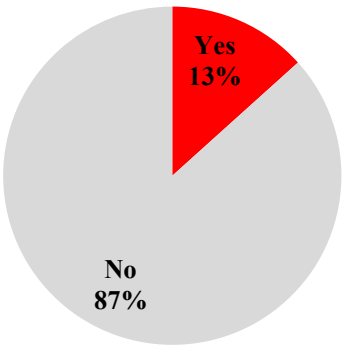
The number of investors continually increased between 2011 and 2014, so that in 2014 more than 13,000 people invested money in crowdinvesting projects. In particular, the number of investors on the platform Companisto, which requires a minimum contribution of only 5 EUR, has risen dramatically since 2012. The number of investors in 2015 fell back to just under 11,000 (Fig. 11). Since this is the sum of the investors involved in the individual portals, the available figures may contain double counts. These numbers therefore represent the upper limit of investors that were active in the crowdinvesting market. The number of individuals employed with crowdinvesting portals grew to 91 in 2015. Crowdinvesting portals employed an average of five people.

Figure 11: Number of investors who participated in individual crowdinvesting campaigns

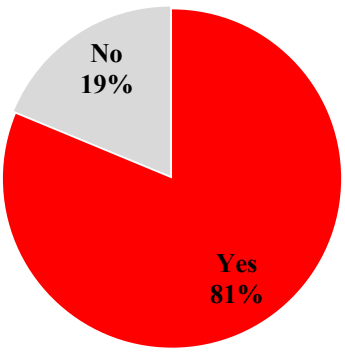


A total of 16 crowdinvesting portals furnished additional information by participating in our survey. Participants in the survey represented 81% of the market volume in 2015. At the present time, no German crowdinvesting portal has a banking license, which among other things would allow commercial loans without the involvement of a partner bank. Only the platform Bergfürst ever had such a license, but it gave it up in 2015 because of its cost (Kummermehr, 2015). Since January 2016, all crowdinvesting portals must have a license for the solicitation of investments pursuant to §34f of the Trade Regulation Act (*Gewerbeordnung - GewO*).

Figure 12: Technological and regulatory impediments in the crowdinvesting subsegment



Technological impediments (N=15)



Regulatory impediments (N=16)

Perceived regulatory and technological impediments

Only two of the crowdinvesting platforms surveyed indicated that there were technological impediments in Germany and that these limited the scope of their activities. These platforms were concerned about bad Internet connections in rural areas. Regulatory hindrances, on the other hand, were discussed by a clear majority of the surveyed platforms (Fig. 12). A total of 13 participants in the survey indicated that the regulatory environment currently impedes their operations. Representatives from the portals refer to the limits imposed by the German Small Investor Protection Act regarding subscription limits for investors as well as the exemption from the prospectus obligation pursuant to §2a of the German Investment Act (*Vermögensanlagengesetz – VermAnlG*). In addition, they drew attention to the unequal treatment of different investments with respect to the prospectus requirement. At present, profit-participating loans, subordinated profit-participating loans, and similar types of investment can be issued with a maximum volume of 2.5 million EUR without a prospectus. By contrast, silent partnerships and non-securitized participation rights can only be issued without a prospectus if their total volume is under 100,000 EUR, irrespective of whether they are distributed via a crowdinvesting portal or through a direct placement.[12]

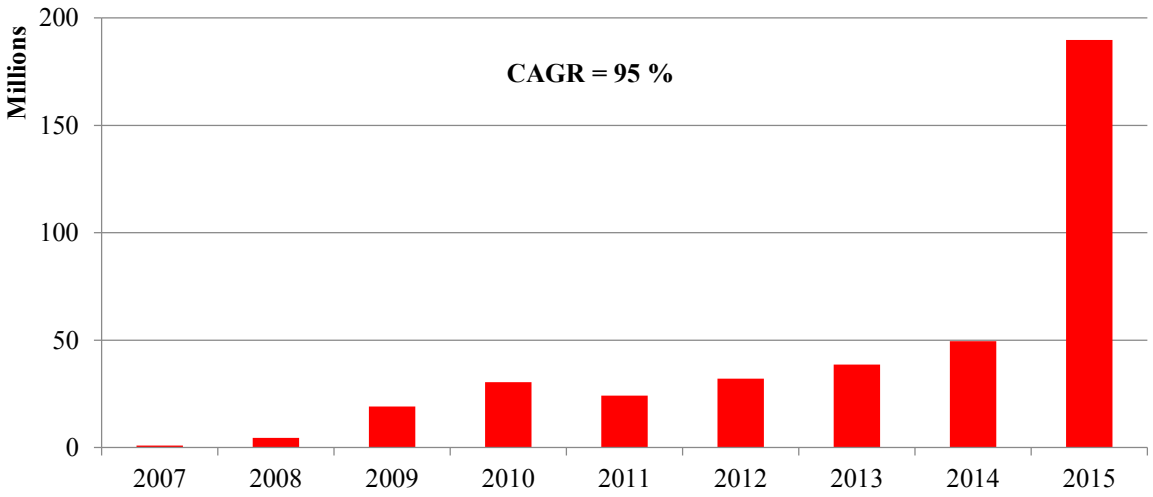
Finally, portal operators were critical of the fact that the issuing of securities is in practice impossible in crowdinvesting. The transfer of shares in a limited liability company is virtually impossible for crowdinvesting platforms, since it requires a notary (Braun et al., 2013) whose fee would make transfers of securities with a value of as little as 5 EUR uneconomical. Although the transfer of shares in a stock corporation is pursuant to the German Stock Corporation Act (§23 paragraph 5 AktG) not subject to the notarial requirement, an issue without a securities prospectus is in line with the German Securities Prospectus Act (§3 paragraph 2 sentence 1 No. 5 WpPG) only possible up to an amount of 100,000 EUR. Moreover, the start-up costs and the operating costs of a joint-stock company are comparatively high. Finally, the operators of the portals pointed out that cross-border activity in Europe was difficult because there was no possibility of a Europe-wide passport for businesses making use of subordinated profit-participating loans.

[12] Klöhn and Hornuf (2015) also pointed out that this regulation was inconsistent prior to the implementation of the German Small Investor Protection Act.

4.6 Crowdlending

In 2015 the German crowdlending market boasted **a total market volume of 189 million EUR** (Fig. 13). In the history of the industry up to 2015, active platforms raised financing worth just under 400 million EUR. Crowdlending for private loans was established early on in the German market. Two crowdlending platforms, eLolly and Smava, had already been founded by 2007. Shortly thereafter Auxmoney, which is currently the industry leader, entered the market. Portals specializing in the brokerage of corporate loans came later. In 2014 the first company loan was financed by the crowd on the platform Zencap, which, following a merger in 2015, became a part of Funding Circle. A total of 13 crowdlending portals have been founded in Germany. Five of these provide loans to private individuals and ten provide loans to companies and cooperatives; three portals serve both kinds of functions, financing both private and corporate loans. At present, nine of these platforms are still active in the market.

Figure 13: Successfully brokered capital in the crowdlending subsegment in EUR



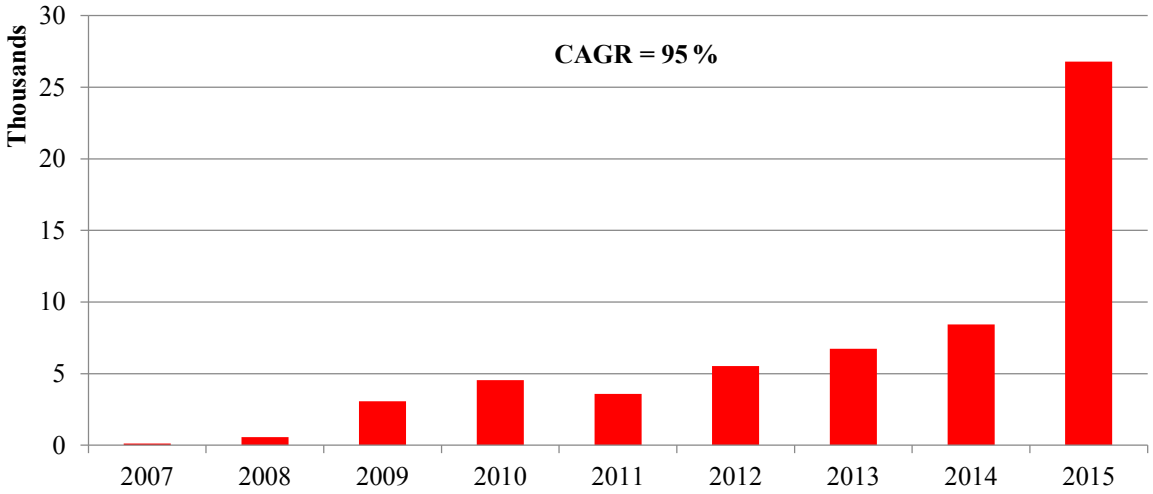
Crowdlending is the largest subsegment of crowdfunding. Both the volume of financing and the number of financed loans exceed the corresponding values from donation and rewards-based crowdfunding and crowdinvesting. The crowdlending market has recorded an **average annual growth rate of 95%**. Especially in its early years, but also in 2015, the growth rate for the entire market was three digits. In the period between 2011 and 2014, however, there were only moderate or even negative growth rates of -20% to 33%. In 2012 one of the biggest crowdlending platforms fundamentally altered its business model. Instead of offering credit financed through the crowd, Smava now mainly provides loan comparisons for traditional banks and similar kinds of information on their online marketplace.

The German crowdlending market is dominated by the market leader, Auxmoney. In 2015 more than half of the total volume of lending in the industry came from this platform. Accordingly, the recent very high industry growth rates are largely attributable to the growth of Auxmoney. The platform nearly tripled the volume of financed loans in 2015 (Auxmoney, 2016a). Nearly 23% of the borrowers on Auxmoney use crowdlending in order to replace other credit or to balance overdrafts as well as private giro accounts. Only the category "other" was more often indicated as the intended purpose for taking out a loan (Auxmoney, 2016b). By comparison, borrowers the US market leader, Lending Club, use 68% of all loans to repay other debts (Lending Club, 2016). In addition, in the last two years the brokerage of corporate loans gained importance in Germany, which served to propel the overall market forward.

As in the other two crowdfunding subsegments, the growth in the crowdlending market during its early years can be attributed primarily to curious investors who wanted to try out a new form of investment and were looking for returns in a low-interest-rate environment. While interest rates had previously been determined by an auction procedure, they are currently set by the platforms. In their risk-calculation models, many of the crowdlending portals fall back on external credit assessments, such as the Schufa scores or Creditreform ratings. Some portals have developed their own risk classifications, which generally also take into account external indicators. Using such information, these portals form a risk-adequate and term-dependent interest rate.

Depending on the risk and duration of a financing project, different rates of return can be achieved on the leading platforms. These range from between 2.3% and 7.7% on Auxmoney (Auxmoney, 2016c) and between 2.8% and 16.6% on Funding Circle (Funding Circle, 2016). Accordingly, assuming successful risk diversification by investors, crowdlending could be seen as a way to achieve comparatively high returns despite the ongoing low-interest policy of central banks. Auxmoney states, furthermore, that the default rate on financed loans is below 3% (Auxmoney, 2016c). However, Dorfleitner et al. (2016a) estimate that approximately 12% to 14% of the crowdlending loans on Smava and Auxmoney up to September 2013 were involved in difficulties as a result of borrowers' inability to pay. Auxmoney has changed its company policy over time, so that since February 2013 borrowers are now subject to credit investigation by Schufa. There may have been fewer problems with defaulting borrowers in recent years as a result of this change.

Figure 14: Number of successfully financed loans in the crowdlending subsegment



In crowdlending, the number of loans and the total volume financed developed in a parallel fashion. As shown in Figure 14, only moderate growth rates were recorded between 2011 and 2014. In 2015, the number of successfully financed loans jumped sharply to approximately 26,800.

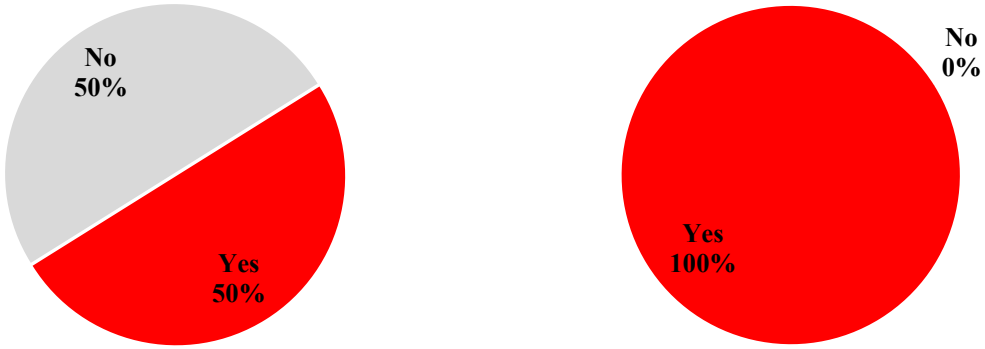
In 2015, German crowdlending portals employed approximately 338 people. This represents an average of approximately 38 employees per portal.

Six crowdlending platforms supplied additional information through our survey. The financed volume of these six platforms represented 43 % of the total market in 2015. Like crowdinvesting platforms, platforms in the crowdlending subsegment are permitted to solicitate investments under §34f of the Trade Regulation Act (GewO).

Perceived regulatory and technological impediments

Only three crowdlending platform stated that technological deficiencies constricted its ability to do business in Germany (Fig. 15). These platforms lamented the lack of a digital signature and the very cumbersome procedure for authenticating consumers. All six platforms, however, criticized regulatory frameworks in the crowdlending context and made particular reference to the exemption from the prospectus requirement in accordance with §2a of the German Investment Act (*Vermögensanlagengesetz – VermAnlG*). The operators of the platforms pointed out that various rules regarding the exemption of the prospectus did not go far enough and that they should be expanded within the crowdlending subsegment.

Figure 15: technological and regulatory impediments in the crowdlending subsegment



Technological impediments (N=6)

Regulatory impediments (N=6)

4.7 Credit and Factoring

In 2015, the **volume of financed credit** in the credit and factoring subsegment was **almost 140 million EUR**. In addition, the industry posted a **volume of purchased receivables** of over **500 million EUR**. The first businesses in the credit and factoring subsegment began operations in 2012. SMEs and banks have been able to auction their bad debts and loans on factoring platforms. In the same year, additional FinTech companies appeared that offer traditional factoring solutions via the Internet, but they focused on smaller receivable volumes by comparison with traditional factoring companies. The first company in the credit sector, Vexcash, started its business in 2012. The platform offers private individuals micro loans with a maturity of up to 30 days and a quick credit decision and payment. Loans are transferred to a partner bank. Unlike in crowdfunding, they are not refinanced through a multitude of indi-

viduals. In subsequent years, several FinTech companies, some of which had very different business models, entered the market. The offerings of such companies range from online pawnshops to portals for the mediation of SME loans.

There is a total of 14 FinTech businesses that are active in the credit and factoring subsegment. Half of these companies offer factoring and the other half offers loans. The subsegment comprises four FinTechs that specialize in private loans and three that mainly provide financing to companies.

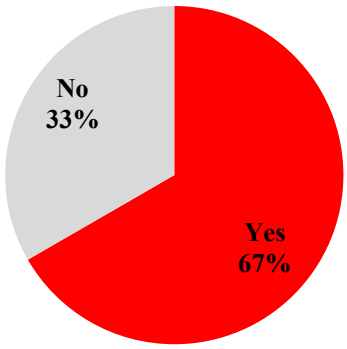
The companies in the credit and factoring subsegment did not provide any information about their current and historical business development during our survey. It was also impossible to estimate market volumes and growth rates for the past years using external sources. However, it can be inferred from the growing number of FinTech companies in this subsegment that the factoring market has gained in popularity in recent years. According to its own data, Debitos, which is the market leader in the factoring segment, has exceeded 1.4 billion EUR in auctioned receivables between the start of the business and May 2016 (Frühauf, 2016).

Two factoring companies and one credit company participated in our survey. Two of these companies claimed to have certain licenses. The license for the provision of financial services pursuant to §32 of the German Banking Act (*Kreditwesengesetz – KWG*) was listed.

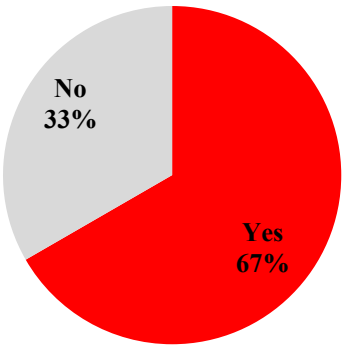
Perceived regulatory and technological impediments

Two companies complained of technological deficits in Germany (Fig. 16). Both companies suggested that the dissemination of broadband Internet and mobile data supply was not yet sufficiently developed in Germany. They were also critical of the fact that securities transactions and issuances could not be processed in real time. Two businesses also mentioned regulatory problems. In particular, they complained that acquiring licenses and permits is very costly, especially for start-up companies.

Figure 16: Technological and regulatory impediments in the credit and factoring subsegment



Technological impediments (N=3)

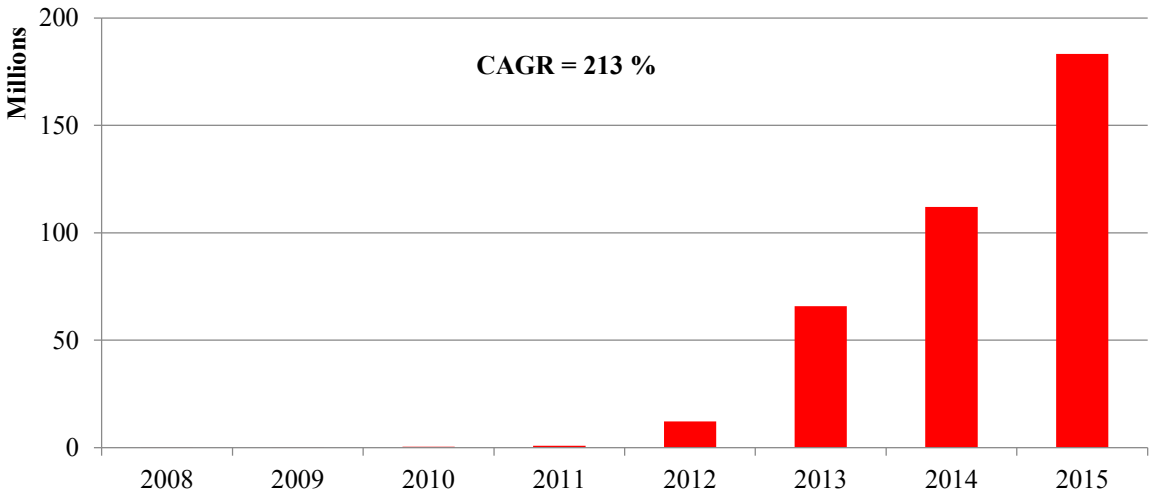


Regulatory impediments (N=3)

4.8 Social Trading

By the end of 2015, a total volume **of 190 million EUR** was transacted on social trading platforms in Germany (Fig. 17). In comparison to the previous year, that represents an increase of 63%. Social trading, an alternative form of financial investment, has been important in Germany since 2008. The appearance of an offshoot of the Cypriot platform eToro and the founding of Ayondo gave investors in Germany their initial access to these new investment opportunities. In 2012 the platform Wikifolio entered the market, which today counts as one of the most popular social trading platforms in Germany. There are currently 14 social trading platforms active in Germany. Since more than a third of these companies have been established in the last three years, some platforms manage negligibly small volumes of capital.

Figure 17: Assets under management in the social trading subsegment in EUR



Since the beginning of the observation period, the social trading subsegment achieved an **average growth rate of 213%**. In 2012 and 2013 the market boasted a three-digit growth rate. Subsequently, however, growth slowed down. Yet the growth rate has continued to hover around 70%.

In Germany, most social trading takes place on the platforms of the three market leaders: Wikifolio, eToro and Ayondo. Accordingly, the growth rates of the overall market can be largely explained by the growth of these leading platforms. Within a year after wikifolio started its business in 2012, the platform hosted transactions amounting to just under 50 million EUR. This development is reflected in the high growth rates of 2012 and 2013.

A big difference between the various platforms consists in the products they deal in. On social trading platforms like eToro and Ayondo individuals can invest their money exclusively in contracts for difference (CFDs), which they leverage on average by a ratio of 20 (Dorfleitner et al., 2016b). On other platforms like Wikifolio, by contrast, there is a wide spectrum of equities, funds, certificates and leveraged products. Many of these investment opportunities are derivative products that can be leveraged by investors in order to multiply their profits and losses. There is a relatively high probability that investors will incur a total loss of their investment. An analysis of the social trading platform eToro shows that only 16% of its investors made a profit between 2010 and 2012 (Pan et al., 2012). Furthermore, Doering et al. (2015) show that returns from social trading are generally not normaly distributed, and that there is negative skewness and high kurtosis. The authors conclude that in social trading the tail risk, i.e. the probability of suffering extreme losses, is significantly higher than in other forms of investment. Despite the high degree of risk of loss, social trading platforms have enjoyed significant growth in recent years.

Growth drivers in the social trading industry could include, among other things, higher transparency and liquidity in comparison to investment funds (Doering et al., 2015). Moreover, in the last few years an increasing number of media companies and professionals have been using social trading platforms. For example, the magazine Börse Online operates a portfolio on the platform Wikifolio and several asset managers are also active there.[13] This kind of high-profile participation could boost the confidence of investors and allow the market to continue to grow.

[13] Similarly, the operators of Bayerische Vermögens AG and Hinkel & Cie. Vermögensverwaltung AG own Wikifolios.

Social trading platforms employed a total of approximately 280 people in 2015. This represents an average of approximately 21 employees per platform.

Three social trading platforms took part in the survey. Since two out of the three are market leaders, the statements provided in the survey are representative of the whole social trading market. While only one of the three platforms has a banking license, the other two platforms indicated that the necessary licenses and authorizations were covered by partner companies.

Perceived regulatory and technological impediments

One platform had criticisms of the technological lag in Germany (Fig. 18). The company referenced the under-provisionof the mobile data network, especially in the local and long-distance public transportation sector. None of the social trading platforms suggested that the regulatory environment in Germany hindered their business operations.

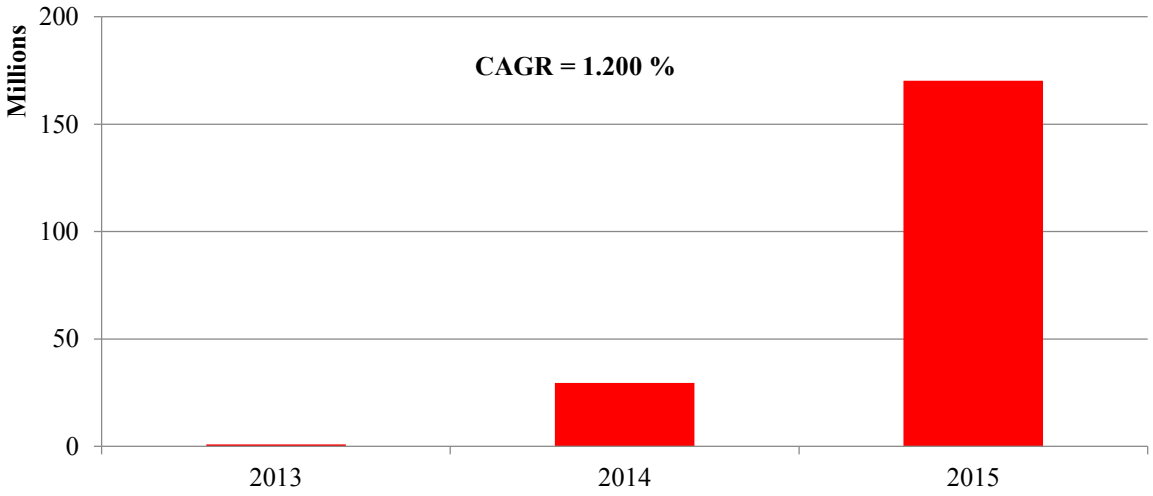
Figure 18: Technological and regulatory impediments in the social trading subsegment

Technological impediments (N=3) Regulatory impediments (N=3)

4.9 Robo-Advice

In 2015, **assets under management** in the robo-advice subsegment amounted to **170 million EUR** (Fig. 19). In 2013, Quirion and Cashboard became the first companies to bring this type of automated investment advice to the German market. Since then, 21 other companies have joined the market, so that 23 robo-advice companies are currently active in Germany. Approximately half of these advice platforms were founded in 2014 or later and consequently have had almost no assets under management during the observation period of this study.

Figure 19: Assets under management in the robo-advice subsegment in EUR



In the robo-advice subsegment the **average annual growth rate** of the assets under management was approximately **1,200%**. From 2013 to 2014, the volume of assets under management in the robo-advice subsegment nearly tripled. In 2015 there was also a very high growth rate, amounting to nearly 500%.

More than half of the assets under management in the robo-advice subsegment are controlled by the two market leaders, SmartDepot and Quirion. Most German robo-advice providers invest in exchange traded funds (ETFs). This holds for the two market leaders. For some robo-advice providers, the investment universe also extends to shares and mutual funds. The advantageous cost structure of ETFs and the high degree of automation in the industry allow robo-advice providers to charge much lower fees by comparison with traditional fund managers. On the platform Quirion, investors are only billed for 0.48% of their investments (Quirion, 2016). In general, businesses in the robo-advice subsegment offer simple and user-friendly services to investors, which is a strong argument for the future use of these platforms (O'Keefe et al., 2016). In addition, O'Keefe et al. (2016) explain that as a result of their cost structures robo-advice providers are able to meet the needs of young investors with only modest personal wealth. With a minimum investment of between 0 EUR (Vaamo or Ginmon, for example) and 10,000 EUR (Scalable or Quirion) and the possibility of maintaining a savings plan, robo-advisors have had the opportunity to develop a new investor class that had not been served by traditional asset managers.

The robo-advice industry in the US has received generally positive media coverage in recent years, which is likely to have also boosted growth in Germany. Firstly, well-known American robo-advice providers such as Betterment and Wealthfront could already boast approximately

3 billion USD in assets under management by the end of 2015 (Malito and Zhu, 2016). In addition, traditional American asset managers have now developed their own robo-advice services for the US market.[14]

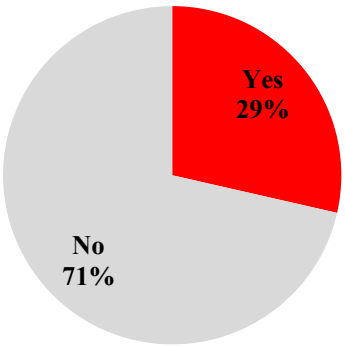
German robo-advice providers employed a total of 158 people in 2015. This represents an average of around seven employees per company.

Seven of the robo-advice providers that are currently active in Germany participated in our survey. The volume managed by these providers represented approximately 35% of the total market in 2015. All of the surveyed robo-advice providers have licenses. The majority indicated that they had the authority to manage investments in accordance with §34f of the Trade Regulation Act (GewO). In addition, there was mention of permission to provide financial services pursuant to §32 of the German Banking Act.

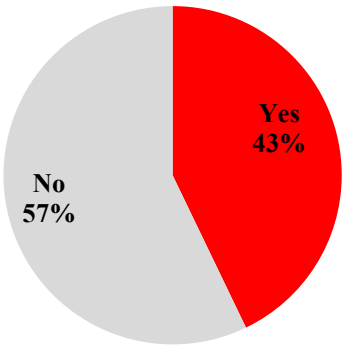
Perceived regulatory and technological impediments

Only two providers complained about a lack of interfaces with banks and the generally low level of digitalization in the financial services sector. Three of the robo-advice providers complained of regulatory impediments (Fig. 20). A principal challenge in this regard is the high costs associated with various legal requirements. In addition, §34f of the Trade Regulation Act (GewO), which is primarily concerned with traditional forms of personal financial advising, can create difficulties of various kinds for online-based activities.

Figure 20: Technological and regulatory impediments in the robo-advice subsegment



Technological impediments (N=7)



Regulatory impediments (N=7)

[14] The investment advisers Vanguard and Schwab Capital have brought robo-advice services into the US market.

4.10 Personal Financial Management

Approximately **1.2 million people** in Germany use bank-independent PFM systems for the visualization and analysis of their personal finances. This estimate is based on a survey by Lößl et al. (2014), according to which 3% of respondents used PFM systems from an independent vendor. In addition, 5% of respondents said they were using PFM applications through a bank. In the calculation of the number of users of independent PFM providers, it was taken into account that the sample of the study is not representative for the German population as a whole.[15]

There are numerous applications of PFM that exist within the German market. Due to the partial overlap between the digital offerings of traditional banks on the one hand and of FinTechs from other subsegments on the other, it is difficult to estimate the volumes processed by PFM systems. The services of PFM systems range from apps to online solutions to software that has to be downloaded. There are also significant differences with respect to functionality. Some providers simply focus on the clear presentation of financial volumes and transactions. As a rule, accounts may be accessed through a number of financial institutions, or at the least outputs and expenditures may be analyzed. This includes, among others, the app Just Spent, which enables the categorization and analysis of expenses. Other PFM systems, such as Finanzblick, make it possible to manage personal payment transactions, including domestic and foreign transfers, via the PFM application. Some PFM systems have even integrated advising functionality for their users. After all accounts and financial volumes have been entered and visualized in the PFM application, the system compares these with other offers and thus gives customers the potential to optimize their transactions. An example of such an application is the App Treefin.

Only one business from the PFM subsegment took part in our survey. The FinTech indicated that it holds various brokerage licenses. No regulatory or technological impediments were mentioned.

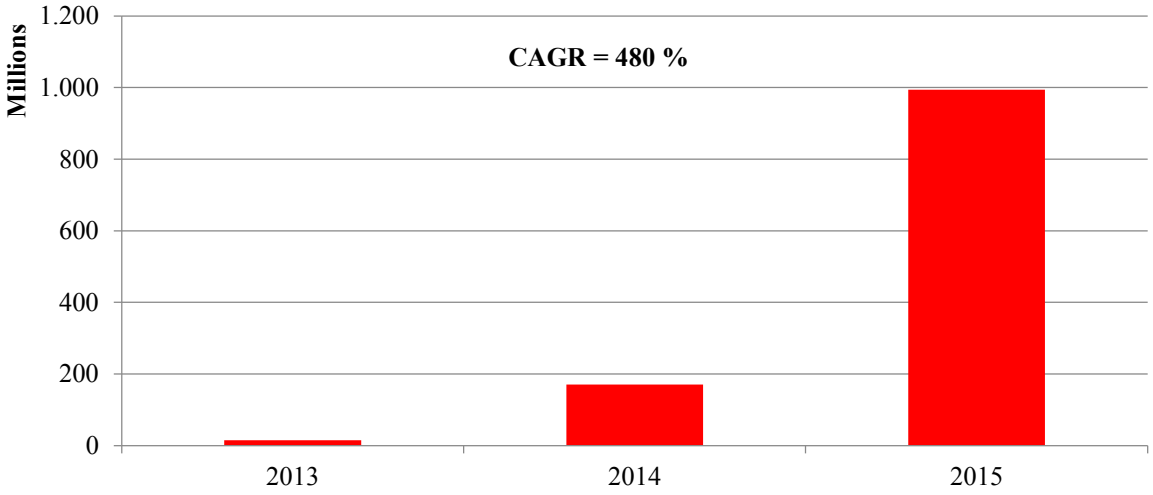
[15] A total of 98% of those interviewed stated that they regularly use online banking. It can be concluded from this that Internet savvy users are overrepresented in this sample. According to the Association of German Banks (Bankenverband, 2015), only 56% of the German population used online banking to perform banking transactions in 2014.

4.11 Investment and Banking

The **assets under management** of FinTech businesses in the investment and banking subsegment were **nearly 1 billion EUR** in 2015 (Fig. 21). In 2013, WeltSparen became the first Europe-wide online deposit brokers in the market. Additional platforms with a similar business model, such as Zinspilot and Savedo, entered the market one year later. Brokers of banking solutions have participated in the German market since 2015. Online-based investment managers are still a recent phenomenon. These FinTech businesses first entered the German market between the end of 2015 and the beginning of 2016. They accordingly registered no significant assets during the period of observation.

There is a total of six businesses in the investment and banking subsegment. Three of them offer investment advice, two engage in online-based asset management, and one provides banking solutions. None of these businesses has yet discontinued its business operations.

Figure 21: Assets under management in the investment and banking subsegment in EUR



The assets under management in the investment and banking subsegment rose with a **growth rate of over 480%** between 2014 and 2015. The high growth rate is primarily attributable to the fact that the majority of businesses in this subsegment are still very young. Comparative analyses of all the FinTech subsegments show that in the beginning phase of a given market it is typical for there to be a high growth rate.

Approximately 97% of the assets under management in the investment and banking subsegment are attributable to three platforms utilizing business models geared toward investment advice. The business plans of these platforms are based on the EU-wide deposit guarantee scheme from 2014. Accordingly, deposits (in particular, daily and fixed-term deposits) of up

to 100,000 EUR are guaranteed throughout the EU.[16] Deposit platforms provide daily and fixed-term deposits to partner banks, which can also be located in other EU countries. Since foreign banks offer interest rates that differ from domestic institutions by over 200 basis points, investors can take advantage of interest rate differences between individual member states of the EU and at the same time secure their deposits of up to 100,000 EUR. In addition to the user-friendliness of the FinTech portals in general, the historically low interest rates in Germany are likely to have contributed significantly to the industry's growth.

In 2015 there were approximately 250 people employed by FinTechs in the investment and banking subsegment. That represents an average of about 42 employees per company.

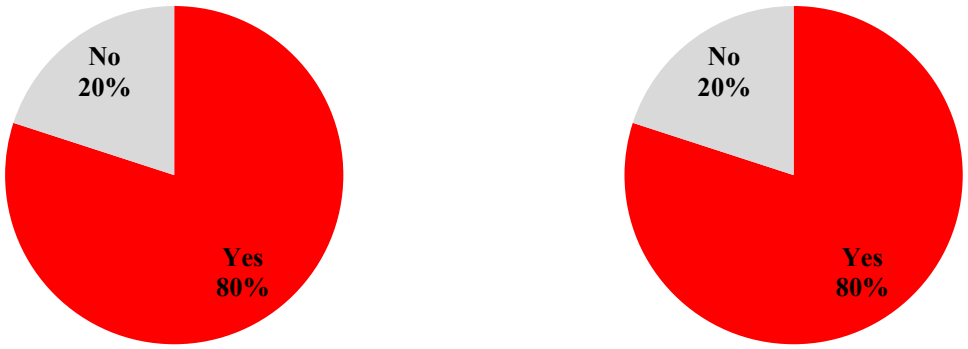
Five of the six businesses in the investment and banking subsegment took part in our survey. These five businesses represented 83% of the total assets under management in this subsegment in 2015. Two companies that currently offer asset management have, according to their own data, a permit to provide financial services pursuant to §32 of the German Banking Act or have applied for one. None of the other businesses based in Germany have any kind of special licenses.

Perceived regulatory and technological impediments

Nearly all of the surveyed FinTechs in the investment and banking subsegment had criticisms of the state of technology in Germany (Fig. 22). A principal concern is that the German central bank uses outdated systems that are slow and inefficient when processing SEPA transfers. They also complained of poor Internet connections in rural areas as well as inadequate data supply. A majority of the surveyed businesses also drew attention to regulatory impediments to their business operations. They mentioned the sheer number of applicable regulations and the inconsistent application of them throughout Europe. In particular, rules on money laundering have been implemented differently in various countries, and meeting the various national standards is associated with high compliance costs.

[16] The deposit guarantee can apply to amounts exceeding 100,000 EUR, so long as the payment was not made more than three months previously and is linked to a specific life event such as a home sale (see Directive 2014/49 / EU).

Figure 22: Technological and regulatory impediments in the investment and banking subsegment



Technological impediments (N=5) Regulatory impediments (N=5)

4.12 Payments

In 2015, the **volume of transactions** of FinTech businesses in the payments subsegment was approximately **17 billion EUR**. Approximately 15 billion EUR of this is attributable to alternative payment methods used for online purchases. According to a study of Worldpay (2015), 31% of all e-commerce sales in Germany had already been transacted through eWallets by 2015. The market leader specializing in this payment method is PayPal, which was founded in 1998. It is also necessary to take account of cryptocurrency transactions, which account for approximately 2 billion EUR, in the payments subsegment. The daily transaction volume of the 200 most important international cryptocurrencies is almost 190 million USD (CoinMarketCap, 2016). Since detailed information about the use of cryptocurrencies in Germany is not currently available, the market volume is estimated to be 2 billion EUR on the basis of Germany's share of the world's gross domestic product (IMF, 2015).

By the end of the observation period a total of 79 FinTech businesses specializing in payment solutions had been founded in Germany. A total of 70 of these businesses are still active in the German market.

The most important driver of growth in the payments subsegment is the increasing popularity of e-commerce. According to the Trade Association of Germany (2016), sales in e-commerce have increased since 2006 with an average annual growth rate of over 11%. Alternative payment options such as eWallet systems may also benefit from this development. Other payment services, such as contactless payment, are not yet widely used in Germany. A survey by Kilic et al. (2015) shows that contactless payments using mobile telephones are very rarely made in

Germany. Only approximately 20% of banks currently offer their customers any form of contactless payment options.

Bitcoin, which is the most widely used cryptocurrency, was developed in 2008 and appeared on the market one year later. However, the virtual currency only began to gain widespread public attention since 2012 (Gandal and Halaburda, 2016). Besides Bitcoin, there are more than 700 other crypocurrencies worldwide, all of which have lower transaction volumes (CoinMarketCap, 2016). Glaser et al. (2014) show, however, that these virtual currencies are often not used as a method of payment, but rather as speculative investments.

The PSDII is of decisive importance for the payments subsegment.[17] Since the adoption of the Directive by the European Parliament in October 2015, not only traditional financial institutions but also FinTechs specializing in payment solution services fall within the scope of regulation. Similar to providers of PFM systems, the FinTechs that are affected by the Directive are likely to suffer an increase in compliance costs in order to meet the legal terms of the new regulations. On the other hand, it is particularly FinTechs within the payments subsegment that stand to gain the most from the open-access provision of the PSDII. As a result of the improved access to account information, new products and services could be developed in the payments segment that are beneficial to consumers.

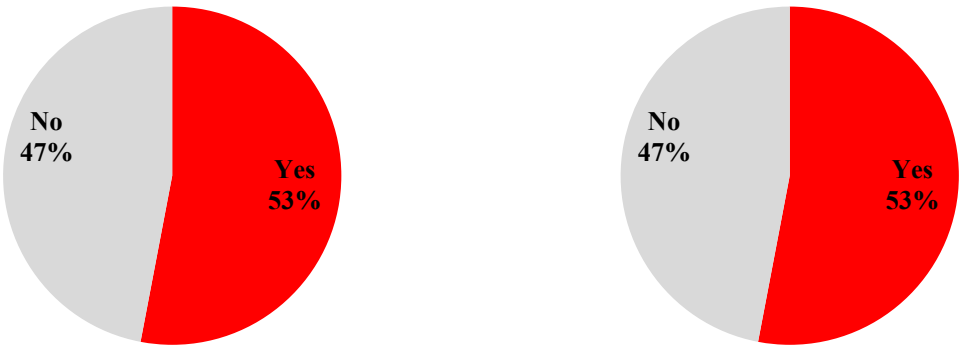
Eleven businesses in the payments segment took part in our survey. Five of these FinTech businesses indicated that they did not own special licenses, but that they were covered under the banking licenses of partners with which they cooperate. One FinTech possesses a license to transact certain investments in accordance with the Payment Services Supervision Act (ZAG), one FinTech has a full banking license, and one FinTech has applied for a license to solicitate investments in accordance with §34f of the Trade Regulation Act (GewO).

[17] For a detailed introduction to PSDII, see section 4.1 of the Current Market Environment.

Perceived regulatory and technological impediments

Five of the companies that were surveyed mentioned technological inadequacies in Germany (Fig. 23). In particular, they suggested that the expansion of the broadband network in Germany was not yet sufficiently advanced and there was a considerable need to develop NFC terminals, which employ near-field communication technology to enable contactless payments. Nine businesses indicated that there were regulatory impediments to their operations. Almost all of these companies drew attention to uncertainties as to how their businesses models were affected by the regulatory environment as well as the time and costs associated with regulation. In addition, they suggested that it is difficult to comply with rules regarding data protection, particularly in light of the fact that there is no uniform procedure for data protection in the various states.

Figure 23: Technological and regulatory impediments in the payments subsegment



Technological impediments (N=11) Regulatory impediments (N=12)

4.13 Insurance

During the observation period, 37 FinTechs were founded in Germany that offer or broker insurance services. 32 of these are still active in the German market today. The business models of FinTechs in this subsegment are highly varied, ranging from peer-to-peer insurance, to comparison sites on which insurance can be purchased directly, to short-term insurance schemes. A closer look at the individual providers also shows that insurance companies represent one of the most significant recent developments in the German FinTech market. Nearly half of the businesses in this subsegment entered the market in the course of 2015.

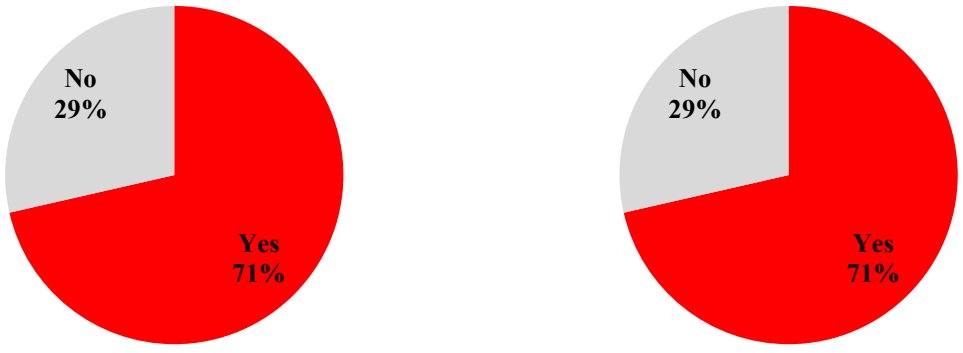
Insurance FinTechs employed a total of approximately 300 people in 2015. This represents an average of about eight employees per company.

Seven companies from the insurance segment participated in our survey. All of the participants stated that they had a license to provide insurance in accordance with §34d of the Trade Regulation Act (GewO). One of these companies also indicated that it was in possession of a broker's license in accordance with §34c of the Trade Regulation Act (GewO).

Perceived technological and regulatory impediments

Five of the companies that were surveyed mentioned technological inadequacies in Germany (Fig. 24). In particular, they complained that there are too few API interfaces and a shortage of skilled workers. More generally, they made reference to the low level of digitization of insurance companies and the insufficient dissemination of broadband. Five companies were also critical of regulatory impediments to carrying out their business. They were especially concerned about the uncertainty with regard to the regulation of FinTechs, as well as the high costs in administration and time required to comply with existing regulations.

Figure 24: Technological and regulatory impediments in the insurance subsegment



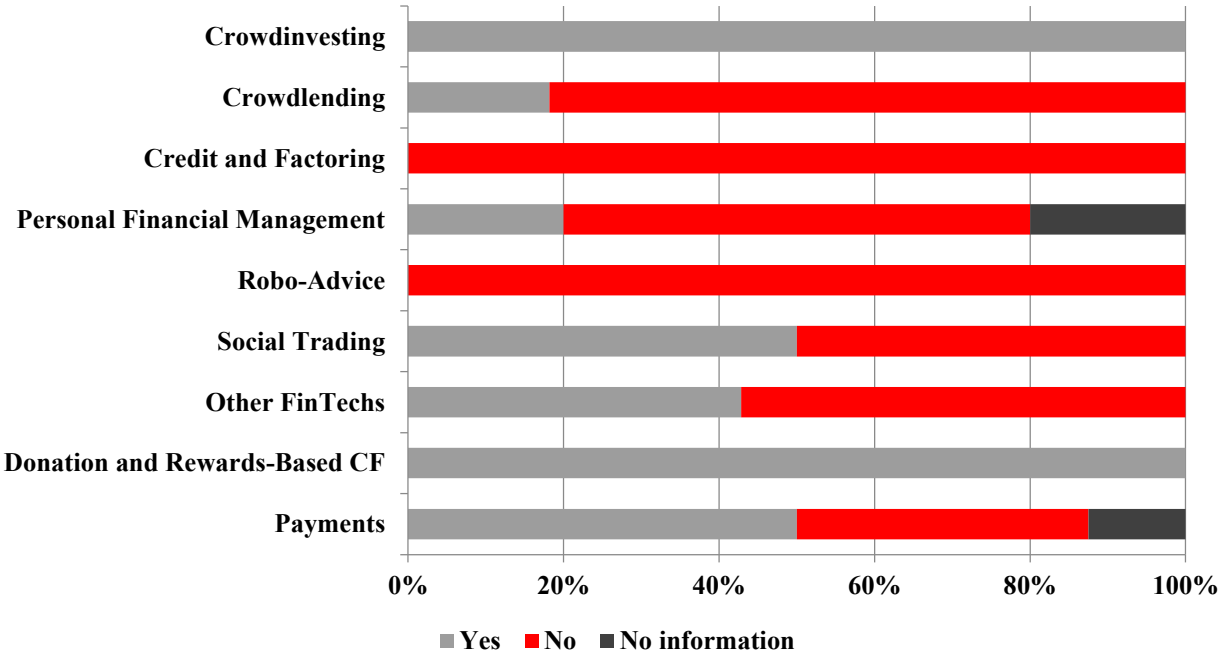
Technological impediments (N=7) Regulatory impediments (N=7)

4.14 Global Player

In all four FinTech segments, large, internationally active FinTech companies have also established themselves and made at least some of their products and services available to German consumers. A total of 58 of these global players were considered in this study, out of which

25 are currently active in the German market. A total of 29 global players only offer their products and services abroad, and in three cases it is unclear whether the FinTechs are active in the German market (see figure 24). Moreover, 23 international FinTech businesses operate in the financing segment. There are five global players in the donation and rewards-based crowdfunding subsegments, eight in crowdinvesting, nine in crowdlending, and one in the credit and factoring subsegment. In addition, ten global players offer PFM systems, five give robo-advice and three are involved in social trading. Eight global players provide payment solutions and a further seven are included in the other FinTechs segment.

Figure 25: Availability of services from global players in Germany



The volume generated in Germany cannot be determined for the majority of global players. As a result, no statements can be made with regard to the overall volume and the growth rates of global players.

Four global players took part in our survey and furnished additional information. One of these businesses participates in the crowdlending subsegment and three are active in the payments segment. Two of these global players stated that they own a German subsidiary in the legal form of a limited liability company (GmbH). The other two companies surveyed are subject to the regulation of the Financial Conduct Authority (FCA) in Great Britain.

4.15 FinTech activities of German banks

In this study the nine largest German banks[18] and 33 innovative[19] small and medium-sized banks were investigated with respect to their FinTech activities. Out of the total of 42 financial institutions, 16 provided information in our survey. These included three of the five largest German banks.

Digitization and FinTech activities are seen as the way of the future by most of the traditional financial institutions. The degree to which individual banks are already invested in FinTech operations varies very significantly. First of all, banks differ in terms of the supply of products and services typically offered by FinTechs. While some banks already offer various FinTech-related services, others are scarcely involved in them. In particular, most banks have as of yet scarcely explored crowdfunding solutions. Only one bank that was surveyed provides a crowdfunding solution, and another bank—Commerzbank—offers crowdlending services to its customers. However, these institutions have only recently made such services available. The crowdlending platform of Commerzbank, called Main Funders, first went online in the middle of 2016. This portal, which is directed at SMEs, aims at bringing together different clients of Commerzbank and offering them an alternative form of financing (Main Incubator, 2016).

PFM systems, on the other hand, are already offered by a large number of institutions. These PFM systems have, however, so far mainly focused on the financial volumes of their own bank. In addition, nine of the banks surveyed have alternative payment options, such as transferring money by means of an app. Robo-advice solutions are already offered by a number of German banks (for example, Deutsche Bank, Comdirect Bank and ING-DiBa). Two additional financial institutions indicated in the survey that they had public API interfaces. The majority of surveyed banks indicated that up to now only a low number of clients made use of these innovative products and services, though the trend is growing.

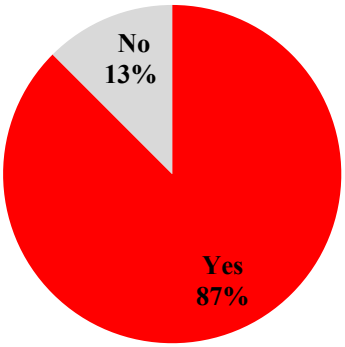
The degree to which banks cooperate with FinTechs also varies. In our survey, three banks said that they were already invested in FinTech companies. However, 14 banks pointed out that they cooperated with FinTechs on various initiatives (see Figure 25). The types of cooperation referenced by these banks must be differentiated. While some banks have formed con-

[18] The Association of German Banks lists the largest German banks, as measured by their total assets (Bankenverband, 2015).

[19] In this study, financial institutions are classed as innovative if they have already entered into cooperation with FinTechs or offer FinTech services themselves (for start-up companies). An overview of these financial institutions is provided by Bajorat (2015) and has been supplemented by five additional companies for the present investigation.

tractual ties with FinTechs, others have launched accelerator programs (Commerzbank, for example) or offer FinTechs financial and technical support.

Figure 26: Cooperation of banks with FinTech companies



N = 16

A total of 87% of the surveyed banks either currently cooperate with a FinTech business or are pursuing a partnership or cooperation with FinTech businesses in the future. In this context, most of the banks explained that they see FinTechs less as a threat to their business model than as an opportunity to drive innovation and digitization.

Perceived technological and regulatory impediments

Four banks complained of technological deficiencies. Above all, they see Germany as being far behind other countries in terms of mobile payment options, such as the spread of NFC technologies. In addition, they suggested that in general digitization has not progressed far enough in Germany. Nine banks complained of regulatory impediments. In particular, they cite the density and complexity of legislation, which comes with high costs for businesses and also represents an obstacle to new FinTechs entering the market.

5 Forecasts for the FinTech market in Germany

In order to assess not only the present but also the future importance that FinTech companies will have for the German market, we provide a forecast of the size of the FinTech market for the next five, ten and twenty years. Despite the current media presence of the FinTech industry, our empirical study shows that it currently has a small volume relative to the entire financial market. Traditional financial institutions or asset managers today claim the largest market shares in the respective subsegments. However, the current state of the market does not rule out the possibility that the markets addressed by FinTechs are developing rapidly, as has been the case with other disruptive technologies, such as those occurring within the music industry or online hotel bookings.

5.1 Methodology

Within the scope of this study, market volumes of the financing and asset management segments are projected for the years 2020, 2025 and 2035. A linear extrapolation of past trends can be highly misleading, since the past development of other disruptive technologies such as online hotel bookings shows that exponential growth rates are often recorded in the nascent years of an industry (VIR, 2013). For this reason, in what follows we present a forecast of the German FinTech market on the basis of potentially addressable markets. For this purpose, it is necessary first to calculate the current size of the market FinTech companies can potentially address. In extrapolating from current market volumes, statistical adjustments are made to estimate the size of the potentially addressable markets for the next five, ten and twenty years.

Next, we calculate the potential market penetration that FinTech companies can achieve in these markets in the future. To this end, the market penetration of another disruptive technology is used as a benchmark and adapted to the future FinTech market environment. The potential market penetration is also adjusted to take into account the current widespread use of the Internet in Germany.

Within the framework of the following forecast, the size of the potential market is multiplied by the potential market penetration. Next, we present three different scenarios describing future developments based on differential customer value. The three scenarios are discussed separately for each segment. Finally, the scenarios are compared with the projections made by the FinTech companies who participated in our survey.

5.2 Potential addressable markets

Overall, the volume of potentially addressable markets in FinTech's financing and asset management segments was nearly 1.7 trillion EUR in 2015. This figure consists of a market volume of approximately 380 billion EUR in the financing segment and approximately 1.3 trillion EUR in the asset management segment.

The potential addressable markets do not necessarily correspond to the FinTech subsegments defined above, since some of those sometimes target the same markets. This is the case, for example, with the crowdlending and credit and factoring subsegments. In the financing segment, four different potential markets are considered. We distinguish between potential markets for (1) donation and rewards-based crowdfunding, (2) crowdinvesting, (3) crowdlending and other forms of credit, and (4) factoring. In the asset management segment, the potentially addressable markets comprise (5) social trading, robo-advice, and investment and banking, as well as (6) PFM. There are no projections for the payment services and other FinTechs segments in this study. Accordingly, no potential markets are defined for these segments.

Donation and rewards-based crowdfunding

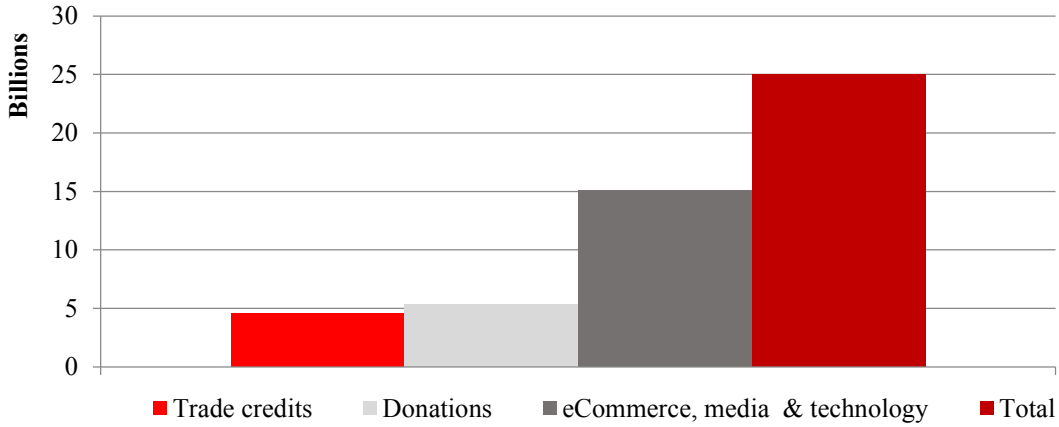
The primary goal of donation and rewards-based crowdfunding is the financing of charitable and creative projects. In the case of charitable projects in particular, investors often do not receive any consideration for their investment. They donate their money. Accordingly, the amount of annual donations in Germany is used to assess the potential market for this subsegment. For the year 2015, the umbrella organization Deutscher Spendenrat e. V. (2016) estimates this value to be 5.4 billion EUR.

In the case of rewards-based crowdfunding, there is often a pre-purchase of a product that is still in development. As a rule, it is mainly start-ups and smaller companies that make use of this form of financing. Therefore, the aggregated trade credit of SMEs are used to assess the potential market. According to the definition provided by the *Institut für Mittelstandsforschung Bonn* (IfM Bonn), companies with a turnover of less than 50 million EUR (IfM Bonn, 2016) are regarded as SMEs. Data from the German central bank (Deutsche Bundesbank, 2015) are used to determine the volume of trade credits of these companies. However, rewards-based crowdfunding is not equally suitable for all industries. This form of financing appears particularly suitable for products that are easily scalable but difficult to copy (Hornuf and Schwienbacher, 2016b). Companies with high costs for research and develop-

ment are used as an approximation for the potential market, since as a rule their innovations are difficult for competitors to imitate. The industry classification of the KfW survey of SMEs (KfW Research, 2015) is used as the basis for this. According to this survey, 2% of the German SMEs are active in research and development intensive industries. The volume of the trade credits of these businesses, which corresponds to the potential market for crowdfunding, is calculated to be 4.6 billion EUR.

In addition, it is common in the donation and rewards-based crowdfunding subsegment to receive a non-monetary consideration, such as a t-shirt displaying the logo of the financed organization. In order to estimate the size of this market segment, the level of e-commerce in the media and technology sector is used. As in the case of pre-purchases, this kind of reward for financing does not make sense for all business models. This form of financing is particularly important for musicians and other artists. In addition it can be relevant within other areas of media and technology, such as the development of video games. According to the results of Doplbauer (2015), revenues in this area of e-commerce account for around 15.1 billion EUR in 2014. As Figure 27 illustrates, the potentially addressable market of donation and rewards-based crowdfunding has a total volume of around 25 billion EUR.

Figure 27: Potential addressable market volume of donation and rewards-based crowdfunding in EUR

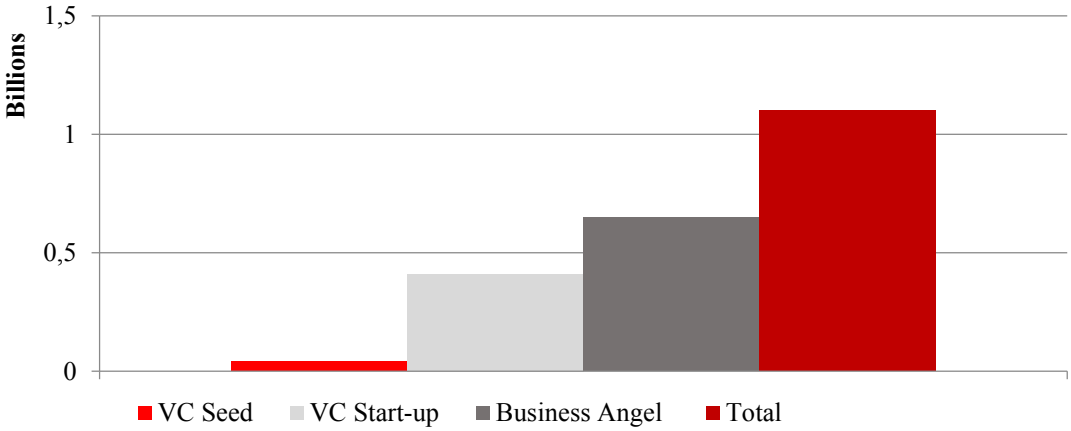


Sources: own calculations, German Central Bank (2015), Deutscher Spendenrat e.V. (2016), KfW Research (2015), Doplbauer (2015)

Crowdinvesting

The business model of German FinTechs in the crowdinvesting subsegment generally consists in providing young companies with equity or mezzanine capital. It is expected that crowdinvesting will at least partly replace the financing of businesses through business angels and venture capital funds in the seed and start-up phase. According to a study by Egeln and Gottschalk (2014), which evaluates the KfW/ZEW start-up panel, business angels provide 650 million EUR of financing for businesses in Germany annually. Added to this is the volume of venture-capital funds. According to the German Private Equity and Venture Capital Association (*Bundesverband Deutscher Kapitalbeteiligungsgesellschaften – BVK*), in 2015 financing for businesses in the seed phase was approximately 40 million EUR and for businesses in the start-up phase was another 411 million EUR (BVK, 2016). In total, the potential market volume amounts to 1.1 billion EUR. Figure 28 shows the composition of the potential market for crowdinvesting in Germany.

Figure 28: Potential market volume of crowdinvesting in EUR



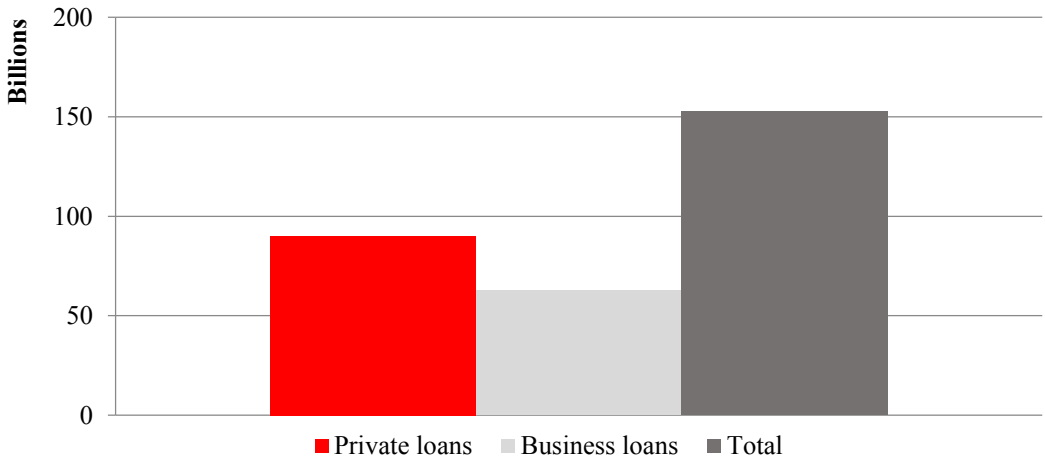
Sources: own calculations, BVK (2016), Egeln and Gottschalk (2014)

Crowdlending and other types of credit

The crowdlending subsegment provides loans to private individuals and businesses. As with a traditional bank loan, in crowdlending borrowers usually pay a pre-determined interest rate. The same target market serves FinTechs from the credit and factoring subsegment, which also lends but does not include the participation of the crowd. Therefore, the forecast for both of these subsegments is summarized. According to the statistics of the German central bank (Deutsche Bundesbank, 2016a), there were 90.1 billion EUR in consumer loans granted in

2015. The second part of the potential market is represented by corporate loans. With respect to this form of credit, it is important to consider that offers are generally only extended to SMEs. Accordingly, for the potentially addressable market of crowdlending and other loans, only those loans that finance SMEs are taken into account. Data from the KfW SME Panel (*KfW Mittelstandspanel*) of 2015 shows that in 2014 bank loans worth 62.6 billion EUR were distributed to German SMEs in order to finance their investments (KfW Research, 2015). The potentially addressable crowdlending market thus has a total volume of 152 billion EUR, as shown in Figure 29.

Figure 29: Potential market volume of crowdlending and other loans in EUR



Sources: own calculations, German Central Bank (2016a), KfW Research (2015)

Factoring

Other FinTechs offer companies innovative services and products for the factoring of their accounts receivable. The potentially addressable market consists in the volume of accounts receivable that is currently purchased by traditional factoring companies. According to the German Factoring Association (Deutscher Factoring-Verband, 2016), factoring companies purchased nearly 210 billion EUR in 2015. The members of the association account for more than 98% of the volume of accounts receivable purchased in Germany and thus represent virtually the entire market. Therefore, the potentially addressable market for FinTechs of the factoring subsegment is valued at 210 billion EUR.

Social Trading, Robo-Advice and Investment and Banking

In the asset management segment, FinTechs of the social trading, robo-advice, and investment and banking subsegments offer advice and the management of assets. FinTechs in the investment and banking subsegment also manage savings. As the three subsegments are largely aimed at the same market, they are grouped together in the following estimate. The products and services of these FinTechs are primarily of interest to private investors in Germany. For this reason, assets that are invested in shares, interest-bearing securities, certificates, and funds, or else take the form of savings, are defined as potentially addressable market for these subsegments. The size of the relevant volumes can be calculated using data from the German central bank (Deutsche Bundesbank, 2016b). According to this data, about 10% of German households owned shares in 2014. The average volume of shares amounted to 39,000 EUR per household. Since there are approximately 40.2 million households in Germany,[20] this leads to an aggregate volume of shares totaling 156.9 billion EUR. The calculation of the volume of certificates, interest-bearing securities, funds and savings is carried out in the same way. Accordingly, in 2014 residents of Germany invested a total of 9.8 billion EUR in certificates, 69.3 billion EUR in interest-bearing securities, 207.6 billion EUR in funds and 851.4 billion EUR in the form of savings. This amounts to a total of almost 1.3 trillion EUR of securities and savings accumulated by private individuals in Germany.

Personal Financial Management

The goal of PFM systems is to facilitate customers' private financial planning by means of specialized software or an app. The volumes of various financial institutions are visualized and analyzed in an application. The target group of PFM providers comprises private individuals. To estimate the potential market for PFM, people living in Germany who are above 16 years of age and have relevant financial resources are considered. According to data provided by the Federal Department of Statistics (Destatis, 2015), approximately 70 million people over the age of 16 live in Germany. These comprise the potentially addressable market for PFM services.

[20] The data regarding the number of households in Germany comes from the Federal Department of Statistics (Destatis, 2010).

Statistical Adjustments

The volumes of the potentially addressable markets described above will probably continue to grow in the future. In viewing the probable market conditions for different times in the future, statistical adjustments are made. In principle, it is assumed that the volumes of potential markets in the financing sector will develop in the same way as the German economy as a whole. The annual growth rate of the gross domestic product (GDP) is used as an indicator. For the next five years, the federal government forecasts an average GDP increase of 1.6% (BMWi and BMF, 2016). In addition, the market for corporate loans and factoring should increase in tandem with the growing number of SMEs. According to data provided by the IfM Bonn (2012), the growth rate of SMEs has historically averaged a relatively low 0.2%. Similarly, the market potential for private loans should increase in tandem with the growing number of German households. Projections regarding the growth in the number of households have been published by the Federal Department of Statistics (Destatis, 2010) and are taken into account in the following analysis.

The potentially addressable market for robo-advice, social trading, and investment and banking will also be adapted in accordance with the different forecasting dates. First of all, it is assumed that the value of securities and savings increases in proportion to the return generated. Since stocks historically generate a higher return than bonds or savings, we use a weighted average of the returns from the German stock index, and from long-term bonds and savings. We make use of data concerning the bond market provided by the German central bank (Deutsche Bundesbank, 2016c). Data from the Federal Department of Statistics (Destatis, 2016) is used to calculate the average annual savings of Germans. However, since not all Germans have these types of securities or savings and in general do not invest their entire savings in them, only part of the calculated average annual savings is taken into account in determining the size of the potential market.

The adjustment of the potential market for PFM is based on the population estimates of the Federal Department of Statistics (Destatis, 2015).

5.3 Potential Market Penetration of FinTech Businesses

In order to predict the future importance of the FinTech industry, the historical market penetration of another disruptive technology is used as a comparison. Since online banking is both

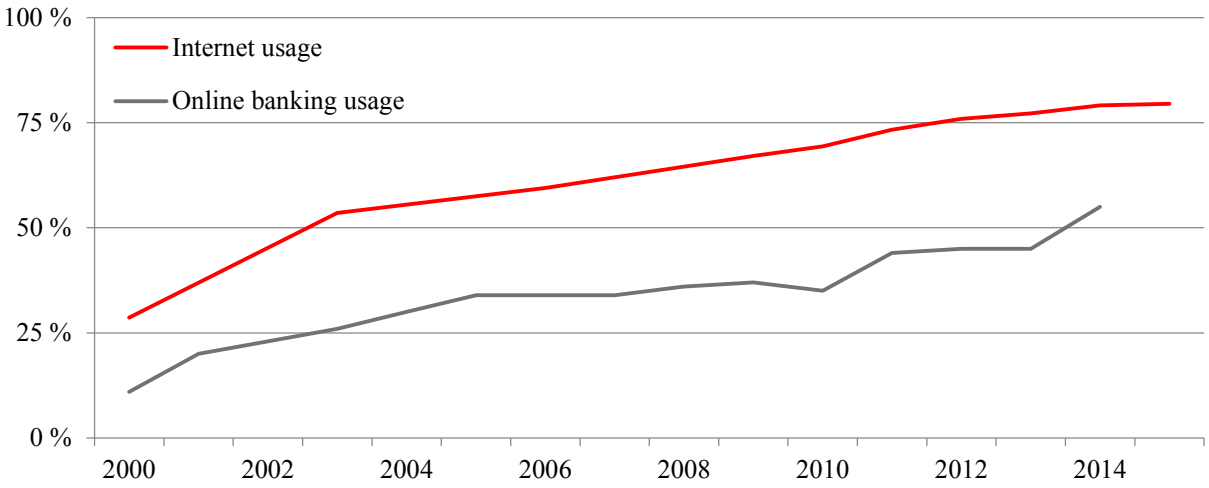
Internet-based and a financial service, the development of the market penetration of this technology is used as a benchmark for the FinTech industry.

German participants in the banking industry have been increasingly accepting of online banking since the mid-1990s. Data from a survey carried out by GfK on behalf of the Association of German Banks (*Bundesverband deutscher Banken*) shows that in 1998 a total of 8% of Germans over the age of 18 had already made use of online banking (Bankenverband, 2011). By 2004, the number of people using online banking had risen to 30% and by 2014 it grew again to 54% (Association of German Banks, 2015).

In order to take into account the fact that FinTech businesses have already participated in the market for a number of years, comparison is made with the online banking industry at a similar stage of development. The market penetration of online banking in the year 2000 is taken as the basis for comparison. Values from the online-banking industry from 2005 are used for the 10-year forecast of the FinTech industry; statistics from the online banking industry from 2015 form the basis for an estimate of the FinTech market in twenty years.

In assessing the market penetration of online-based technologies, the expansion and use of the Internet must also be taken into account. Especially in the early phase of the online banking industry, the use of the Internet in Germany was not yet commonplace. An online study from the ARD/ZDF from 2015 shows that only 28.6% of Germans 14 years old and over used the Internet at least occasionally in 2000 (Frees and Koch, 2015). By 2015, this percentage had already grown to 79.5%. The frequency of Internet use has also grown. The ARD/ZDF study shows that in 2015 over 63% of Germans used the Internet on a daily basis. Figure 29 tracks the usage of the Internet and of online banking over time. In order to extrapolate the future development of the FinTech industry from the initial market penetration of online banking, it is necessary to correct for the relatively limited access to the Internet during that earlier period.

Figure 30: Changes in Internet and online banking usage



Sources: Association of German Banks (2011; 2015), Frees and Koch (2015)

Furthermore, demographic information is taken into account in preparing the long-term forecast. People who were born after 1980 and have grown up with digital technologies are called digital natives (Palfrey and Gasser, 2008). This generation is accustomed to navigating the Internet and utilizing information technology in many facets of life. For this reason, it is assumed that digital natives in particular represent a relevant target group for FinTech products and services. Over the course of time, an increasing number of digital natives reach an age at which financial services become relevant. This demographic change should contribute to the development of the FinTech industry. In the forecast of the potential market penetration, then, the data is adjusted to take into account both demographic development and the spread of the Internet.

5.4 Forecast

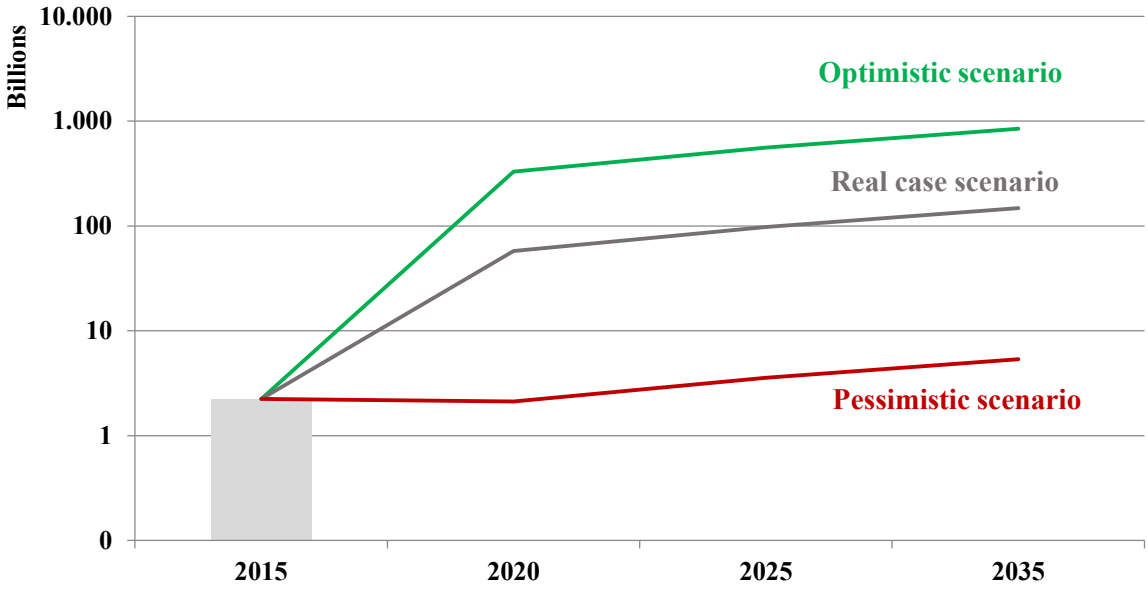
This section provides a forecast for the next five, ten, and twenty years for the financing and asset management segments. With respect to the PFM subsegment, there is no forecast of volumes, but rather of the number of users, since PFM systems generally only represent assets. These assets do not constitute managed assets, as is the case in the other asset management subsegments.

The financing and asset management segments have a total market volume of 2.2 billion EUR. For the forecast of the overall market development, individual subsegments are considered and grouped according to the potential markets defined in section 5.1. The forecast will include the development of (1) donation and rewards-based crowdfunding, (2) crowdinvest-

ing, (3) crowdlending and other loans, (4) factoring, (5) robo-advice, social trading and investment and banking, and finally (6) PFM. In creating this forecast, the potentially addressable market is first multiplied by its potential market penetration and then additionally by a factor that reflects the potential value to the customer in the respective scenario. Alternative future developments are predicted by creating optimistic, pessimistic, and real case scenarios.

The forecast makes it possible to establish a lower limit for the market volume of the financing and asset management FinTech segments. This lower limit corresponds to the sum of the market volumes of the subsegments in the pessimistic scenario. Similarly, the sum of the volumes in the optimistic scenario represents an upper limit for the estimated volume of the future market segments. For the year 2020, the market volume of the financing and asset management (excluding PFM) segments are expected to range from at least 2 billion EUR to a maximum of 330 billion EUR. By 2025, the total market volume of the two segments is expected to grow to between 4 billion EUR and 558 billion EUR. In 2035, the lower limit of the market is expected to be approximately 5 billion EUR and the upper limit almost 847 billion EUR. Figure 31 and Table 1 summarize the various scenarios for the overall market of the financing and asset management segments.

Figure 31: Forecast of the market volume of the German financing and asset management segments in EUR



Note: in the figure a logarithmic scale is used

Table 1: Forecast of the market volume of the German financing and asset management FinTech segments in EUR

	2015	2020	2025	2035
Optimistic scenario	2.2 bn	330 bn	558 bn	847 bn
Real case scenario	2.2 bn	58 bn	97 bn	148 bn
Pessimistic scenario	2.2 bn	2 bn	4 bn	5 bn

Donation and rewards-based crowdfunding

In 2015 the market for donation and rewards-based crowdfunding had a volume of approximately 36 million EUR. Consequently, the donation and rewards-based crowdfunding subsegment had a market penetration of around 0.1% in the potentially addressable market.

In the real case scenario, an increase in the customer value and therefore a concomitant increase in the use of donation and rewards-based crowdfunding platforms are expected. Up until now, fraud on international crowdfunding platforms such as Kickstarter or Indiegogo has been extremely rare (Cumming et al., 2016) and according to the real case scenario will remain at a low level in the future. The customer base is limited, however, by significant delays in the delivery of products within the framework of rewards-based crowdfunding (Mollick, 2014). Yet, the number of delayed deliveries in the real case scenario can be reduced and the

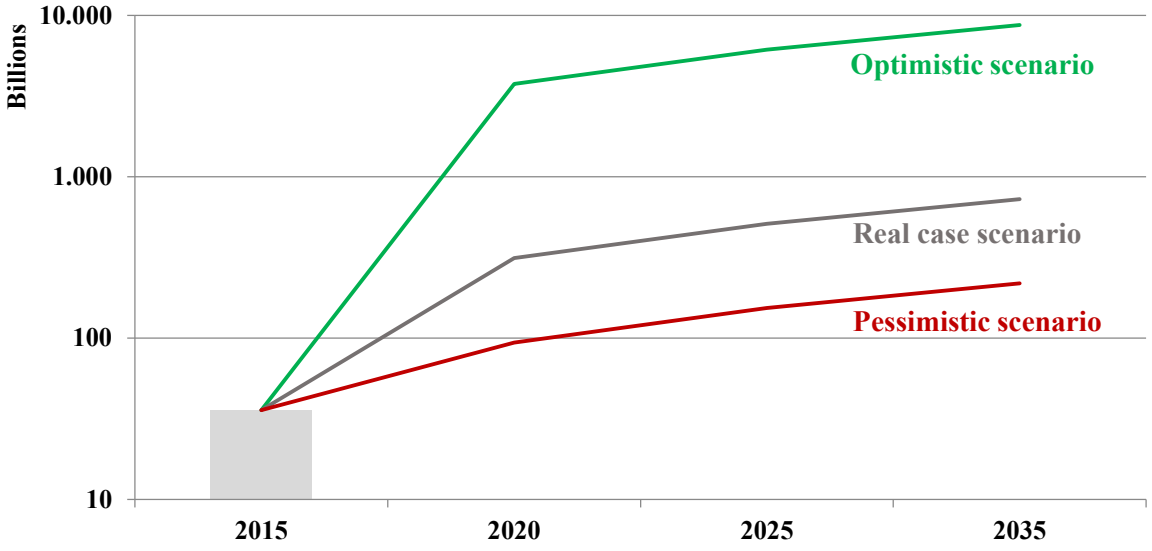
value to customers increased if platforms undertake appropriate measures. Due to the growing trust on the part of those who contribute money in the industry, not only more, but also increasingly larger projects are financed through donation and rewards-based crowdfunding in Germany. In the USA, Kickstarter alone has financed 172 projects with a volume of over 1 million USD secured from the crowd. Positive development in this subsegment will also be fostered by demographic changes: an ever-growing number of digital natives will continue to enter the market and take the opportunity to support social and creative projects via crowdfunding platforms. In this scenario, financed volume will increase to approximately 313 million EUR in 2020. In 2025 there will be further growth in the market to 512 million EUR and in 2035 to 723 million EUR.

The optimistic scenario presumes a very significant increase in customer value. By comparison with the real case scenario, delays in the delivery of products in rewards-based crowdfunding are dramatically reduced. The number of fraud cases remains at a consistently low level. In this scenario, the increased use of crowdfunding is buoyed by not only a growing number of digital natives but also by the increased participation of older and less technologically savvy people. In addition, donation and rewards-based crowdfunding will be incorporated within the state's promotion of cultural and creative projects as well as start-up financing. As a result of federal subsidies of crowdfunding projects, this form of financing of artistic and social projects will become more and more attractive. An increasing number of initiators of such projects rely on this type of financing. In the optimistic scenario the market volume of donation and rewards-based crowdfunding grows to as much as 4 billion EUR in 2020. Market growth continues in subsequent years, so that in 2025 projects worth up to 6 billion EUR and in 2035 of as much as 9 billion EUR will be financed.

In the pessimistic scenario, there is a decrease in the customer value in donation and rewards-based crowdfunding. Historically, there have only been small rates of fraud recorded, but in the pessimistic scenario the growing popularity of this form of financing attracts not only legitimate initiators of projects but also criminals with fraudulent intentions. In addition, products in rewards-based crowdfunding continue to be delivered after considerable delays, and many of the initiated projects fail. In consequence, supporters of the relevant kinds of projects lose faith in crowdfunding platforms and return to traditional ways of supporting charitable and creative projects. Above all, large and well-known charitable organizations that enjoy the trust of the public receive increasingly disproportionate attention. In the pessimistic scenario, the market volume will only rise to as much as 90 million EUR in 2020. Thereafter, there will

continue to be moderate growth, with volumes reaching 153 million EUR in 2025 and 220 million EUR in 2035.

Figure 32: Forecast of the market volume of the donation and rewards-based crowdfunding subsegment in EUR



Note: in the figure a logarithmic scale is used

Table 2: Forecast of the market volume for the donation and rewards-based crowdfunding subsegments in EUR

	2015	2020	2025	2035
Optimistic scenario	36 m	4 bn	6 bn	9 bn
Real case scenario	36 m	313 m	512 m	723 m
Pessimistic scenario	36 m	90 m	153 m	220 m

Only one platform provided its own forecast for the year 2020. The rewards-based crowd-funding platform assumes an average growth rate of 68% for the next five years. The growth predicted by the portal is thus lower than the historical average for the last 5 years.

Crowdinvesting

Crowdinvesting platforms brokered a total of 47 million EUR in financing in 2015. Measured against the potentially addressable market, the crowdinvesting subsegment thus has a market penetration of around 4% at present.

In the real case scenario, it is expected that there will be a moderate increase in the customer value and thus also in the crowdinvesting subsegment as a whole. Crowdinvesting could become more attractive to investors as a result of higher returns. Signori and Vismara (2016) have investigated the crowdinvesting market in Great Britain and estimate annual returns of 8.8%. The actual return on investment in Germany has so far been much lower (Hornuf and Schmitt, 2016). The difference in returns in the two markets is due to the different methodologies employed in the two studies. While Signori and Vismara (2016) calculate the returns on investment in the UK by means of unrealized profits in the event of a firm valuation (for example, in the case of follow-up financing through the respective crowdinvesting portal or private investors), Hornuf and Schmitt (2016) determine the returns in Germany based on the actual exit opportunities for investors. If one compares the probability of companies financed in Germany and the UK surviving on the basis of insolvencies that have so far taken place, British companies have a better chance of remaining actively engaged in the market after three years (Hornuf and Schmitt, 2016). Assuming that actual returns on investment in Germany will increase in the future, investors should accordingly perceive greater value in crowdinvesting.

In addition, the legal frameworks will be modiefied in Germany and become more advantageous for the crowdinvesting industry. It cannot be ruled out that the Small Investor Protection Act will be amended in the future so that the threshold for silent partnerships and non-securitized participation rights will be bound to the current threshold of 2.5 million EUR. In this scenario the business models of crowdinvesting platforms also change. One example of this is the emergence of The DAO (Decentralized Autonomous Organization). The DAO works similarly to an investment fund, but investors can vote to decide how money is invested. What is distinctive about this company is that it is completely based on blockchain technology and uses smart contracts. Smart contracts are computer programs that define contract terms, verify their conditions and, if necessary, enforce their components. Through the use of such contracts, many costs can be saved by comparison with traditional crowdfunding platforms. The success that has been achieved through the use of smart contracts is indicative of the huge market potential of companies like The DAO. Even in an initial financing round, 160

million EUR was already collected from the crowd (Kyriasoglou, 2016).[21] The real case scenario accordingly anticipates a market volume of 69 million EUR in 2020. For the year 2025, there is expected to be a further increase reaching 113 million EUR, and in 2035 the volume could reach 160 million EUR.

In the optimistic scenario, customer value in crowdinvesting is greatly increased by platforms' effective selection of the start-up companies and real estate projects to be financed by the crowd. As a result there are fewer insolvencies and liquidations, and there are also numerous follow-up financings through professional venture capitalists, which provide pay-outs to crowdinvestors in accordance with their respective stakes. Even without an early payout to crowd investors, they earn comparatively high returns after the financing contracts expire. In general, the selection of successful start-up companies and real estate projects through the portals and the investors leads to an improved risk-return profile for investments and makes crowdinvesting more attractive in the eyes of the investors.

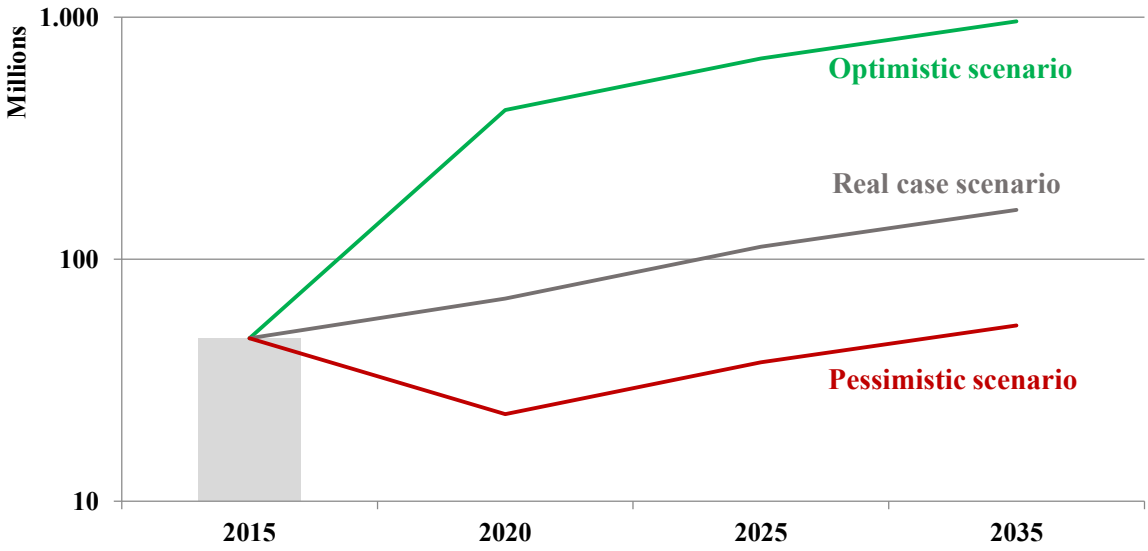
In addition, the crowdinvesting subsegment could be promoted through regulatory changes. In this scenario too, it is anticipated that the Small Investor Protection Act will be modified in such a way that silent partnerships and non-securitized participation rights will be bound to the threshold of 2.5 million EUR. Only assets that simulate an equity interest in a start-up company are currently issued in Germany, mostly because the transferability of shares in a private limited liability company (GmbH) is subject to the notarization requirement, which makes it too expensive to sell a large number of small shares. If the notarization requirement were removed, investors could acquire real equity shares in companies and regular control rights, just as is currently the case in the UK. In such circumstances the investment products in the crowdinvesting subsegment would gain attractiveness for investors. Crowdinvesting could then make inroads in parts of the venture capital and business angel markets, thereby assuming a decisive market share in early-stage and growth financing. In this scenario, it is expected that crowdinvesting will achieve a volume of up to 413 million EUR in 2020. By 2020 the volume is projected to increase to 675 million EUR and then to as much as 959 million EUR in 2035. However, the likelihood of this scenario, in which there is a major increase in the number of crowdinvestors, is estimated to be low.

The pessimistic scenario is based on a downward trend of customer participation in the crowdinvesting subsegment in the future. In the case of a constant or increasing rate of insol-

[21] In July 2016 The DAO was the victim of a cyber attack (Kannenberg, 2016). This first major scandal also illustrates the risks currently associated with the use of this technology.

vencies and liquidations, the expectation of returns from the crowdinvesting subsegment remains low and even falls further. Customer value in the crowdinvesting subsegment accordingly remains low in the pessimistic scenario. Furthermore, investors who develop an aversion to crowdinvesting switch to the crowdlending subsegment, which has hitherto realized higher profits. Only those investors who have other motives for participating in the crowdinvesting subsegment, such as providing capital to friends and family members in a simple and secure way, continue to make use of crowdinvesting platforms in this scenario. In the pessimistic scenario, the market volume is expected to drop to 23 million EUR by 2020. The crowdinvesting market is expected to secure up to 38 million EUR in 2025 and 53 million EUR in 2035.

Figure 33: Forecast of the market volume for the crowdinvesting subsegment in EUR



Note: in the figure a logarithmic scale is used

Table 3: Forecast of the market volume for the crowdinvesting subsegment in EUR

	2015	2020	2025	2035
Optimistic scenario	47 m	413 m	675 m	959 m
Real case scenario	47 m	69 m	113 m	160 m
Pessimistic scenario	47 m	23 m	38 m	53 m

Projections regarding the market situation in 2020, which were canvassed in the survey, are available from eight portal operators. The volume that these participating companies have financed represented approximately 40% of the total market volume in 2015. The amount of

capital that they expect to broker through financings is 720 million EUR, which is even in excess of the amount forecasted in the optimistic scenario above. The platforms surveyed expect there to be very high annual growth rates, averaging more than 100% over the next five years. The predictions for annual growth range from 20% to 300%. These forecasts from the portal operators appear to be unlikely given the current market conditions, since the market growth within the industry has steadily declined over the last five years.

Crowdlending and other loans

In 2015, crowdlending platforms facilitated loans amounting to 190 million EUR and FinTechs operating in the credit and factoring subsegment were responsible for 140 million EUR. FinTechs thus currently have a market penetration of approximately 0.2% from these two subsegments as measured by the potential market.

In the real case scenario, it is expected that there will be increasing use of crowdlending portals and other FinTechs that broker loans to private individuals or companies. Corporate loans are a strong driver of growth. In the more mature market in the UK, crowdlending for companies (including real estate loans) has already resulted in a financed volume of around 1.5 billion GBP, which accounts for the bulk of the capital accumulated through crowdfunding in 2015 (Zhang et al., 2016). Zhang et al. (2016) also show that crowdlending is highly important for small businesses: 13.9% of small businesses are already funded by the crowd in Great Britain. One reason that companies choose crowdlending is to avoid the increased lending cost of traditional banks. Since the introduction of Basel II and Basel III, companies seeking loans are required to get a rating. Müller et al. (2011) point out that loans to companies with a poor rating have become significantly more expensive as a result of higher capital requirements for banks. According to Schindele and Szczesny (2015), the introduction of Basel II has significantly increased SME credit costs for banks using an internal ratings-based approach (IRBA approach). In addition, the study shows that banks using the revised standardized approach (RSA) offer interest rates that have increased by 0.16 percentage points for loans to SMEs with a poor rating.[22] A survey concerning the financial situation of SMEs by the European Commission also shows that for 7% of SMEs in Germany the biggest challenge in their business operations was securing access to financing (Doove et al., 2015). In the real

[22] As part of the implementation of Basel III, an SME correction factor was introduced in the Capital Adequacy Directive and its corresponding Capital Adequacy Regulation to compensate for the higher capital requirements for banks providing SME loans (EBA, 2016).

case scenario, more and more companies resort to crowdlending as an alternative to traditional bank loans, which means that the volume of financing in this segment will continue to rise.

In addition, there is growth in the market for private loans in this scenario. Firstly, the attractiveness of crowdlending investments increases as a result of the development of a secondary market, which provides the opportunity to easily sell these loans later on. This can create additional customer value by allowing the supply and demand sides to better reconcile the respective interests for the course of the loan period. In addition, refinancing the loans through securitization can open up new market segments. Managers of large private assets, such as family offices, might want to finance an already diversified and transaction-minimized financial product rather than deal with a large number of microloans. While in the USA such securitizations have already taken place for more than two years (Wardrop et al., 2016; Scully and Buhayar, 2016)[23], in Europe the first securitization of loans took place in the middle of 2016 on the platform Funding Circle, which is based in Great Britain (Hale, 2016). The German branch of Funding Circle and other platforms in Europe could also securitize their claims in the future, which would give the market additional liquidity. However, there is also the risk that loans will not be appropriately priced in the context of the securitization and possibly related structuring (tranching). This could result in a tranche of such securities that is a desirable on the basis of credit portfolio models, but which poses a higher risk than the given rating would indicate. Such a development was observed after the turn of the millennium and is thought to be a major cause of the last global financial crisis (Roubini and Mihm, 2010).

The real case scenario also predicts increasing demand due to the growing interest of institutional investors. Both in the US and the UK, institutional investors already hold an increasing proportion of loans brokered through crowdlending. In the UK, 26% of corporate loans and 32% of private loans have already been financed by institutional investors (Zhang et al., 2016). In the US, the figures are even higher, with 53% of consumer loans and 73% of corporate loans being held by institutional investors (Wardrop et al., 2016). The volume of loans from the credit and factoring subsegment is also rising as more and more customers discover it as an alternative to traditional bank loans. The market for these loans is growing as a result of several advantages, including rapid credit decisions, the speed with which money is made available, and their overall user-friendliness. Nevertheless, this type of lending continues to play a subordinate role alongside loans secured through crowdlending. In the real case scenar-

[23] In the US, Citigroup Inc. has already issued three bonds that included consumer loans from Prosper Marketplace Inc.

io, there is estimated to be an increase in financed volume of as much as 5 billion EUR in 2020. There is expected to be further growth to approximately 7 billion EUR in 2025 and 11 billion EUR in 2035.

In the optimistic scenario customer participation in crowdlending and other loans brokered by FinTechs continues to grow. By comparison with the real case scenario, the volume of corporate loans financed through crowdlending shows a sharp increase. Especially in the financing of real estate there is considerable growth potential. Both in the UK and in the US, real estate financing is provided through senior collateralized loans (crowdlending) and through equity participation and subordinated debt (crowdinvesting) (Zhang et al., 2016; Wardrop et al., 2016). In the optimistic scenario, real estate financing in Germany is no longer primarily conveyed through subordinated loans in the crowdinvesting subsegment, but rather via senior commercial loans in the crowdlending subsegment. In addition, crowdlending is increasingly used to provide financing to borrowers that tend not to be serviced by traditional financial institutions. De Roure et al. (2016) show that already many risky loans that would not be financed by traditional banks in Germany have been brokered through crowdlending portals. Furthermore, the cost structure of crowdlending platforms can be another advantage. Moldow (2014) shows that, due to the lack of a branch network and automated processes, traditional banks are at a disadvantage of as much as 400 basis points in comparison with the US platform Lending Club.

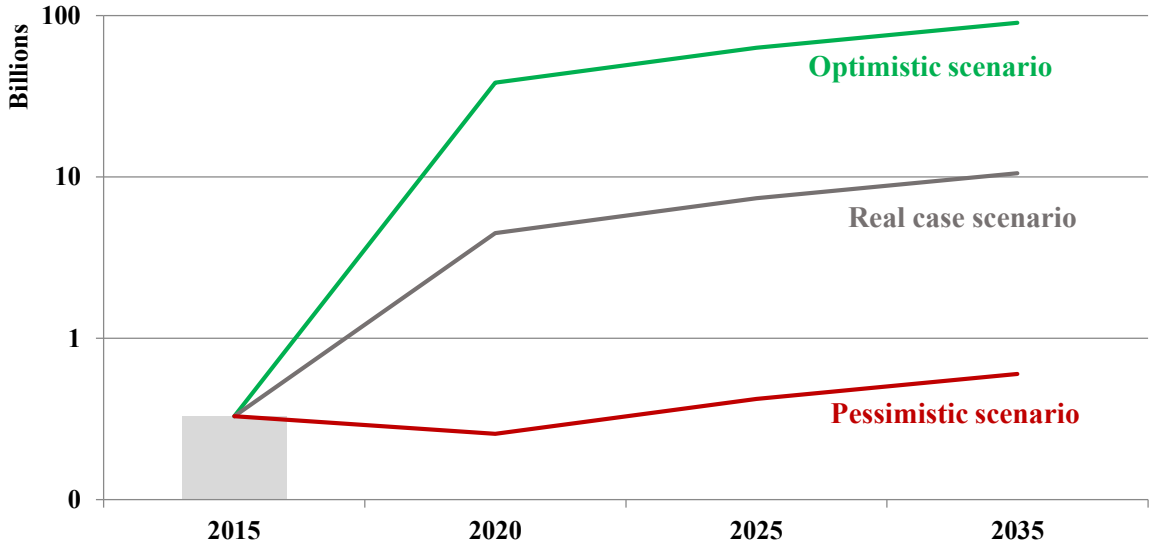
The credit risk models of FinTechs represent another opportunity for businesses offering crowdlending (US Department of the Treasury, 2016). Big data and self-learning algorithms can be used to estimate credit risks more cost-effectively and reliably than by the models of traditional banks. Insofar as FinTech businesses can more accurately assess credit risk, individual investors may also see larger returns. Private loans financed by crowdlending as well as other loans provided through FinTechs grow at a faster rate than in the real case scenario. According to the optimistic scenario, the market will grow to a volume of up to 38 billion EUR in 2020. Growth will then continue, with the total market reaching a volume of 63 billion EUR in 2025 and up to 90 billion EUR in 2035.

In the pessimistic scenario the customer base increases only slightly. As the optimistic scenario suggests, credit models based on analyses of big data represent an opportunity. However, they could also pose risks for the market. The US Department of the Treasury (2016) points out that the credit risk models have so far only been tested in the current environment characterized by low interest rates. In the negative scenario, the models provide poor risk assess-

ments as interest rates return to higher levels. As Dorfleitner et al. (2016a) show, higher interest rates in the crowdlending subsegment led to higher rates of default. If interest rates do not rise to appropriate levels, investors' yields will decrease and so investing in crowdlending loans will lose some of its attractiveness. In any case, even if interest rates rise to an appropriate level, some companies may not be able to afford financing because their projects will yield too low a return. Market growth is therefore subject to a natural limit.

In this scenario, new laws and regulations for crowdlending platforms will be introduced that will increase their operating costs. An increase in the amount of regulation could result from a growing lack of transparency and entrepreneurial misconduct, as was recently the case with the managing director of Lending Club Renaud Laplanche (Corkery, 2016). If the additional costs are transferred to investors, the yields will decrease further. Transferring costs exclusively to borrowers is not an option for platforms, since this could lead to an adverse selection in which they only get access to bad loans (Akerlof, 1970). It is assumed that the overall market in this scenario in 2020 has a volume of up to 257 million EUR. After that, it is expected that there will be increases to 420 million EUR in 2025 and 602 million EUR in 2035.

Figure 34: Forecast of the market volume of crowdlending and other loans in EUR



Note: in the figure a logarithmic scale is used

Table 4: Forecast of the market volume of crowdlending and other loans in EUR

	2015	2020	2025	2035
Optimistic scenario	330 m	38 bn	63 bn	90 bn
Real case scenario	330 m	5 bn	7 bn	11 bn
Pessimistic scenario	330 m	257 m	420 m	602 m

Two portals from the crowdlending subsegment and one portal from the credit and factoring subsegment participated in the survey and provided projections for their business volume for the year 2020. All three businesses calculated a very high average annual rate of growth of up to 340% per year. Since these subsegments have recently shown very high growth rates and also have enormous potential, these high growth rates appear realistic.

Factoring

In 2015, a volume of over EUR 500 million in receivables was purchased through FinTech companies in the credit and factoring subsegment. Measured against the potentially addressable market, this corresponds to a market penetration of 0.2%.

In the real case scenario, the volume of receivables purchased through FinTechs is expected to grow significantly. According to the German Factoring Association (Deutscher Factoring-Verband, 2016a), factoring in Germany is still a relatively young form of financing with a high growth potential. From 2013 to 2015, an annual growth rate of around 10% has been recorded for the overall market. FinTech companies in the credit and factoring subsegment should benefit from the general market growth. According to data provided by the association, 88% of the customers of traditional factoring companies are SMEs. However, not all SMEs have the opportunity to avail themselves of factoring solutions, since most traditional factoring companies set minimum sales that the potential customers must have.[24] Thus, traditional factoring companies do not serve the self-employed and very small companies.

This is an area in which FinTech companies can win new customers. According to Hartmann-Wendels et al. (2011), the three main purposes of companies using factoring is to ensure liquidity, to preserve independence from banks, and to protect against defaults in payment.

[24] The minimum sales figure varies with the individual factoring companies. A large proportion of the members of the German Factoring Association (Deutscher Factoring-Verband, 2016b) stated that they would require minimum sales of between 100,000 EUR and 5 million EUR.

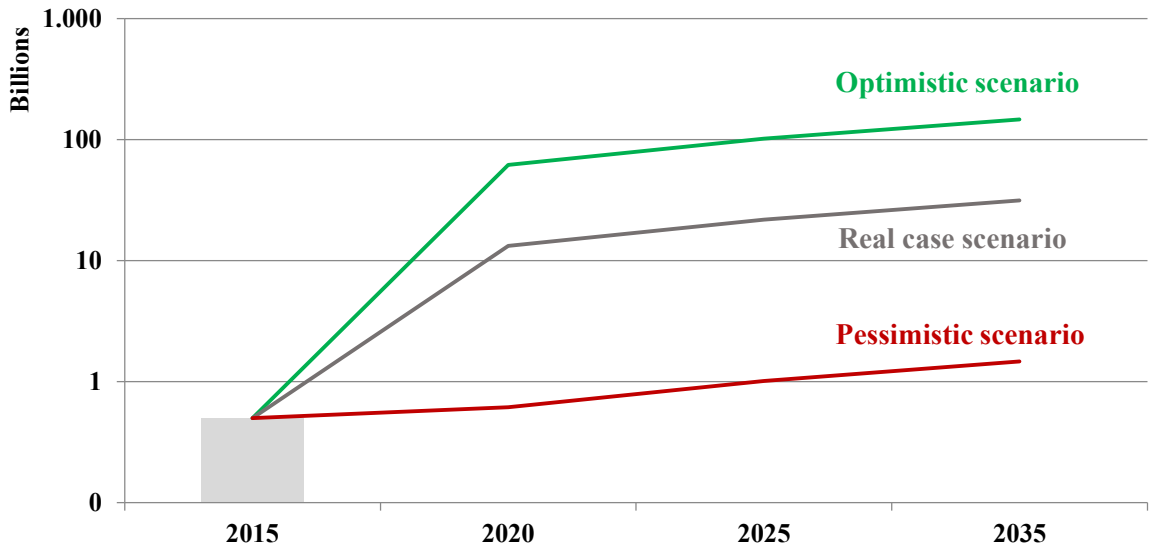
These purposes are obviously also important for small SMEs. Accordingly, the real case scenario assumes an increase in the volume of receivables purchased through FinTech companies in this subsegment. In addition, the volume of other factoring solutions, such as the online-exchange Debitos, is increasing. More than 300 million pounds were auctioned on platforms in Great Britain in 2015 (Zhang et al., 2016). At approximately 30 million USD, the American market for this type of sale of receivables is still smaller than in the UK, but in 2015 it had the largest growth rate out of all of the alternative financing options (Wardrop et al., 2016). In the real case scenario, an increase in the volume of receivables purchased by FinTechs is expected to reach 13 billion EUR in 2020. The market is then expected to grow to as much as 22 billion EUR in 2025 and to approximately 32 billion EUR in 2035.

In the optimistic scenario, customer participation in the industry and thus also the distribution of factoring solutions offered by FinTechs increase dramatically. As in the real case scenario, FinTech companies are growing along with the overall market for factoring and can also win individuals and small SMEs as customers. Nevertheless, in this scenario FinTechs are still better able to attract larger companies as customers. The study by Hartmann-Wendels et al. (2011) states that 17.3% of the companies surveyed consider the introduction and use of factoring to be overly complicated. This is the area in which FinTechs, with their comparatively user-friendly and convenient products, are most likely to win SMEs and larger companies as new customers. In addition, the optimistic scenario suggests that platforms specializing in the auctioning of receivables could record very high growth rates and develop in a manner similar to the corresponding markets in the UK and the US (Wardrop et al., 2016; Zhang et al., 2016). In this scenario, the total market volume of FinTechs will increase to 60 billion EUR in 2020 and to as much as 101 billion EUR in 2025. Thereafter, receivables worth up to 147 billion EUR will be purchased through FinTechs in 2035.

In the pessimistic scenario, FinTechs in the factoring subsegment do not create additional value to customers, and the volume of purchased receivables increases only slightly. In this scenario, the established factoring companies develop their own product and consulting solutions for the target group of self-employed persons and small SMEs. The large, established factoring companies develop their own platforms, on which processes are automated and the processing costs are reduced to such an extent that even companies with a small minimum turnover are profitable for them. As these factoring companies already have a reputation and appropriate experience in the industry, they are more likely to gain the trust of customers. FinTechs are pushed out of the market to a certain extent in the pessimistic scenario. However, it is expected that the auctioning of receivables will continue to rise on FinTech platforms.

The total market thus reaches a volume of up to 620 million EUR in 2020. It is expected that volumes will rise to 1 billion EUR in 2025 and to 2 billion EUR in 2035.

Figure 35: Forecast of the market volume of factoring in EUR



Note: in the figure a logarithmic scale is used

Table 5: Forecast of the market volume of factoring in EUR

	2015	2020	2025	2035
Optimistic scenario	500 m	60 bn	101 bn	147 bn
Real case scenario	500 m	13 bn	22 bn	32 bn
Pessimistic scenario	500 m	620 m	1 bn	2 bn

None of the companies contacted provided their own projections for future factoring volumes as part of the survey.

Social Trading, Robo-Advice, and Investment and Banking

In 2015, the assets under management of social trading platforms, robo-advice providers and FinTechs in the investment and banking subsegment totaled approximately 1.4 billion EUR. Measured against the potential market, the three subsegments thus have a market penetration of approximately 0.1%.

The real case scenario assumes an increase in the consumer base for social trading, robo-advice, and investment and banking. In order to become more profitable, it is important for all the subsegments considered to attract greater numbers of customers in the future. Wong

(2015) estimates that the break-even point for robo-advice providers is between 16 billion USD to 40 billion USD in assets under management. At present, the largest German provider only has approximately 100 million EUR in assets under management. Moreover, Wong (2015) demonstrates that for robo-advice providers customer acquisition is associated with high costs. The study shows that gaining a new customer can require as much as 1,000 USD as a result of the high costs of marketing. Traditional advisors and financial institutions, which already have a broad customer base, have a great advantage when they digitize their offerings.

The advantageous position of such institutions is well illustrated by the success of robo-advice solutions from US companies like Schwab Capital and Vanguard. According to Malito and Zhu (2016), after the introduction of robo-advice solutions in 2015 these two asset managers were able to overtake the largest US FinTechs, Betterment and Wealthfront, in terms of assets under management. In the real case scenario, there is significant consolidation in the German robo-advice market. As in the other subsegments of the FinTech market, only a few providers will be able to establish themselves. There will be mergers of robo-advice providers with asset managers and banks. Indeed, this development has already begun, with the robo-advisor Easyfolio having been purchased by Hauck & Aufhäuser Privatbankiers in 2015 (Freimuth, 2016). In addition, Comdirect Bank and Deutsche Bank have already developed their own robo-advisors (Kanning, 2015). Robo-advice providers that offer no innovations by comparison with traditional asset managers with an online presence will be pushed out of the market.

In the cases of robo-advice, social trading, and investment and banking, the return on investment is of central importance for consumers. Pan et al. (2012) claim that in 2012 only one in six of the investors who participated on the social trading platform eToro earned a profit. As a result of the increased use of social trading platforms by media companies such as Börse Online and professional asset managers, who already have experience and knowledge of the stock market, in the real case scenario it is assumed that this rate of profit can be significantly improved. In the real case scenario, there is also increased public awareness of the industry. Further functionalities that allow for improved asset planning also increase the value to consumers. In addition, asset managers in the investment and banking subsegment are able to achieve comparatively high returns. The relatively high degree of automation results in lower fees in comparison with those charged by traditional investment advisors, and so an increasing number of investors resort to this type of asset management. Moreover, at least for the time being interest rates on savings deposits and fixed-term deposits in Germany remain at low levels. More and more Germans are using the services of deposit brokers to benefit from

differential interest rates in markets within the EU. Overall, it is estimated that the assets under management controlled by social trading platforms, robo-advisors, and investment and banking FinTechs will grow to 40 billion EUR in 2020 and 68 billion EUR in 2025. For the year 2035, a further increase in assets under management is expected to reach 105 billion EUR.

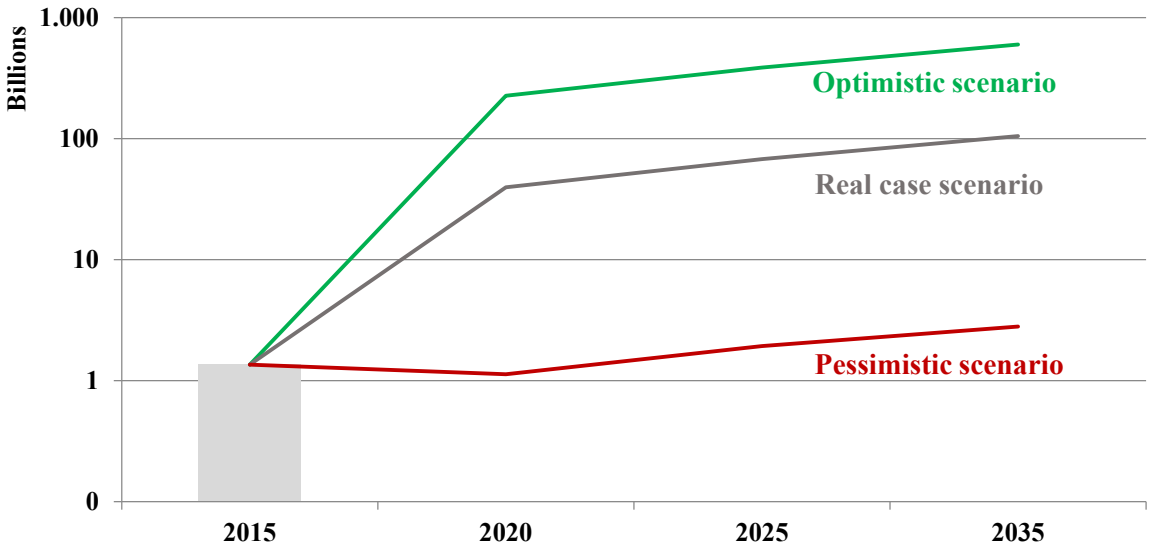
In the optimistic scenario, there is a sharp upsurge in the customer base and thus a significant expansion in the use of robo-advice, social trading, and investment and banking. FinTechs from these three subsegments have a significant advantage over traditional investment advisors as a result of their high level of transparency. For example, they furnish investors with performance analyses, disclose the strategies they have used, and document the investment products they have purchased. In addition, these Internet-based services come with lower costs for consumers in comparison with personal consulting. In particular, the fees of robo-advice providers are much lower than those charged by traditional investment consultants.

Robo-advisors are also able to advise investors who have less than 250,000 EUR in assets as a result of the improved cost structure they are able to achieve through digitization (Wong, 2015). Furthermore, in this scenario the offerings of social trading platforms, robo-advice providers, and investment and banking FinTechs are bolstered by additional functionalities. In the US, robo-advisors already offer special tax-optimized products for individual retirement accounts. In the same way, German suppliers could also take advantage of tax-optimized products in their investment proposals and thereby generate additional customer value. In addition, this scenario assumes that not only young but also older Internet users take an interest in alternative forms of investment in the robo-advice, social trading, and investment and banking subsegments. In the optimistic scenario, the capital managed by these FinTechs is estimated to increase to as much as 226 billion EUR by 2020. Subsequently, assets under management in these subsegments would grow to 386 billion EUR in 2025 and 600 billion EUR in 2030.

In the pessimistic scenario, there is no increase in customer participation, and indeed the number of customers of social trading platforms, robo-advice providers, and investment and banking FinTechs drops slightly. The FinTechs in these subsegments have only been active on the market in Germany for a small number of years. During this period they were able to profit from rising prices on the stock market. It remains to be seen how the performance of investors changes if the stock market should decline. The pessimistic scenario assumes that social trading, robo-advice, and investment and banking all have poorer performance in a time

of a struggling stock market in comparison with traditional fund managers. In social trading in particular, such decline could lead to high losses for investors as a result of the widespread use of leveraged products. In this scenario, negative returns also result in lower participation from customers. In social trading, questions can be asked as one is furnished with commentary, but replies take longer than in personal conversation with an adviser. In addition, misunderstandings can occur that further reduce customer involvement. This scenario also predicts changes in EU-wide regulations pertaining to deposit protection. Modifications or, in an extreme case, even the discontinuation of the deposit guarantee scheme within the EU greatly reduces the use of deposit brokers. In this scenario, the managed assets of social trading platforms, robo-advice providers, and investment and banking FinTechs will be around 1 billion EUR in 2020. In 2025, assets under management increase to 2 billion EUR and in 2035 to just under 3 billion EUR.

Figure 36: Forecast of the market volume of social trading, robo-advice, and investment and banking in EUR



Note: in the figure a logarithmic scale is used

Table 6: Forecast of the market volume of social trading, robo-advice, and investment and banking in EUR

	2015	2020	2025	2035
Optimistic scenario	1.36 bn	226 bn	386 bn	600 bn
Real case scenario	1.36 bn	40 bn	68 bn	105 bn
Pessimistic scenario	1.36 bn	1 bn	2 bn	3 bn

Neither the social trading platforms nor the robo-advice providers have submitted their own projections for the year 2020 in our survey. A FinTech from the investment and banking subsegment forecast an average annual growth rate of 150%. Within the framework of this study, such a growth rate is considered optimistic but not unrealistic.

Personal Financial Management

To date, some 1.2 million people in Germany use bank-independent PFM systems. Measured against the potentially addressable market, this corresponds to a market penetration of approximately 2%.

The real case scenario is based on an increase in customer use and thus also on the increasing distribution of PFM systems. The implementation of the revised PSDII in particular affords significant potential for growth as well as greater legal certainty for FinTechs. Most importantly, the requirement that financial institutions must issue all account information to third parties in the future at the request of the customer will have a beneficial effect on the PFM subsegment. In this scenario, the number of open API interfaces from banks increases significantly and facilitates the integration of the financial volumes of different financial institutions into one application. In this way the customer base can be significantly increased. However, extending the scope of the PSDII to account information services for PFM systems is also associated with increased costs. Now the FinTechs must also comply with the regulations. It is therefore to be assumed that PFM system providers incur additional costs. In the real case scenario, more and more financial institutions offer PFM systems in which the financial volumes of other banks can also be taken into account. In the real case scenario, it is expected that there will be an increase in the number of users to as much as 8 million in 2020 and 12 million in 2025. The growth continues in subsequent years, with the result that as much as 14 million people will use PFM systems in 2035.

The optimistic scenario predicts a very significant increase in the use of PFM systems. In comparison with the real case scenario, it is assumed that PFM providers can improve or expand their offerings due to the PSDII open-access legislation. Moreover, Lößl et al. (2014) have published the results of a survey indicating that more than 60% of the customers of banks that they contacted would be interested in making use of PFM systems. Even if this survey is not representative of the total population in Germany, this result nevertheless shows that there are a large number of potential users of these systems in Germany. In the optimistic

scenario, the number of users of PFM systems increases to 18 million in 2020 and to as many as 28 million in 2025. In 2035, up to 33 million people are expected to make use of PFM systems to manage their personal finances.

The pessimistic scenario forecasts a decrease in the use of independent PFM systems. The principal reason for this is the cost pressure resulting from legislation applying to PFM providers within the PSDII. According to the pessimistic scenario, PFM system providers will be seriously hindered by new legal requirements, such as stricter data protection guidelines and rules pertaining to money laundering. In this scenario, a significant portion of the independent PFM systems is pushed out of the market. The number of users of PFM systems drops to approximately one million in 2020. In 2025, up to 2 million people use bank-independent PFM systems and in 2035 there is an excess of 2 million.

Figure 37: Forecast of the number of users in the PFM subsegment

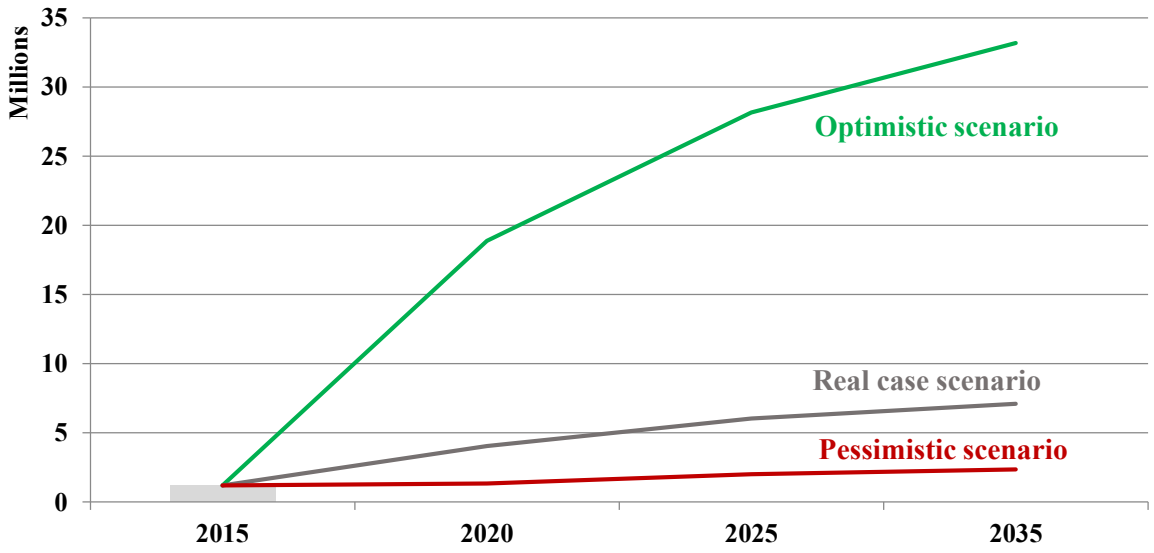


Table 7: Forecast of the number of users in the PFM subsegment

	2015	2020	2025	2035
Optimistic scenario	1.2 m	18 m	28 m	33 m
Real case scenario	1.2 m	8 m	12 m	14 m
Pessimistic scenario	1.2 m	1 m	2 m	> 2 m

One PFM provider has given a personal projection of the future number of users as part of the survey. In its response, the company estimates a future annual growth rate of around 40%.

This forecast is regarded as realistic and in keeping with the forecast of the growth of users of independent PFM systems provided above.

6 Summary

The goal of this study is to provide comprehensive data collected in accordance with scientific standards that are relevant for understanding the German FinTech market. This data is intended to contribute to a clear picture of the importance of FinTech companies for the German financial sector and the economy as a whole. In order to give an indication of possible future developments in the market, forecasts are made on the basis of current figures for the next five, ten and twenty years. The fundamentals that characterize the total market for FinTech companies are examined. A particular focus, however, is on the subsegments of donation and rewards-based crowdfunding, crowdinvesting, crowdlending, robo-advice, PFM, investment and banking, and social trading. The comprehensive data that was collected about the market size and market structure of the German FinTech industry should allow for the better assessment of the opportunities and risks of these innovative financial service providers.

In order to examine the size and potential of the German FinTech market, this study focuses on 433 FinTech companies that have been active in Germany. A total of 346 of these companies continue to have active business operations. In the course of the examination we focus on the financing, asset management, and payments segments as well as the insurance subsegment. Information was requested from 309 FinTech companies in the first half of 2016 by means of a questionnaire adapted to their business model and other estimates. Approximately a quarter of these FinTechs participated in the survey. In order to determine the volumes of the FinTechs that did not provide data or are no longer actively involved in the market, publicly available data and various methods for estimating market volumes were used.

The current size of the various market segments serves as the starting point for the forecast of future development. In order to estimate the market potential of FinTechs, six potentially addressable markets are defined for the relevant subsegments. The future market penetration of FinTechs is then derived from the historical market penetration of a comparable technology, namely online banking. In considering the market penetration of online banking, the data is adjusted to take the current widespread use of the Internet into account. The forecast itself includes three alternative scenarios, an optimistic, a pessimistic and a real case scenario, each of which makes different assumptions about the further development of the regulatory and technological environment in Germany as well as general changes in the market.

In certain cases, FinTechs represent a complement rather than a substitute to the German market for financial services, since they offer products that are already available in the conven-

tional financial industry but not yet available for all market participants. Due to a unique cost structure FinTechs are able to achieve as a result of digitization, they are able to meet new kinds of small-scale demands previously not served by traditional financial institutions. For example, crowdlending platforms make it possible for investors to hold a diversified portfolio of risky but high-interest bearing loans with a small four-digit contribution, whereas in the past such kinds of investment had been reserved for banks. Social trading platforms enable their users to create a kind of investment fund on their own despite a low level of managed assets. Robo advice can similarly be used to ensure that individuals with fewer assets are provided with personalized wealth management. Certain forms of crowdlending for corporate loans have the same effect as syndicated loans, with the difference that syndication is already possible for six-digit amounts. This type of downsizing has the effect that larger groups of the population can benefit from certain types of financial services. The question for the future is the extent to which FinTechs from these previously neglected segments will be able to gain a foothold in the conventional market. This would seem, at least in principle, to be possible.

The current very extensive media coverage of the FinTechs in the finance and asset management segments, given its current volume of approximately 2 billion EUR, only makes sense in light of the extremely high growth rates of the relevant segments and the potential for significant growth in the future. According to our estimate, the market volume in the real case scenario for the year 2035 is 148 billion EUR.

The development of the FinTech industry as a whole is highly dependent on the future regulatory environment and technological change. An example is online legitimation and authentication. If a safe procedure is established that is both easy to use and cost-effective and meets requirements for detecting fraud and money laundering, this should clearly have a positive effect on the future development of FinTechs in several subsegments. A comparison with other countries with regulatory environments that differ fundamentally from Germany's suggests that significantly larger volumes can be generated in many areas of FinTech as a result of legislative change, as for example in crowdinvesting.

Ultimately, however, the use and expansion of FinTech services depends not only on technical and regulatory frameworks, but also on the value that customers can derive from their services. This may be clearly seen with respect to robo-advice or social trading. Regardless of how quickly and efficiently these services can be offered from a technological perspective, investors will be unsatisfied unless they can secure an average positive return on their investments. The proof of this is still pending.

Since the FinTech industry is still very young in Germany, many FinTech companies are in an early phase of growth. It remains to be seen how many of these companies will be profitable in the medium term. In some FinTech segments, profitability is contingent upon very high numbers of customers, or rather a high volume of assets under management or brokered financing. The acquisition of new customers, moreover, can be very costly.

At the present point of time, there are no systemic risks from FinTechs due to the small volumes they generate. However, further development should be monitored very closely. In the future, regulatory interventions may be necessary to prevent potential sources of risk, such as in the area of social trading where it is conceivable that a single market participant could cause severe price fluctuations for certain securities due to the large number of persons following him or her. In addition, the securitization and refinancing of loans from different subsegments can lead to new secondary markets, which may lead to more liquidity, but also to new risks, such as inappropriate pricing of certain tranches in securitization.

The media has often portrayed a "battle between banks and FinTechs," but the data collected in this study does not bear this idea out. On the contrary, 87% of banks surveyed said they were already cooperating with FinTechs and would continue to cooperate in the future. There are, however, subsegments, such as the crowdlending, where FinTechs tend to compete with banks. In general, many FinTechs are cooperative and complement existing banking services, so that banks and FinTechs have already developed very close ties and cooperative activities. Such close proximity sometimes takes the form of the acquisition of FinTechs by banks.

Considered in the international context, the German FinTech industry is gaining in importance. Haddad and Hornuf (2016) show that the US is the world leader, both in terms of the number of newly created FinTech companies and the amount of capital invested in them. In Europe, however, Germany already ranks second behind the UK and continues to make gains. According to an analysis by KPMG and CB Insights (2016), more money from venture capital firms flowed into German rather than British FinTechs for the first time in Q2 2016. In addition, the German FinTech market is exceptionally dynamic: it grew by almost 290% in the financing subsegment and by 480% in the asset management segment between 2014 and 2015. In the UK, by contrast, growth in 2015 slowed significantly. The finance segment was only able to record a growth rate of approximately 84% (Zhang et al., 2016). Alternative payment methods are also increasingly popular in Germany. While debit and credit cards are the prevailing payment methods in e-commerce in the US and the UK and only 15% to 21%

of the sales are paid by eWallets, the use of the latter payment method in e-commerce in Germany is significantly higher, comprising approximately 31% of such transactions (World-pay, 2015). These developments make it clear that the whole FinTech market in Germany has a high potential for growth and development.

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