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The Impact of Demographics on Investments

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Abstract:
South Africans are over-indebted; therefore, a large portion of the population will not have saved enough for retirement. South African over-indebtedness highlights the importance for banks to understand the needs of their clients and promote relevant investment opportunities. The main purpose of this paper is to analyze the total amount of South African banking clients invest, based on their demographics. The study found that each demographic factor analyzed affects the expected amount being invested. Secondary data were collected from a universal bank that agreed to participate in the study. Results indicated that male and female investors invest similar amounts; however, gender becomes a predictive variable when combined with other demographic factors. A substantial difference was found in the average amount being invested by the wealthiest investors compared to other investors. There are also inequalities between the different racial groups, with African investors of all income levels investing less than the other groups with similar income levels. The findings tie back to the history of Apartheid in South Africa, with African investors investing less than the other race groups. African investors make up the biggest portion of investors in South Africa, and banks have an opportunity to improve their investment habits. This will make these clients wealthier and more profitable for the bank and the South African economy.

Keywords: investment amount, banking industry, demographic factors, South Africa, black tax.

人口统计对投资的影响

摘要:
南非人负债累累；因此，很大一部分人口将没有足够的储蓄来退休。南非的过度负债凸显了银行了解客户需求并促进相关投资机会的重要性。本文的主要目的是根据人口统计分析南非银行客户的投资总额。研究发现，分析的每个人口统计因素都会影响预期的投资金额。二手数据是从一家同意参与研究的全能银行收集的。结果表明，男性和女性投资者的投资金额相似；然而，当与其他人口统计因素结合时，性别成为一个预测变量。与其他投资者相比，最富有的投资者的平均投资额存在显着差异。不同种族群体之间也存在不平等，所有收入水平的非洲投资者的投资都少于收入水平相似的其他群体。调查结果与南非种族隔离的

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历史有关，非洲投资者的投资少于其他种族群体。非洲投资者占南非投资者的最大比例，银行有机会改善其投资习惯。这将使这些客户更富有，为银行和南非经济带来更多利润。

关键词：投资金额、银行业、人口因素、南非、黑税。

1. Introduction

The concept of banking as understood today originated from Italy during the 14th century. The word 'bank' is derived from the Old Italian word *'Banca*', meaning bench or a money exchange table (Gold 1976). Moreover, the line between commercial banking and investment banking has become unclear, as numerous commercial banks offer investment banking solutions and some investment banks have extended loans and other forms of credit. The key to success for banks in the South African investment industry is to fully understand the unique investment needs of their clients (Seetharama et al., 2017). An important factor to remember is that investor needs change over time. A product that was suitable for specific investment needs at a certain point in time might not be what is needed in a couple of years (Jagongo & Mutswenje, 2014). Banks group investors into different risk profiles based on the investors' willingness to tolerate risk. Risk tolerance can be defined as the amount of volatility an investor is willing to tolerate with the anticipation of greater returns, individual investment objectives, and investment considerations (Harlow & Brown, 1990).

The traditional banking industry focused on safekeeping funds and extending credit (Goddard & Wilson, 2016). This activity has been a very lucrative endeavor, with interest rates on credit products being higher than interest on the funds kept on behalf of their clients. With the changing technology and modern clients becoming accustomed to quick and easy solutions, more clients would like to see all their financial assets and obligations on one single platform. This is causing a shift towards banks launching their unique investment products and solutions. Banks also have a moral obligation to provide clients with products they need instead of only pushing the most profitable option like extending credit (Mostert & Lotz, 2018). South Africans are over-indebted, and studies have estimated that a large portion of the population will not have enough savings at retirement age (Nogantshi, 2015). South African over-indebtedness highlights the importance for banks to understand the needs of their clients and promote relevant investment opportunities.

Hofacker (2016) also found that banks can record every action a client takes due to the ease of transacting online. If a client starts the process to open a new investment account, for instance, and then stops before accepting the terms and conditions, banks can analyze the data and make deductions as to what prompted the client to cancel the application. Utilizing Big Data provides banks with a competitive advantage over their competitors (EY 2014). By understanding the data and needs of the clients, banks can effectively provide relevant products and boost client retention rates (Lee, 2017). Due to these, fewer clients would move their funds to compete with firms that provide a wider range of investment opportunities (Kitchens et al., 2018). This allows the bank to promote investment products suitable for their investments based on their predicted stage on the investor life cycle. Bodie and Treussard (2007:47) found that life cycle funds, structured around the concepts of the life cycle theory, provide investors with limited investment knowledge with a simpler alternative to conventional investing. The portfolio will be diversified based on the theoretical life cycle phase the investor is in (Bodie&Treussard, 2007:47).

Data and analytics have become so sophisticated that banks can see when their clients have funds flowing to competing firms. With this information, banks can determine which products the competing firms have that could be attracting their clients and lure them back by providing similar products, with the added benefit that all their products would be available on a single platform (Hao 2000). Using historical data to visualize trends and make assumptions on how clients will react is a vital part of determining how clients will react in the future. The use of Big Data and sophisticated statistical analysis tools allow for more accurate predictions (EY 2014).

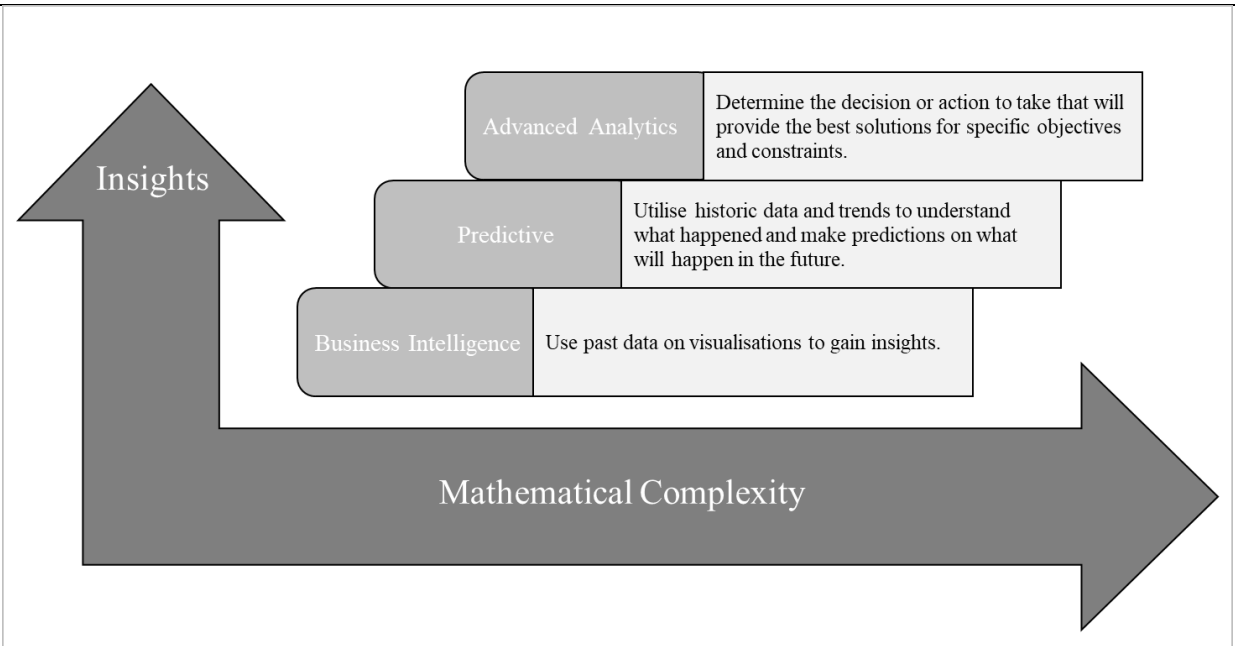

Figure 1. Stages of big data analysis (EY, 2014)

According to Lee (2017), Big Data is the availability and interpretation of large quantities of data using technological advances. The concept has had profound implications on how firms analyze their clients' behavior and utilize the data to improve everyday operations and marketing. Hofacker (2016) found that big data can provide insight into each different stage of the investor decision-making process. Banks have large volumes of client data which can be used to gain client insights. The data can be used to model client investment portfolios to gain a view of the overall bank's investor behavior and the differences between clients of different demographics and income levels (Kitchens et al., 2018).

By analyzing the amount being invested based on demographic factors like age, gender, race, and income level by using Big Data, it is possible to determine which groups are saving enough and which groups are not (Kitchens et al., 2018). The scope of the article thus analyses how these demographic factors influence the current total investment values of the participating bank's investors. Thus, marketing campaigns can focus on promoting investment opportunities to individuals who are not saving enough and be personalized based on the findings. Using historical data to visualize trends and make assumptions on how clients will react is a vital part of determining how clients will react in the future.

2. Literature Review

The investor life cycle theory can be defined as the investors' behavior given their investment horizon. The main assumption of this theory is that investors will behave differently in different stages of their lives and that the amount of time an investment is expected to be kept influences the amount of risk an investor takes. According to Brown and Reilly (2012), the theory comprises four different life stages: accumulation, consolidation, spending, and gifting. Bodie and Treussard (2007) found that target-date funds, also known as life-cycle funds, have the potential of earning greater returns when compared to some of the investment choices made by uninformed fund participants that lack investment knowledge. This fact highlights the importance of the life-cycle as it simplifies the concept of investing to the average person.

The importance of determining the willingness and ability of investors to take on risk is an essential component in the financial and investment planning process for investment banks (Larkin et al., 2013). The influence of an individual's risk tolerance and its association with the amount individuals are willing to risk when investing can greatly contribute to how banks aim their investment products at their clients. The process of establishing how much money an individual is willing to risk when investing is not an easy or straightforward process but rather entails the vigorous multidimensional evaluation of the number of predisposing factors that can influence this decision (Trone et al., 1996; Grable & Joo, 2004).

Each individual will have a different level of risk willing to take on, which will vary across the investor life cycle concerning investment goals and objectives (Old Mutual, 2014). According to Massol and Molines (2015), income and wealth are considered interconnected components that have a positive relationship with risk tolerance. It is concluded by a study by Kannadhasan (2015) that individuals tend to save some portion of their income with the aim of increased wealth. It is believed that individuals with higher income levels would be able to meet financial obligations due to having sufficient resources (O'Neil, 1996). The study of Irwin (1993) confirmed that individuals with stable and predictable income tend to

be more risk-tolerant than individuals with unstable and unpredictable income.

The accumulation phase is one of the most important stages as investors can make use of a longer investment horizon as it can be expected that they still have time to recover investment amounts lost in risky investments (Brown & Reilly, 2012). The potential earnings on the smallest investment amounts in risky high-return assets over the long investment period have the potential of generating massive returns when considering the effects of compounding interest (Mpofu et al., 2010).

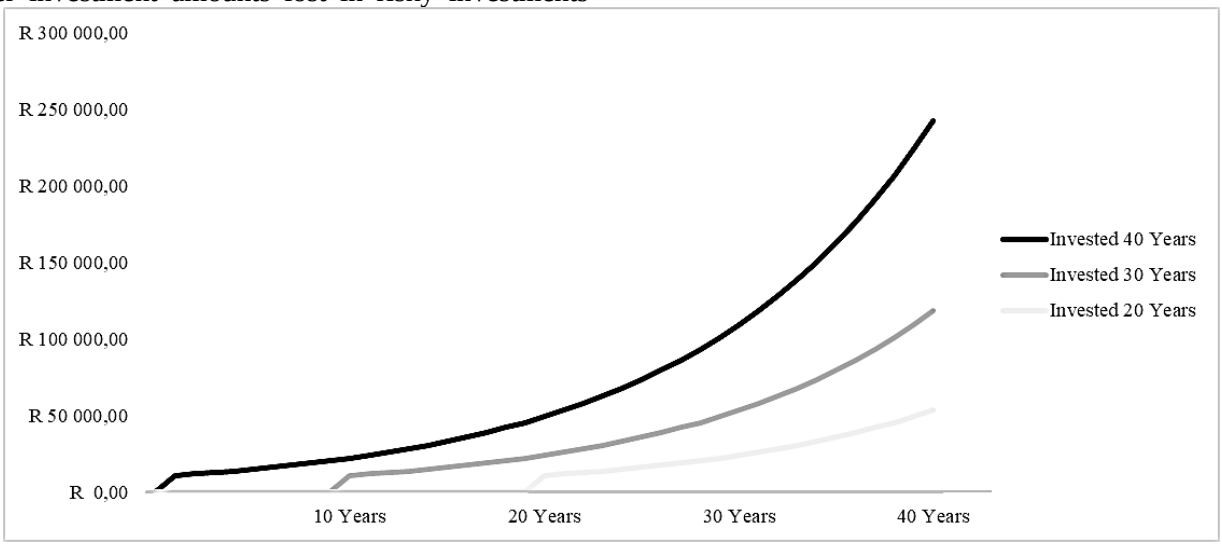

Figure 2. Compounding interest of R10 000.00 invested at 8% compounding monthly

Notes: Figure 2 demonstrates that an investor with an initial investment amount of R10 000,00 (USD 700) invested monthly at a rate of 8% compounding monthly from the beginning of the period can expect the below future values:

- 20 years R49 268.03 ($3500 USD)
- 30 years R109 357.30 ($7500 USD) (R60 089.27 ($4100 USD) more compared to 20-year investment)
- 40 years R242 733.86 ($16 900 USD) (R133 376.56 ($9300 USD) more compared to 30-year investment)

A vast majority of research exist where these researchers such as Friedman(1974); Cohn et al. (1975); Blume (1978); MacCrimmon and Wehrung (1986); Riley and Chow (1992); Hawley and Fujii (1993); Irwin (1993); Shaw (1996); Schooley and Worden (1996); Sung and Hanna (1996); Grable (1997); Grable and Lytton (1999a:); Grable and Lytton (1999b); Grable (2000); Yip (2000); Grable and Lytton (2001); Hartog et al. (2002); Chaulk et al. (2003); Chang et al. (2004); Grable and Joo (2004); Grable et al.(2004); Hallahan et al. (2004); Yao et al. (2004); Ardehali et al. (2005); Nairn (2005); Fan and Xiao (2006); Al-Ajmi (2008); Sages and Grable, (2010); Van Schalkwyk (2012); Mabalane (2015); Gibson et al., (2017:68); Dickason (2017); Van den Bergh (2018); and Dickason and Ferreira (2018) concurred that individuals with higher income levels are more risk-tolerant than individuals with lower income levels. A concave relationship was noticed between income and risk tolerance (Hallahan et al., 2003), where risk tolerance continuously increases to the highest income level and then decreases. A study conducted by Massol and Molines (2015) indicated that high-earning individuals are likely to experience losses due to high-risk investments. On the contrary, Samuelson (1969), Schoemaker (1980), and Kannadhasan (2015) found in their research that there is no significant relationship between income and risk tolerance. From a South African perspective, mostly a positive relationship was found between income and risk tolerance, indicative that high earning individuals tolerate high levels of risk. Du Plessis (2008) also found that a higher income level would result in bigger investment amounts as investors have more disposable income. A study conducted by Mangoma and Wilson-Prangley (2019) investigated the phenomenon of Black Tax in South Africa. Black Tax in a South African context is the obligation or expectation that exists for young African professionals to send money to their struggling families. This results in a lower disposable income amount to be invested. There are countless newspaper articles chronicling stories regarding the effects of Black Tax on African professionals. Some refer to it as a burden, while others view it as helping the less fortunate (Mtlolo, 2018). Mongoma and Wilson-Prangley (2019) confirm that African professionals are unsatisfied with the amounts they are saving and investing.

Various international and local research studies such as Cohn et al. (1975); Lee and Hanna (1991); Riley and Chow (1992); Irwin (1993); Shaw (1996); Sung and Hanna (1996); Grable and Lytton (1999a); Grable and Lytton (1999b); Grable and Lytton (2001); Hartog et al. (2002); Chaulket al. (2003); Chang et al. (2004); Grable and Joo (2004); Grable et al. (2004); Yao et al. (2004); Fan and Xiao (2006); Al-Ajmi (2008); Sages and Grable (2010); Griesdorn et al. (2014); Sharma et al. (2017)established that wealthier individuals are willing to take on more financial risk than less fortunate individuals. Wealthy individuals are known to invest in risky asset securities (Cohn et al., 1975). However, a study conducted by Hawley and Fujji (1993) concluded that wealth negatively affects the risk tolerance of

individuals. In agreement, Hallahan et al. (2003) emphasized that wealthy investors tend to be cautious when investing because of the aim to protect wealth rather than increase wealth. Previous research conducted by Mabalane (2015) and Dickason and Ferreira (2018) indicated that wealth is related to income, and the relationship is positive.

Sung and Hanna (1996) highlight from previous research that demographic factors such as education levels, race, employment status, gender, other income, and age can influence financial risk tolerance. Previous researchers such as Wang and Hanna (1997) found a relationship between age and risk tolerance; whereas, Grable and Lytton (1997) found that the two most influential variables on risk tolerance are age and gender. Grable and Lytton continued with research in the field of financial risk tolerance. They revealed that other factors such as marital status, education level, financial knowledge, income level, occupation, and economic expectations also impact the level of risk investors are willing to tolerate. In contradiction to the previous findings, Grable and Joo (1999) emphasize in their research that gender, marital status, and age are not considered important influences.

Irwin (1993) states that young people are more risk-tolerant than older people. It is believed that older people have time constraints to recover from financial losses due to making inaccurate investment decisions (Grable, 1997). Therefore, young people are willing to take on more financial risk as they have more time to recover from financial losses experienced due to inaccurate investment decisions (Grable & Roszkowski 2007; Gibson et al. 2013; Dickason 2018; Dickason & Ferreira 2018). In contrary to the above, researchers such as Botwinick (1966), Vroom and Pahl (1971), Baker and Haslem (1974), Okun and DiVesta (1976), Morin and Suarez (1983), Hawley and Fuji (1993), Wang and Hanna (1997), Grable (2000) and Van de Venter et al. (2012) found that older investors are willing to tolerate more risk.

No universal agreement is established as to whether gender, as a demographic factor, influences the level of risk an individual is willing to tolerate. Investigations done by Higbeeand Lafferty (1972), Blume (1978), Coet and McDermott (1979), and Yip (2000) indicate that gender is an important, influential factor of risk tolerance. Roszkowski et al. (1993), Hawley and Fuji (1993), Slovic (1966), Sung and Hanna (1996), Sharma (2006), and Rahmawati et al. (2015) reached a consensus that females take fewer risks than males. Thus, males are more risk-tolerant than females. Cultural differences in terms of values, tastes, and preferences can affect risk tolerance levels. The general norm is that White people are willing to tolerate more risk than non- Whites (Sung & Hanna, 1996). This norm is based on the accessibility White people have to banks and financial institutions, and they are more future-oriented and have more investment opportunities than non-White people. White people, therefore, will portray an attitude of confidence in decision-making skills and their abilities to analyze (MacCrimmon & Wehrung, 1986; Zhong & Xiao, 1995). In South Africa, a study was conducted between risk tolerance and race. A significant difference exists between the White and Indian population groups. However, Van Schalkwyk (2012) concluded that African people tend to take higher risks than White people do, thus making African people more risk-tolerant. These results were once again confirmed by Dickason and Ferreira (2018).

3. Methodology

The study made use of secondary data provided by a bank that agreed to participate in the study. The bank's investor data are stored on a relational database and were extracted using a domain-specific data extraction language, namely Structured Query Language (SQL). Demographic data like age, race, and gender are directly supplied to the bank on account opening by the investors. The bank also keeps a record of the value and types of investment each investor holds and funds flowing through the accounts that the researcher used to determine income levels.

This study used secondary data to reflect actual investment types and values held by the bank's investors. These tactics eliminate the investors' risk of misrepresenting the investments they hold and demographic information when conducting surveys and other primary data collection methods (Kothari, 2004). The sample data serves as a snapshot of the investors' profiles from July 31, 2018.

3.1. Research Sample

The population for this study was selected based on convenience as a reputable universal bank in South Africa was chosen based on their willingness to participate. The sample was obtained randomly from the bank's population to ensure the chosen investors share similar characteristics to the entire population of the bank. The sample was made up of 19 911 investors (n = 19 911). The bank determined the calculated sample size to be 20 000, and the stratified random sampling technique was applied. The population data were divided into different strata to ensure the distribution percentages of age, race, gender, and income level reflect the distribution per stratum seen in the entire population.

3.2. Hypotheses

The following hypotheses were formulated to achieve the primary objective:

Null hypothesis (H_0): The demographic factors have no significant impact on the value invested.

Alternative hypothesis (H_a): The demographic factors have a significant impact on the value invested.

3.3. Statistical Analysis

Linear and multiple regression analyses were used to determine a relationship between the different

demographic factors used in the analysis and the value being invested set to a confidence level of 95 percent.

4. Empirical Results

For understanding and potential change of investor behavior in South Africa, it is essential to understand the value investors are investing in and the factors that drive these values. Therefore, this section analyses the relationship between different demographic factors and the amount being invested. The first step was to use descriptive statistics to gain insights into how the total investment amount is distributed.

Table 1. Distribution of amounts invested

Statistical measure	Total investment amount
Mean	55 826.70
Median	2 224.90
Variance	71 115 500 000
Standard deviation	266 674.86
Skewness	13.71
Kurtosis	260.66
Minimum	0.01
Maximum	7 289 199.86

From Table 1, the mean investment amount for the total invested amount is 55 826.70, while the median is only 2 224.90. This is an indication that more investors invest smaller amounts compared to high investment amounts. This is also evident when analyzing the skewness of 13.71, which indicates that the distribution is positively skewed to the right. The high kurtosis of 260.66 results in a leptokurtic distribution shape as a normal distribution has a kurtosis of 3. The high variance of 71 115 500 000.00 and standard deviation of 266 674.86 indicates that the investment amounts fluctuate quite dramatically from the mean value of 55 826.70 (Gujarati & Porter, 2010). The analysis will focus on each demographic factor and how they influence the total amount invested. The demographic factors include age, gender, race, and income level.

4.1. Influence of Age on Total Investment Amount

The first demographic factor analyzed was the age of the investors. Coco et al. (2005) found the investment horizon plays a significant role in the amount invested and the risk an investor is willing to or expected to take.

Table 2. Spearman correlation results for age and total investment amount

Demographics	Age	Interpretation
Total investment amount	0.18434 <.0001	Weak positive correlation Statistically significant

Table 2 indicates the relationship between age and the total amount invested. The relationship is positively correlated and statistically significant at 1 percent. This implies that the older an individual is, the higher the amount invested will be.

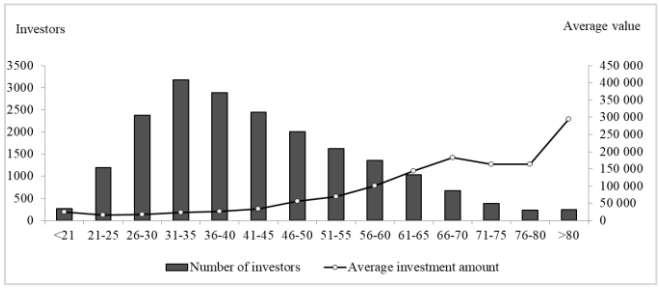

Figure 3. Average investment amount per age group

Notes: Figure 3 shows the number of investors on the left y-axis and the average value of invested amounts on the right y-axis. The x-axis reflects the different age ranges of the investors

Figure 3 shows that the number of investors reaches a maximum investment amount at the age group 31-35. However, a decline is seen after this age group. The average amount being invested increases with investors' age, which supports the basic theory of the investor life cycle, as individuals are saving more towards retirement. The graph also confirms the correlation results, suggesting that the average investment amount also increases as investors' age. Linear regression was performed with age as the independent variable and total investment amount as the dependent variable to determine the effect of age on the investment amount of South African investors.

The results showed that age has a statistically significant influence over the total value invested at a confidence level of 95 percent. The R-square of 0.034 indicates that 3.4 percent of the sample's total invested value can be predicted based on the investor's age. Table 3 shows the parameter estimates used to predict the total amount invested based on age.

Table 3. Parameter estimates for linear regression

Dependent variable	Parameter	DF	Estimate	Standard error	t-value	Pr > |t|
Total invested amount	Intercept	1	-94192	5965.5	-15.79	<.0001
	Age	1	3480.254	131.512	26.46	<.0001

4.2. Influence of Gender on Total Investment Amount

Studies such as that done by Dickason et al. (2017) and Dickason and Ferreira (2018) found differences between how males and females view investments. The findings showed that male participants are more confident when it comes to investing when compared to female investors. Analyzing the descriptive statistics for gender gives insights into the differences between males and females for the sample.

Table 4 shows that the mean, minimum and maximum values for both genders are similar. Males have higher standard deviations and variance, indicating that the values fluctuate further away from the mean

compared to females. Skewness and kurtosis are also very similar, indicating that the shapes of the distributions are comparable. Both genders are positively skewed, with outliers to the right. Kurtosis is very high, indicating a leptokurtic distribution. A t-test was performed to determine if the mean-variance for gender is the same.

Table 4. Descriptive statistics for gender

Gender	Female	Male
Mean	53 111.31	58 773.88
Median	3 160.32	1 513.05
Mode	1 000.00	100.00
Variance	56 539 400 000.00	86 926 600 000.00
Standard deviation	237 780.22	294 833.18
Skewness	13.60	13.41
Kurtosis	262.36	243.04
Minimum	0.01	0.01
Maximum	6 995 929.13	7 289 199.86

The null hypothesis was formulated as H_0: $\mu_1 = \mu_2$. If the null hypothesis is concluded, it indicates that both mean variances are equal. The alternative hypothesis was formulated as H_a: $\mu_1 \neq \mu_2$. If the alternative hypothesis is concluded, it indicates that the mean variances of the gender distributions are significantly different. The results had a significance level of <.0001, and as a result, the Satterthwaite method was used.

Table 5. T-test results

Method	Variances	DF	t-value	Pr > |t|
Satterthwaite	Unequal	18347	-1.48	0.1378

Based on Table 5, the null hypothesis cannot be rejected at a confidence level of 95 percent. There are no significant differences between the mean variances, and both males and females have distinctly similar distributions.

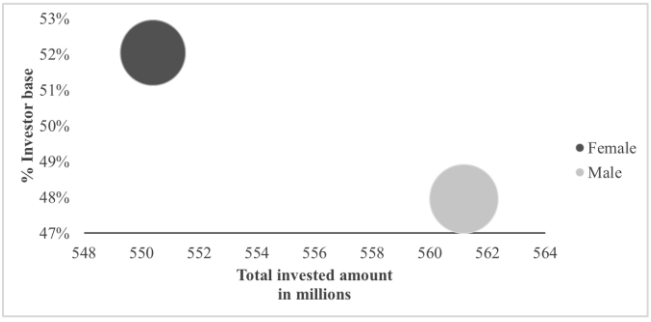

Figure 4. Total amount invested (in ZAR millions) based on gender
Notes: Figure 4 illustrates the difference between the amounts invested by female and male investors. The y-axis shows the percentage each gender represents in the total sample base, and the x-axis shows the percentage of total investment

The bubbles represent the average size of the amount invested per gender. Females make up 52 percent of the overall sample. However, their total amount invested is only 50 percent of the entire sample. Females also invest 10 percent less than their male counterparts on average. Males make up 48 percent of the sample; however, they invest 50 percent of the total invested amount.

4.3. Influence of Race on Investment Amount

Income inequality is a contentious subject in South Africa, as the damage done by the Apartheid era can still the when considering income level and general wealth in the country (Wilson, 2011). Due to cultural backgrounds and different historical viewpoints, race influences how individuals invest and save (Du Plessis, 2008).

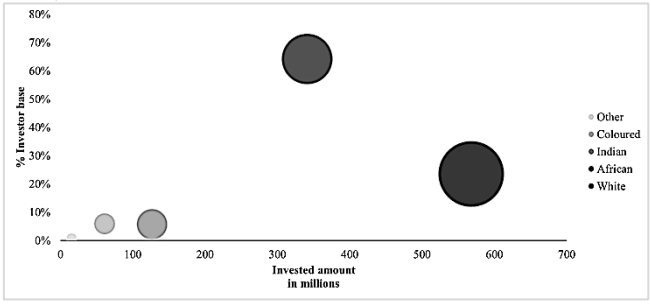

Figure 5. Total amount invested (in ZAR millions) per racial group
Notes: Figure 5 uses the percentage of investors of the total sample base per race on the y-axis and the total invested amount in millions on the x-axis to illustrate how the invested amount is distributed based on different races. The bubbles are sized according to the amount invested

The highest total investment amount of 51 percent is distributed among White investors, even though White investors only make up 23 percent of the total investor base used in the sample. The second-highest total invested amount of 31 percent is allocated to African investors, who make up the highest number of individual investors of 64 percent. Indian investors hold 11 percent of the total invested amount and make up 6 percent of the investor base, with Colored investors holding 5 percent of the total investment amount and making up 6 percent of the investor base. Other races hold the lowest amount of the total investment amount at 1 percent and making up 1 percent of the total investor sample base.

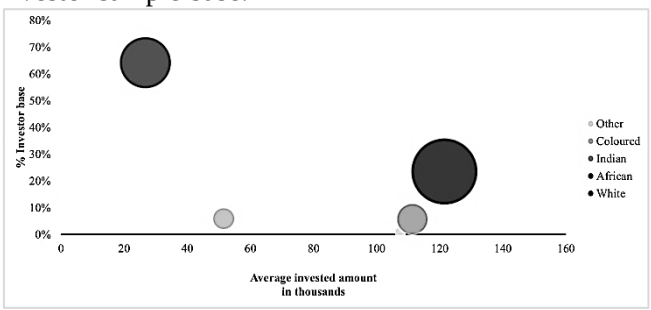

Figure 6. Average invested amount per race group
Notes: Figure 6 is similar to Figure 5, except for using the average investment amount instead of the total investment amount on the x-axis

White and Indian investors have similar average amounts, substantially higher than the two race groups with the lowest average investments. The results showed that even though "Other" investors only make up a small fraction of the total investor base and investment amount, they have a high average investment amount close to White and Indian investors. Colored investors have the second-lowest average investment amounts, with African investors having the

lowest average investment amounts. The graph reflects the wealth inequality seen in South Africa after the end of the Apartheid era (Wilson, 2011). Investors from different backgrounds have different investment styles and preferences. The study conducted by Mangoma and Wilson-Prangley (2019) on the effect of Black Tax could be an explanatory factor for the results in Figures 5.6, where African investors have a much lower average investment amount when compared to the other races. Researchers such as Cronjé and Roux (2010) found that the emerging African middle class in South Africa has started contributing significantly to the consumption side of the economy. However, their saving amounts remain low. This fact is indicative that the African middle class is part of a debt culture instead of a savings culture. The researchers also found that Chinese and Indian cultures are the exact opposite, with a savings culture (Cronjé & Roux, 2010). This is clear in the results with the other races category and Indians having higher average investment amounts.

4.4. Influence of Income Level on Investment Amount

Du Plessis (2008) found that a higher income level would result in bigger investment amounts as investors have more disposable income. South Africa is one of the most unequal in the world in terms of income inequality. By analyzing the patterns of wealthy investors compared to lower-income bands, conclusions can be made around how investors with different income levels and needs invest their disposable income.

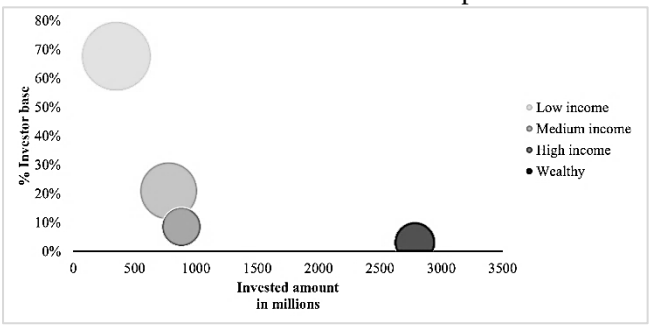

Figure 7. Average invested amount per income level

Notes: Figure 7 indicates the wealth distribution among different income levels. The y-axis shows the percentage of the sample investor base, and the x-axis the average investment amount. The bubbles are sized based on the total investment amounts per income level

The majority of investors fall into the lower-income percentile, with 68 percent of the total sample investor base. These investors also make up the bulk of the total invested amount at 42 percent. However, they are on the lower end when it comes to the average investment amount per individual. Medium income investors make up 21 percent of the sample base and hold 29 percent of the total invested amount. The average invested amount for medium-income investors 122 percent more than that of the low-income group. High-income investors make up 8 percent of the sample base and hold 13 percent of the total invested amount. The average invested amount is 13 percent more on average compared to medium-income investors. Wealthy investors only make up 3 percent of the sample; however, they hold 15 percent of the total invested amount. The average amount per investor is also a staggering 216 percent larger than the average amount for the high-income category.

4.5. Multiple Regression Analysis of Demographic Factors and Investment Amount

By establishing a linear relationship between demographic factors and the total amount, a predictive model can be built that attempts to identify if there is a relationship between these factors and the amount being invested. The multiple regression model used the total investment amount as the dependent variable and investor age, race, gender, and income level as independent variables. A backward elimination technique was used to disregard factors that were not statistically significant.

The resulting model had eleven steps before the most efficient mix of factors was selected, and the data were statistically significant at a 95 percent confidence level. Table 6 gives the parameter outputs for the model.

Gujarati and Porter (2010) found that the adjusted R-square measure is more accurate than the standard R-square measure for multiple regression analysis. The model had an adjusted R-square of 0.1006, indicating that 10.06 percent of the total invested amount can be predicted by age, gender, race, and income level. The results confirm that race on its own has a significant impact on the expected investment amount. The combination of age*race, gender*income, and age*gender*income were also statistically significant contributing factors. Analyzing each parameter individually, starting with race, the model selected White investors as the base parameter with a degree of freedom equal to zero. The model indicated a high significance between the total investment amount for White investors compared to African, Colored, and Indian investors. The "Other" race group is not statistically significant. The combination of age and race also had high significance across all five race categories. With the combination of gender and income level, the model selected wealthy males as the base with degrees of freedom equal to zero. Female investors with low-, medium-, and high-income levels and wealth show statistical significance. Male investors with low- and medium-income levels also show high statistical significance, while male investors with high-income levels are not statistically significant. The final parameter combined age, race, and income level with wealthy males chosen as the base with degrees of freedom equal to zero. The combination of gender with age for all income levels was statistically significant.

Table 6. Parameter results for total investment amount

Parameter	DF	Estimate	Std error	t-value	Pr> |t|
Intercept	1	-369375	49950	-7.39	<.0001
African	1	86398	13982	6.18	<.0001
Colored	1	90176	26420	3.41	0.0006
Indian	1	99502	25222	3.95	<.0001
Other	1	-39634	59180	-0.67	0.503
White	0	0	.	.	.
Age * African	1	11022	1084.237887	10.17	<.0001
Age * Coloured	1	11319	1182.133525	9.57	<.0001
Age * Indian	1	12316	1162.244812	10.6	<.0001
Age * Other	1	15347	1649.857639	9.3	<.0001
Age * White	1	14193	1065.459373	13.32	<.0001
Female * High income	1	234396	62539	3.75	0.0002
Female * Low income	1	271085	50753	5.34	<.0001
Female * Medium income	1	243177	53210	4.57	<.0001
Female * Wealthy	1	-237840	78260	-3.04	0.0024
Male * High income	1	21471	57646	0.37	0.7096
Male * Low income	1	264690	50991	5.19	<.0001
Male * Medium income	1	83920	53005	1.58	0.1134
Male * Wealthy	0	0	.	.	.
Age * Female * High income	1	-8943.424595	1372.166916	-6.52	<.0001
Age * Female * Low income	1	-10209	1084.456039	-9.41	<.0001
Age * Female * Medium income	1	-9214.80379	1141.057696	-8.08	<.0001
Age * Female * Wealthy	1	6429.921853	1676.077572	3.84	0.0001
Age * Male * High income	1	-3302.991275	1250.627679	-2.64	0.0083
Age * Male * Low income	1	-10152	1092.189207	-9.29	<.0001
Age * Male * Medium income	1	-5121.156332	1135.644921	-4.51	<.0001
Age * Male * Wealthy	0	0	.	.	.

5. Conclusion

Banks also have the means and abilities to gain insights from the vast amounts of data available to their clients. Using these insights, banks can model investor behavior and promote a culture of investment. By using the investor life cycle theory, combined with the data available, banks can improve the returns their customers are expecting. With banks providing more investment products, client retention is also the added benefit, as fewer clients would seek these investment opportunities elsewhere.

The study found that each demographic factor, including age, gender, race, and income level, influenced the total amount being invested. There was a high correlation between age and the total amount invested, which indicates that older investors are likely to hold higher investment amounts. The distributions for gender were similar for male and female investors; however, by running a multiple regression analysis, the researcher determined that gender, in combination with the other demographic factors, was a predictive variable. The race was significant as the legacy of Apartheid can still be seen, with a large portion of the total invested amount held by White investors. The study also found that Indians and certain other smaller racial groups had a savings culture, while African and Colored investors were part of a debt culture. Young African professionals also deal with the South African phenomenon of Black Tax, where these individuals have less disposable income as they also need to send money home to care for their less fortunate families. Analyzing the effects of income level, the researcher found a big difference in the average amount being invested by the wealthiest investors compared to the rest. This highlights the income inequalities prevalent in South Africa. The study differs from prior studies due to the focus being on the South African landscape. It attempts to find a solution to inequalities in the investment distribution in South Africa by highlighting which groups display certain behaviors where banks can change their marketing strategies. This will allow them to educate investors based on strategies that will be more effective for each individual investor.

5.1. Limitations and Further Studies

The study was limited to a single major universal bank in South Africa. If data can be obtained from the other major banks, a more holistic view can be obtained from investors across South Africa. Further research could potentially also include more demographic factors or combine the data with needs analysis performed for each investor. One of the most interesting results of the study was that African investors invest less than the other racial groups even when they are in the wealthiest income brackets. Future research could analyze this phenomenon in more detail to determine if this is relevant across South Africa and explain why this is.

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Author's Contributions

Dewald Kellerman specializes in the field of investments with over six years' experience working in marketing analytics for a bank's Wealth and Investments division. The researcher's passion is to use data to promote a culture of investment in South Africa. The research was conducted as part of the researcher's Master's dissertation in Financial Risk Management. Dr. Sune Ferreira and Prof. Zandri Dickason-Koekemoer specialize in financial risk management, having obtained their Ph.D. degrees in this field. Their main focus area is financial risk tolerance, depositor behavior, investor behavior, behavioral finance, and investors' financial well-being. These researchers have already published several articles in accredited journals regarding this field of interest.

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