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The Order of Customer Acquisition of Financial Services in South Africa

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UNIVERSITY OF THE WITWATERSRAND,
JOHANNESBURG

The Order of Customer Acquisition of Financial Services in South Africa

by

Mthunzi A. Ngwenya

A research report submitted in partial fulfilment of the
requirements for the degree of
Master of Business Administration

in the

Faculty of Commerce, Law and Management
Wits Business School

29 November 2010

Declaration of Authorship

I, Mthunzi Abednigo NGWENYA, declare that this research report is my own work except as indicated in the references and acknowledgements. It is submitted in partial fulfilment of the requirements for the degree of Master of Business Administration in the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in this or any other university.

Signed .....

at ..... on the ..... day of ....., ... in the year of our Lord.

"I have enough money to last me the rest of my life, unless I buy something."

Jackie Mason (1934 -)

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

Abstract

Faculty of Commerce, Law and Management
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Master of Business Administration

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Acquisition pattern analysis (APA) of financial services is a fairly new field with most of the empirical research having been conducted in developed economies, and few research in developing economies. These studies looked at patterns in the acquisition of financial services, and the effects of demographic factors in the acquisition of these services.

The author used data from the 2008 All Media and Products Survey (AMPS), conducted by the South African Advertising and Research Foundation (SAARF), to investigate, using multilinear regression, the effects of demographic factors in customer acquisition of financial services in South Africa; and to investigate, using the Mokken Scaling Procedure (MSP), the extent to which there is a discernible pattern in the acquisition of these services.

Income, education and age were highly significant factors in the acquisition of most financial services. Marriage and presence of children were key determinants in home ownership and presence of a mortgage facility. Vehicle financing facility ownership decreased with age. While home ownership was negatively correlated with vehicle financing facility, it had a positive significance in the acquisition of a garage card. The research findings also demonstrated that income was a necessary but not sufficient variable in enhancing ownership of financial assets, especially investment type products. Education is also necessary. Age also showed significance, suggesting that the disadvantage of lack of formal education wears out with age, or increasing practical experience in financially taking care of oneself.

MSP results supported the existence of a pattern in the customer acquisition of financial services in South Africa. The order of acquisition of financial services was different for different income groups.

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- Professor Kalu Ojah, for his patience with a student who is still to learn how to balance work and academia,
- My mother, Nompezulu, the constant in my life, for always saying the most inspiring words at the worst of times, and
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TABLE 1: List of abbreviations

Abbreviation	**Long name**
AMPS	All Media and Products Survey
APA	Acquisition Pattern Analysis
ASISA	Association for Savings and Investment South Africa
BLC(H)	Behaviourial Lifecycle Hypotheses
CLV	Customer Lifetime Value
DM(M)	Doubly Monotone Model
FIA	Financial Intermmediaries and Advisory Act
FICA	Financial Intelligence Centre Act
IRA	Individual Retirement Annuity
IRF	Item Response Function
IRT	Item Response Theory
LCA	Latent Class Analysis
LCH	Life Cycle Hypothesis
MH(M)	Monotone Homogeinity Model
MPC	Marginal propensity to consume
MSP	Mokken Scaling Program or Procedure
NCA	National Credit Act
NPIRT	Non Parametric Item Response Theory
PIH	Permanent Income Hypotheses
PIRT	Parametric Item Response Theory
SA	South Africa
SAARF	South African Advertising Research Foundation

Dedicated to Asanté, Akha, and Nefertiti.

Chapter 1

Introduction

1.1 Purpose of the study

The purpose of this study is

- To determine the extent, if any, to which demographic factors have an effect on the customer acquisition of financial services and
- To determine the extent, if any, to which South African financial services customers have a discernible pattern in their acquisition of these services.

1.2 Context of the study

Globally, there has been increased competition in the financial services sector. This puts pressure on firms to improve their marketing efforts in order to retain or gain market share.

- Firstly, the increased competition has been partly due to government policy in some countries. Their motivation for these policies has been to improve the health of their country specific financial services industries and to improve their industry's alignment with international counterparts (Guiso, Haliassos, and Jappeli 2002). For example, in 2004, Nigeria's Ministry of Finance gave the "poorly managed, undercapitalized and far too numerous banks ... 18

months to raise their capital requirement from USD15 million to USD190 million" (Forbes Magazine 2007, p. 4). This initiative also strengthened the involvement of the private sector and foreign ownership in the banking, insurance and pensions market (Forbes Magazine 2007, p. 4).

- Secondly, a further cause of increased global competition results from well-funded firms, in both developing and developed economies, proactively pursuing globalization in order to enhance earnings growth and to diversify earnings. Examples in South Africa include South Afican company, Old Mutual and UK bank, Barclays. The former entered the European market by buying Skandia Life (Old Mutual plc 2006), while the latter bought South Africa's ABSA as a part of both a growth strategy and an opportunity to exploit attractive valuations (ABSA Ltd 2005).

- Thirdly, there has been an increase in bancassurance — a situation where a single firm offers both banking and insurance services. For example, Sanlam, one of South Africa's big insurance companies, announced in late 2007 that it was going to start to focus on "home loans and money market accounts" (Fisher-French 2009)

- Finally, competition has also increased due to traditionally non-financial firms entering the financial services scene. For example SAA, a South African airline company, has entered the credit card market (SAA 2008), which was traditionally an enclave for financial services firms.

This increased competition means that financial services firms have to intensify their marketing efforts in order to win, both in terms of the number of customers (volume) and the firm's share of an individual customer's budget allocated for the consumption of financial services (cross-selling).

Targeting of customers who already have a product or more with the firm (cross-selling) appeals because:

Probability Studies, by, for example, Kamakura, Ramaswami, and Srivastava (1991), have shown that, with the same level of marketing effort, a customer who already has a product with a firm has a higher probability of buying the product on from the same firm than a new customer would.

Information leveraging Financial services firms usually have large databases, some spanning more than 20 years on current or previous customers, which can be used to better understand the buying behaviour of these customers and increase sales to them.

This data may originally have be stored for a number of reasons including: its informational value, because certain products (like annuities and life insurance) have either recurring premium or recurring benefit payments and therefore there is an administrative need to keep information or to comply with legislation. However, regardless of the original intension of keeping the data, it may be found that the data is useful in providing insight into existing customers that may help with marketing efforts or, by extension into the kind of customers that are attracted to a specific financial firm.

In the developed world, there are statistical models of acquisition pattern analysis (APA) that have been applied to the acquisition of financial services. Empirical testing of these models has demonstrated evidence of patterns in the acquisition of financial services. One of the methods of APA that has been applied a number of times in Europe is the Mokken scaling procedure (MSP). The author could not find any academic literature wherein MSP, or any of these models, had been tested on South African financial services consumers.

1.3 Research question

What are the significant demographic factors that need to be taken into account for the improvement of marketing financial services and what is the optimum order in which these services should be marketed?

This research question or problem is divided into two sub problems:

1. To what extent, if any, do various demographic factors influence the acquisition and ownership of financial services?

2. To what extent, if any, do South African financial services consumers acquire such services in an orderly pattern?

1.4 Significance of the study

The study fills a research gap in that:

- Globally, the amount of research into the APA of financial services is still limited (Paas, Bijmolt, and Vermunt 2007). This research adds to the field.
- In South Africa, the author could not find in searched university libraries *academic* research where the APA of financial services has been done. This research therefore is part of an initiation of study into this area in South Africa.
- The use of robust statistical tools, e.g. the Mokken scale, may be useful to financial services firms operating in South Africa, or possibly other emerging economies, aiming to improve their marketing efforts.
- It may be useful in the formulation of policy to induce South Africans to save where up to now, they have demonstrated a low saving culture (Masilela 2009).
- It may help to clarify the extent to which South African consumers of financial services differ or assimilate their counterparts in the developed world which, in turn, may help governments not to simply transfer savings policies because they have worked somewhere else. This may also help international firms entering South Africa to understand the differences in consumer behavior in this new territory and caution them against importing, out of context, strategies that have worked well in their home countries.

1.5 Delimitations of the study

- This research is about using cross-selling initiatives to sell entry-level to high-end products to existing clients. To clarify, the consumer in question is one who already has a financial product with a specific financial institution. This research did not concern itself with enhancing access to financial services by those that do not yet have a financial product. Nevertheless, the results of this research may shed light on policies that aim to promote savings.

- The focus of this research is on the middle to high-income segment of the population. Therefore, as a starting point, it excludes those earning below R5,000 per month.

- This research looks at the extent to which Mokken scaling fits only the given data set. It is suggested, as scope for further research, that the MSP's predictive power be tested as well.

- This research limits itself to Mokken scaling in a statistical test that is fitting to the South African experience. It is possible that the results of this research could be contradicted by the results of the application of alternative models. The application of other models is suggested as scope for further research.

- The sample is from the All Media and Products Survey of mid-January 2008 to mid-December 2008, commonly known as "AMPS 2008B." It is possible that different data would lead to different results. It may be a scope for further research to use a different survey or population to confirm or challenge this study's findings.

- The data used is cross-sectional. It is possible that a longitudinal data would provide different or clearer results. For example, cohort effects would be more easily understood with longitudinal data. This is suggested as scope for further research.

- Effect of changes in legislation, for example, the Financial Intelligence Centre Act (FICA), the Financial Advisory and Intermediary Services (FAIS) Act, and the National Credit Act (NCA), on this study has been ignored. It is recommended however, as scope for future research, that the effects of these legislative changes on household financial portfolios be studied.

1.6 Division of chapters

This research report has the following division of chapters:

- This chapter (Chapter 1) has set the scene by giving background to the research questions, stating the research questions, and setting out the significance and delimitations of the study.

- Chapter 2 discusses the literature review beginning with studies on demographic factors and their effects on financial services acquisition and ownership. The last section discusses the results of empirical studies in APA of financial services in North America, Australia and Western Europe.
- Chapter 3 discusses the research methodology and design.
- Chapter 4 briefly presents the results.
- Chapter 5 discusses in detail the findings and data analysis.
- Chapter 6 summarises and concludes on the findings and suggests a scope for further research.

1.7 Document preparation using LaTeX

This research report was prepared using the LaTeX document preparation system.

To the extent that creating tables in LaTeX was complex, tables were created using the Microsoft Excel spreadsheet program and exported to LaTeX as figures. This results in some of the tables in the document labeled as figures instead of as tables, a minor inconvenience that is outweighed by the many benefits of the system — e.g. its cross-referencing functionality.

As LaTeX does not have a bibliography package that matches the Wits Business School's referencing guide, attempts were made to be as close to this guide as possible. To this end LaTeX's Chicago Manual of Style package, which is an acceptable alternative at WBS according to the MBA guidelines, was used.

Chapter 2

Literature Review

2.1 Introduction

The first section of the literature review (2.2) discusses the findings of empirical studies on the effects of demographic factors on saving and accumulation of specific financial assets.

The next section (2.3) discusses a range of findings regarding the order of acquisition of financial services in North America, Australia, and Western Europe.

2.2 Demographic factors

From the reviewed literature, age, marital status, the number of children still living at home, wealth, income, level of education, whether the dwelling is owned or rented by the occupants and work status are all major determinants in the accumulation of savings and of specific financial services.

2.2.1 Age

The life cycle hypotheses (LCH) of Modigliani (1966) suggests a hump-shaped pattern of asset accumulation with age as households accumulate assets in their working years and spend them in their retirement. Figure 2.1 depicts the *stripped down* version of LCH when "income [Y is] constant until retirement [and is] zero

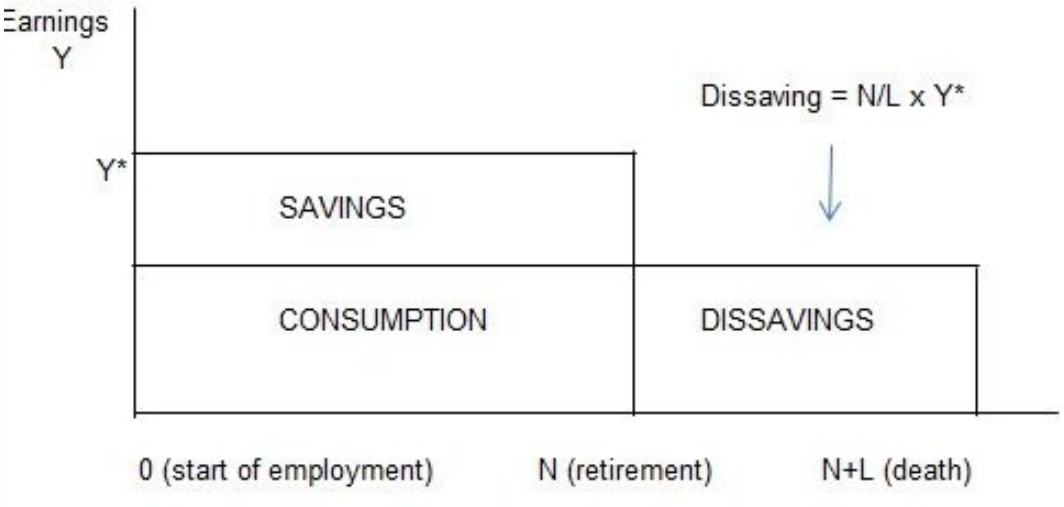


FIGURE 2.1: Stripped down version of LCH (Modigliani 1966)

thereafter; [there are] zero interest rates, ... constant consumption [C(t)] over life; [and] no bequests" (p. 184). The individual begins working earning Y at time 0, at which time he starts saving until he reaches retirement at time N. Because income normally increases with age while "the representative consumer will choose to consume at a relatively stable rate" (p. 153), it follows that the saving rate will increase as a function of age and start falling from retirement onwards.

Studies by Bosworth, Burtless, and Sabelhaus (1991), using the US Consumer Expenditure Survey (CES) of 1972/1973 and Avery and Kenickell (1991), derived from the US Survey of Consumer Finances (SCF) of 1992, show a positive relationship between saving and age group, with the saving rate reaching its peak in the 55-64 age band and then declining. This supports LCH. These studies are summarised in Tables 2.1 and 2.2.

TABLE 2.1: Savings rates % by age in Bosworth et al. (1991)

Age	25-34	35-44	45-54	55-64	65+
Saving ratio 1972/73	9.5	12.1	16.8	22.9	14.9
Saving ratio 1982/85	9.6	8.6	10.5	15.8	11.5

The work of Avery and Kenickell (1991) showed, however, that the median level of savings is quite low compared to the average, suggesting that a significant number of households either do not save or have meagre savings.

Porteba (2000), using the SCF of 1983 to 1992, demonstrated that the hump-shaped curve of wealth accumulation with age is not uniform across all assets,

citing the observation that with owner-occupied housing there was no noticeable decline in ownership with increased age. Shorrocks (1975) deduced from the United Kingdom(UK) Inland Revenue Reports of 1912; 1921; 1931; 1939; 1951; 1961; and 1971 that the hump-pattern in the relationship between age and wealth is more pronounced for the less wealthy then the top 5% and top 1% in each age group examined. He showed that wealth increased with age without a hump for the top 1% in each age group, as depicted in Figure 2.2. In terms of the ownership of specific financial services and assets, he found that the baby boomer generation, when compared to previous generations, appeared to be more willing to utilise sophisticated financial instruments.

Gunnarson and Wahlund (1997) in a random survey of 1,000 Swedish households (response rate: 50.3%), found that 60% of young and single households had most of their savings in liquid saving forms, like cheque and savings accounts. Their commitment to medium and long-term investments was low and they had a gearing (total liabilities to total financial assets) of 1. This profile was also reflective of retired households. This partially supports the LCH hypotheses that at young and retirement age savings decline.

Shum and Faig (2006) derived from the SCF surveys of 1992 to 2001 that holding stocks is positively correlated with age.

Kamakura et al. (1991) used a sample of 3,034 households in the US with annual incomes of at least USD25,000 to linearly regress financial maturity with age. Age was found to be a significant explanatory variable.

Brunetti (2007) reviewed a large body of literature on the relationship between financial portfolios and age. Most of the studies confirmed that with increased age, households prefer less risky, annuity-type investments over high-risk and variable yield portfolios.

The reviewed literature suggests that age is a significant demographic factor in the accumulation of savings and in the acquisition of financial services.

TABLE 2.2: Three year saving levels by age (Avery and Kenickell 1991)

Age	20-34	35-44	45-54	55-64	65-69	70+
Mean saving (USD)	13,300	14,800	18,700	22,400	30,500	1,400
Median saving (USD)	2,400	3,200	4,200	500	500	-500

2.2.2 Marital status and family composition

Smith (1994), measuring savings by differencing the US Panel Study of Income Dynamics (PSID) of 1994 and 1999, found that there is a relationship between saving and marriage: Households who were married throughout the observation period experienced asset growth of 7.1% per year, never-married households had asset growth that was half that (about 3.5%), and households who divorced or separated during the observation period experienced negative growth. This is supported by Xiao (1996) who showed in his study, an increased chance of owning 9 out the 11 financial assets looked at, when the household comprised of a married couple.

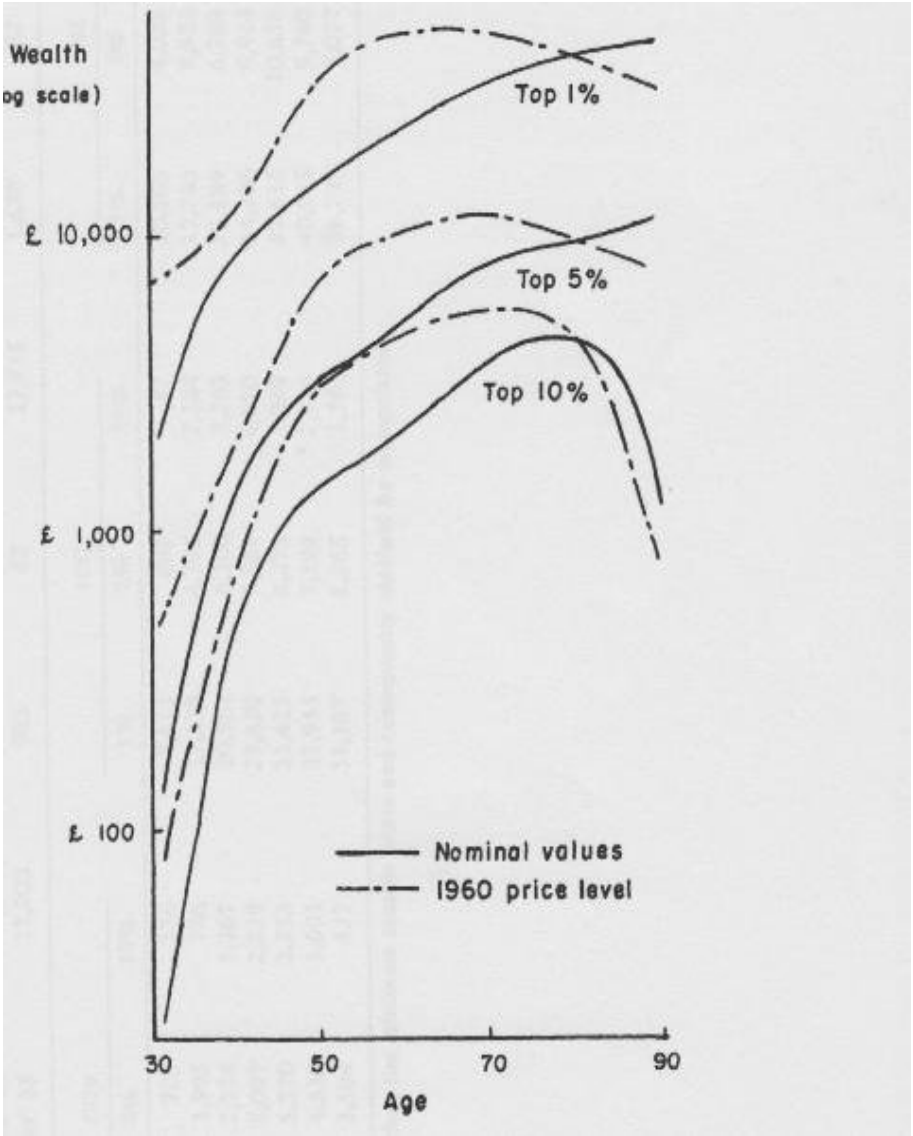


FIGURE 2.2: Results of study of age wealth relationship by Shorrocks (1975)

The introduction of children to the family composition showed declining savings. The work of Bosworth et al. (1991) and Avery and Kenickell (1991) showed that saving rates were higher for married couples without children and lower for households with children. However, single individuals were found to have the lowest saving rate in the population. Also, Euwals, Eymann, and Borsch-Supan (2004), using the Dutch CentER Savings Survey 1994-1997, regressed the presence of children (still) at home to wealth and found that it had a significant negative effect on wealth. Furthermore, Gunnarson and Wahlund (1997) established that the majority of households with dependent children had debt to asset ratios of 4.2. This was the highest in the survey and was only matched by older households without children. The latter observation may suggest that even when children have left home, it may be difficult for the parents to accumulate sufficient wealth for their retirement as some expenses like placing children in tertiary educational institutions involve significant financial commitments or debts.

The reviewed literature suggests that marital status and number of children in the household influence the accumulation of savings.

2.2.3 Wealth

Shum and Faig (2006) found that the holding of stocks is correlated with various measures of wealth including financial net worth.

The observation of Euwals et al. (2004) that households with some form of marital or prenuptial contract had significant wealth, may suggest that because each party strives to have enough resources whether the marriage works or not, there is higher propensity to save by each partner, which would support Smith (1994). However, it is also likely that prenuptial agreements are signed when one or both partners have substantial wealth before marriage. Avery and Kenickell (1991) showed that all net saving from 1983 to 1986 was due to the top decile of the 1986 wealth distribution, suggesting that it is possible that due to the large majority of households having limited wealth, they either borrow to buy sophisticated financial assets like stocks or de-accumulate some of their earlier acquired financial assets. Indeed, the work of Bernheim, Skinner, and Weinberg (2001), using data from PSID between the years 1978 to 1990, found significant discontinuity in the consumption at retirement with the magnitude of the discontinuity negatively correlated to retirement saving and income replacement rates. Accordingly, and contrary to LCH expectations,

they could not find evidence that households use savings to smooth the effects on consumption of expected income discontinuity at retirement.

Thus, the notion that wealth is a significant determinant of asset ownership in the majority of households shown to have relatively low wealth, is questionable. In most cases, the household may be saving to improve its wealth position and not to protect and grow an already sizable stock of wealth.

2.2.4 Income

Bosworth et al. (1991) and Avery and Kenickell (1991) demonstrated that income and saving are highly positively correlated. Also, Kamakura et al. (1991) and Soutar and Cornish-Ward (1997), who used an Australian dataset, found supporting evidence that showed that income is significantly positively correlated with the ownership of financial assets. Also, Shum and Faig (2006) found that holding stocks is correlated with labour income.

Euwals et al. (2004) found that the income of the husband had a positive effect on saving while the income of wife had a negative effect. They suggested that the effect of wife's income might be low as a result of her having to go to work to compensate for thelow wealth position of the household. Her income thus, may go toward aiding in meeting needs or settling liabilities.

The reviewed literature suggests that income has a significant effect on saving and the accumulation of financial assets.

2.2.5 Education

Education is sometimes viewed as an indicator of permanent income (Browning and Lusardi 1996). Thus the relationship between saving (and financial asset accumulation) and education would be expected to resemble that of saving and income. In support of this expectation, Avery and Kenickell (1991) found that higher education groups had higher saving rate. Also, Bernheim and Scholz (1993) discovered that households without a college degree tended to save very little. Further, Euwals et al. (2004) and Kamakura et al. (1991) found education, as a linear regression coefficient of wealth, to be highly significant.

Xiao (1996) found that households without a college degree are significantly unlikely, in comparison to their otherwise similar counterparts, to own all types of financial assets other than trusts.

The reviewed literature suggests that education is a significant influence in the accumulation of savings.

2.2.6 Dwelling rented or owned

Avery and Kenickell (1991); Bosworth et al. (1991) showed that saving is higher for homeowners than renters. Similar results were found by Kamakura et al. (1991). Further, Porteba (2000) argued that owner-occupied housing does not show a hump-shaped pattern in its correlation with age, contrary to LCH expectations: There is no evident decline in its ownership near to or post-retirement. This is supported by Shefrin and Thaler (1988) whose Behavioural Life Cycle Hypotheses (BLCH) suggest that retirees are reluctant to unlock equity accumulated in home ownership and spend it.

2.2.7 Work status

Soutar and Cornish-Ward (1997) regressed work and occupational statuses on final asset ownership as depicted in Table 2.3.

TABLE 2.3: Regression on work status in Soutar and Cornish-Ward (1997)

Category	coefficient	significance level
Self-employed	+2.15	5%
Blue collar worker	-2.32	5%
Unemployed	-2.77	1%

The results are in line with those of Avery and Kenickell (1991) who found that when income was regressed on saving, saving was negatively correlated with the first and second income quartiles and highest in the top quartile.

Xiao (1996) found mixed results: As employment status improved so did the ownership of cheque and savings accounts, savings plans, savings bonds, and cash values of insurance. However, improved employment status decreased the chance of owning bonds.

2.2.8 Summary

The literature review suggests that age, marital status, number of children in the household, income, level of education, status regarding home ownership or rental, and enployment status have an effect on the accumulation of financial assets and liabilities.

2.2.9 Hypothesis 1

Age, marital status, number of children, income, education, whether dwelling is rented or owned, and work status are significant demographic factors in customer acquisition of financial services in South Africa.

This hypotheses will be tested using multi-linear regression.

2.3 The Acquisition of Financial Services

This section of the research report discusses the reviewed literature regarding empirical studies into the APA of financial services firstly in North America, and then in Australia and finally in Western Europe.

The findings and discussions are then summarised in section 2.3.4 at the end of this section.

2.3.1 Empirical studies in North America

The literature review in this section discusses the outcomes of research into the APA of financial services in North America.

2.3.1.1 Initial studies in North America

Stafford et al. (1982) used data pertaining to married couples from the University of Oklahoma DRP/OPUBCO Continuing Consumer Audit. Their surveys, done using stratified random sampling, are similar to those of major newspapers and

attempt to find out what products are bought, as well as where they are bought and so forth. They analysed findings of the 1975 and 1976 audits which had a total response of n = 3500.

Internal validity was assessed by using split samples by years and then by age groups. The former split, by the years 1975 and 1976 is, however, a short period to be said to provide longitudinal validity.

The authors used the technique of Guttman scaling, which orders financial assets in such a way that if a household owns a particular asset, for example shares, then she also owns all assets with a lower Guttman scale, like a savings account. In a three asset portfolio, with Asset 1 being easier to acquire than Asset 2, and Asset 2 being easier to acquire than Asset 3, the Guttman scaling would be depicted as in Table 2.4.

TABLE 2.4: Example of Guttman scalogram analysis

Asset1	Asset2	Asset3
1	0	0
1	1	0
1	1	0

A Guttman scaling exercise is usually evaluated by using the following measures:

1. The coefficient of reproducibility measures the extent to which the Guttman scale score, for the entire sample, is a predictor of each of the household's financial asset holdings. Guttman suggested 0.85 as an acceptable value validating the use of the Guttman scale. Unfortunately the Guttman scale 'is a function of not only the scalability of the financial assets for the given subjects, but also the extremeness of the subjects' (Dickinson and Kirzner 1986, p. 46). The index of consistency aims to correct for this.

2. The index of consistency shows the maximum level of improvement in the reproducibility as currently explained by the Guttman scaling. Accordingly the expected value of this index is 0 and its maximum is 1. The acceptable measure is 0.50 and above (Stafford et al. 1982).

Stafford et al. (1982) obtained values for the index of reproducibility above 0.94 for the whole sample and the split samples, and all were significant at a level of 0.01. They observed indices of consistency from 0.27 to 0.30. Thus, on consideration

of both indices, the Guttman scale was acceptable and therefore the analyses supported the hypotheses that there was a pattern in the acquisition of these financial assets.

The ownership pattern suggested by the aggregate data was as follows (in order of ease of acquisition)

1. Cheque account
2. Husband's life insurance
3. Savings account
4. Wife's life insurance
5. Stocks
6. Bonds
7. Trusts
8. Mutual Funds

There were the following differences between some of the split samples and the aggregate data

- The 1975 split halves had the mutual funds and trusts reversed. This suggested that either the two assets are similar or that there is a time effect.
- The "Age under 35" and the "Age over 50" groups, in both the 1975 and 1976 samples, had bonds and stocks reversed. This suggested possible existence of cohort effects. The total sample results had suggested that stocks are acquired before bonds.

Dickinson and Kirzner (1986)'s research was largely a replication of Stafford et al. (1982)'s in Canada, in that it also used Guttman scaling and focused on married couples. However, it also added two assets that had not been considered by the former: Registered Retirement Saving's plan (RRSP) and Government Investment Certificates or GIC. RRSP are similar to the USA's Individual Retirement Accounts (IRA), whereas GIC are a form of government savings bonds but are less liquid and more vulnerable to interest rate changes than normal savings bonds

(Dickinson and Kirzner 1986). Also trusts, which had been included in the US study, were excluded from the Canadian study.

They sent questionnaires to an association of Canadian professionals of 36,044 individuals. The response rate was 40.4% or 14,569 respondents. Of these, and after allowing for removal of incomplete responses, there were only 9,173 married couples that were used as the sample. Internal validity was checked through the use of random split halves and using age subgroups per the USA study. The results of Guttman scaling are shown in Figure 2.3

Total Sample and Slpit Halves	Coefficient of reproducibility		Index of consistency	
	Dickenson and Kirzner (1986)	Stafford and Kasulis (1982)	Dickenson and Kirzner (1986)	Stafford and Kasulis (1982)
Aggregate sample	0.83	0.94	0.28	0.28
Aggregate sample - Half I	0.83	0.94	0.28	0.30
Aggregate sample - Half II	0.84	0.94	0.28	0.26
Age 34 or younger	0.86	0.94	0.29	0.29
Age 34 or younger - Half I	0.86		0.29	
Age 34 or younger - Half II	0.86		0.29	
Age 35 - 49	0.85	0.94	0.31	0.28
Age 35 - 50 - Half I	0.85		0.30	
Age 35 - 51 - Half II	0.85		0.31	
Age 50 and older	0.82	0.94	0.30	0.27
Age 50 and older - Half I	0.81		0.27	
Age 50 and older - Half II	0.83		0.31	

FIGURE 2.3: Guttman scales: Dickinson et al (1986) and Stafford et al (1982)

Their study supported the existence of an acquisition pattern of financial services in Canada. Its findings, however, differed from the US study as follows

- Unlike in Stafford et al. (1982), the Canadian study showed a reversal in the order of stocks and bonds; corporate bonds appeared to be acquired earlier than stocks. .
- Canadians opted for savings accounts before husband's insurance, as opposed to the Americans, where the opposite was true.

- Canadians ranked corporate bonds last with 11% holding them whereas 20% of Americans owned corporate bonds and two age-subgroups in the American study rated them fifth in their acquisition pattern (Dickinson and Kirzner 1986).
- Only once did the Canadian findings differ between split samples. In contrast, this was observed a number of times with the American study. However it should be noted that the Canadian sample was from a homogeneous population of one profession, whereas the US sample represented the general public of Oklahoma, and therefore it is more easily defensible for its results to be generalised into the ownership patterns of the general public of the US, or, in the least, of Oklahoma.
- High popularity of RRSPs (similar to IRAs in the US) among Canadians.
- The fact that Dickinson and Kirzner (1986)'s work uses data that captures acquisition experiences until about 1985 while Stafford et al. (1982) uses 1975-1976 data allows for the possibility that time effects may confound the comparison of the two studies

Financial service or asset	Aggregate sample		Age 34 or younger		Age 35 - 49		Age 50 and older	
	Canada	US	Canada	US	Canada	US	Canada	US
Chequing account	1	1	1	1	1	2* ^	1	1
Savings account	2	3*	2	3*	2	3*	2	3*
Husband insurance	3	2*	3	2*	3	1* ^	3	2*
Wife insurance	4	4	4	4	4	4	4	4
Corporate Stock	5	5	5	6* ^	5	5	5	6* ^
Mutual Fund	6	7*	6	7*	6	7*	6	7*
Corporate Bonds	7	6*	7	5* ^	7	6*	7	5* ^

* Priority not consistent between the two studies
^ Priority of split or cohort subgroup not consistent with the aggregate sample

FIGURE 2.4: APA in Stafford et al. (1982) and Dickinson and Kirzner (1986)

2.3.1.2 Summary of findings of initial studies

The works of Stafford et al. (1982) and Dickinson and Kirzner (1986) suggested that there was *a* pattern in the acquisition of financial assets by North Americans, although with seemingly different structures for Canadians and for Americans.

2.3.1.3 Emerging questions and further studies

The above studies also left a number of questions remaining regarding the acquisition of financial services. Namely:

1. Question of priority between mutual funds and trusts
2. Question of priority between bonds and stocks
3. Question of the significance of time effects
4. Question of the significance of cohort effects, and
5. Whether the eight asset groups in Stafford et al. (1982)'s model are inadequate in that they are too broad or too narrow.

Kamakura et al. (1991)'s study the APA of financial assets extended the body of literature on this topic in North America and in general. They used data covering the continental United States that therefore was more representative of the US experience than Stafford et al. (1982)'s, which covered only Oklahoma. Also, their data was as at 1987 and therefore more recent than the previous two. However, to the extent that there are time effects, the results are not easily comparable to earlier works.

While the two earlier authors used Guttman scaling in their statistical formulation of the acquisition patterns, these authors used the Two Parametric Logistic Model or "2PLM", which is a member of the family of parametric item response theory (PIRT) models. This change of method helps understand whether the APA is limited to one method or there is a number of methods for which it can emerge.

Kamakura et al. (1991)'s resulting order of acquisition of financial services, as shown in the table summarising the literature review at the end of this chapter, has a longer list of asset classes and therefore corrects for deficiencies if the hypothesissed orders by the earlier authors are inadequate. These authors also ran two regressions to explain the latent financial maturity to acquire the financial asset or service:

- The following household demographic characteristics were used as independent variables: income, net worth, age, education, occupation, rented or own residence, and whether it is a double income family. Other than the double-income family variable, all the other variables were found to be of a 5 percent significance level. The latent trait measure - financial maturity - was positively related to income, net worth, age, education and occupation.

- Using investment and saving objectives and attitudes to risk as independent variables, they found that "the three ... objectives[:] retirement, tax sheltering, and conservative capital accumulation had a positive effect on an investors latent maturity" and that therefore "investors who emphasise these objectives tend to have higher latent financial maturity and consequently seek services further ahead in the order of acquisition" (Kamakura et al. 1991, p. 342).

Overall the estimated order of acquisition fitted their hypothesised pattern well.

On the questions raised by the two earlier works, the work of Kamakura et al. (1991) suggests that

Priority between mutual funds and trusts They did not hypothesise trusts as a separate asset group in the order of acquisition. It can, however, be argued that the fact that the hypothesised order of fourteen asset groups fitted as hypothesised up to and until the level of mutual funds suggests that mutual funds are more popular than (investment) trusts. Indeed Bertaut and Starr-McCluer (2002) show that the sustained growth in stock prices and reduction in the information and transaction costs of investing in equities in the US during 1983 to 1998 led to phenomenal growth in mutual funds and retirement accounts. Unfortunately, as the events of the latest market crashes have shown, part of the phenomenal growth in the number of individuals investing in the market was merely due to naivety: an assumption that past good performance would repeat itself (Galbraith 1994).

Priority between bonds and stocks Kamakura et al. (1991) supports the hypothesis that stocks are more popular than bonds and that we should expect them to be acquired before bonds. The share of stocks held in US household portfolios rose from 15% in 1983 to 35% in 1998, while the number of households sampled with equity holdings rose from 15% to 49%, while during the period the proportion with savings and other bonds fell from 24.6% to 22.3% (Bertaut and Starr-McCluer 2002).

The significance of time effects The results of Kamakura et al. (1991) were largely in line with findings by Stafford et al. (1982) and therefore suggested no time effect. Further, the work of Bertaut and Starr-McCluer (2002) shows that it is major events in time that have significantly altered household

portfolios, rather than time effects themselves. They mention in particular the following:

- The introduction of tax-deferred accounts in the early eighties in the US led to a boom in IRAs and other retirement accounts like 401k types.
- The Tax Reform Act of 1986 in the US that limited the deductibility of interest payments on debt to largely property backed debt. As a result, the equity in residential property, as a percentage of net worth fell from 22% in 1983 to 15% in 1998.

The significance of cohort effects Kamakura et al. (1991) did not analyse cohorts. However, the work of Bertaut and Starr-McCluer (2002) shows that the policy and price-growth induced take up of risky assets occurred among all age groups between ages 35 and 65 in the period 1962 to 1985.

Whether groups in Stafford et al. (1982) were inadequate Kamakura et al. (1991) got a better fit with a long list of asset groups (14 groups), Dickinson and Kirzner [1986] using 10 asset groups, and Bertaut and Starr-McCluer (2002) using 3 asset groups (safe, fairly safe, and risky) achieved meaningful and consistent results as well. This may suggests that it is not that Stafford et al. (1982)'s asset groups were too inadequate in number but that some were too narrow. For example the division of life insurance into husband's and wife's appears unnecessary.

2.3.2 The Australian evidence

The research of Soutar and Cornish-Ward (1997) into the acquisition of financial services by Australians also delivered evidence of a pattern in the acquisition of financial services. The order of acquisition suggested by the study is included in the table summarising the literature review at the end of this chapter.

The study supported the positive relationships between financial maturity and income as well as financial maturity and occupation levels. Financial maturity was negatively correlated to renting as opposed to owning residence.

This study, like previous studies, did not analyse effects per variable, controlling for other variables. It is possible that high income is positively related to net

worth as persons of net worth may be receiving high salaries, interest, dividend and other income from their investments.

While Soutar and Cornish-Ward (1997) show that financial maturity is positively related to occupation levels, on closer inspection of occupation, they showed that the occupations of blue collar workers and the unemployed had a negative relationship with financial maturity. This highlights that it might not be the upward movement in occupation that matters but the earnings potential emerging from such movement. Indeed, the study showed that "the willingness to purchase variables were less important than the ability to purchase variables" (p. 909).

2.3.3 Empirical studies in Western Europe

The section below looks at the empirical studies of the APA of financial services in Western Europe.

2.3.3.1 First use of the Mokken scaling procedure

Paas (1998) used a data set collected from Telepanel (University of Amsterdam, Holland) in 1994 for their Higher Income Panel (HIP), which has a limited list of households with yearly income of 100,000 Dutch guilders. The total households were 881 in HPI when the guilders' interviews took place. These were done by the author throughcomputers and there were 743 respondents - a good response rate of 83.4 percent. Further, the respondents "did not differ significantly from the non-participants" (p. 368). Accordingly external validity was achieved in that there was no reason that this sample may be thought to be different to the population in Holland then earning 100,00 Dutch guilders.

This appears to be the first work dealing with APA of financial services in Europe as well as the first applying the Mokken scale methodology. For more on the Mokken scale, Chapter 3 briefly details this procedure while Appendix A details the mathematical and statistical foundations of MSP.

The results of all the financial assets considered is shown in Table 2.5

It is noted that all the H_i or items' (products') tests are above zero and above the suggested critical level of 0.30. Without this, the model would fair badly. The

aggregate H, the overall test score or "the scale of the test," as it is usually called, is also above 0.30, at 0.39.

However, while the item Lump sum policy has an H_i above 0.30, its P(1,1) matrix has a flaw (see Table 2.6). In Mokken scaling, it is expected that the P(1,1) of a product (X) and another product (Y) should decrease the more it becomes difficult for someone owning just X to immediately acquire Y. We therefore expect the P(1,1) of Lump sum and Investment (0.2719) to be smaller than that of Lump sum and Securities (0.2073) since it is more difficult for someone owning Lump sum to immediately own Securities than for him to immediately own Investment trusts. This is actually the opposite in the Table 2.6.

If the Lump sum policy product is excluded, the remaining three items have a flawless P(1,1) matrix. "Given the fit of ... the model it may be stated that financial products owned by a larger proportion of the population [as reflected in the ownership rates of the products in the sample], e.g. saving account, are usually acquired before financial products owned by less consumers, i.e. subjects acquire a Savings account before an Investment trust, and an Investment Trust is acquired before Securities" (Paas 1998, p. 371).

While the above is easier to follow because of the limited number of financial services involved, it may be too narrow for use to sufficiently grasp the acquisition of products by an average household facing a myriad of financial services, e.g. savings account, cheque accounts, real estate, mortgage bond, credit card, debit

TABLE 2.5: Scalability of the Telepanel set of Paas (1998)

Financial asset	Ownership level	H_i	Z_i
Savings account	0.85	0.34	5.69
Lumpsum policy	0.48	0.32	10.29
Investment trusts	0.43	0.41	13.32
Securities	0.30	0.48	13.42
Test	–	0.39	15.37

TABLE 2.6: P(1,1) matrix from the Telepanel set of Paas(1998)

P(1,1) matrix	1	2	3	4
Securities	-	0.2210	0.2073	0.2719
Investment Trust	0.2210	-	0.2719	0.3903
Lumpsum policy	0.2073	0.2719	-	0.4253
Savings account	0.2719	0.3903	0.4253	-

card, corporate stocks, corporate bonds, government bonds, life insurance, mutual funds, investment trusts, pension plans, individual retirement arrangements, enterpreneurship opportunies, education plans for children and so on.

2.3.3.2 Cross-European study

Paas (2001) analysed the EURODATA dataset collected in 1990 for the Readers Digest consumer survey. The dataset contains 22,339 subjects from 17 European countries, with all interviewees being 18 years or older and living in private households. The sampling technique had the probability of selecting a household proportional to the population as stratified by region.

Paas (2001) confirmed that individuals highly prioritise the acquisition of transactional accounts, like a cheque account and a cheque book, over credit cards. However this study did not look into the acquisition of other forms of financial services products.

2.3.3.3 Predictive power and comparison with LCA

Paas and Molenaar (2005) used data from CentERdata at Tilburg University, Holland collected in 2001 where 2,000 panel members were interviewed. The authors asked respondents to indicate the type of financial services products they own, and when (year) they bought them. The panel was representative of the adult population (aged over 18) of the Netherlands. There were 1,361 respondents, representing a response rate of 68%. Further, "non-respondents are unbiased on age, sex, religion, education, and residential region" (Paas and Molenaar 2005, p. 92).

The authors divided the raw data into two per below: one for applying APA and another for validating it

- Data on ownership patterns that respondents had on January 1, 1996, was used to apply APA so to show "the reproduced ownership patterns" (p. 93). This was in a form of a NxK table with a cell (n,k) having 1 if respondent n had acquired product k by 1 January 1996. The cell (n,k) would record 0 otherwise.

- Data for validation, "the recent acquisitions set" (p. 93), also had an NxK table with cell(n,k) having 1 if respondent n acquired product k during 1996-2001. The cell (n,k) would record 0 otherwise.

The APA was done on the following product set: cheque account, saving account, property insurance, mortgage bond car insurance, credit card, personal loan, life insurance and investment trusts.

After removing products with low H_i along with other attempts to improve the scale of the test, the following items (in order of ease of acquisition) were discovered by APA

1. Cheque account
2. Saving account
3. Property insurance
4. Car insurance
5. Life insurance

The final scale for the test, H, was 0.41. All the H_i's are non-negative and greater than 0.30.

The predictive power of the model is such that among likely acquisitions that are predicted by the model, the acquisition rate is 6.667% and among the unlikely acquisitions the acquisition rate is 3.333%. The odds ratio is therefore 2.1 and is greater than 1, which would be the odds ratio if the probability of likely acquisitions was the same as that of unlikely acquisitions (Paas and Molenaar 2005).

The model was also compared to an APA using Latent Class Analysis (LCA). The LCA model fitted all nine products. However, the odds ratio was 1.3 - significantly smaller than that of the final APA using Mokken scaling.

While the LCA model ensured that no products were excluded, therefore enabling forecasting for all products, this came at a cost of poorer forecasting ability. Also, the LCA method would be less helpful if an organisation has a limited budget and wants to market selected products that will have the largest effect on revenue and profits.

2.3.3.4 Longitudinal study

Paas, Bijmolt, and Vermunt (2007) analysed a representative sample (n = 7,676) of Dutch households provided by a Dutch division of an international market research firm, GfK. The data spanned the years 1996, 1998, 2000, and 2002. About 32.6% dropped out of each successive wave of these four interviews. The internviews analysed the ownership of six financial assets including savings account, pension fund, life insurance, bonds, investment trusts and shares.

Their analysis resulted in 8 segments with segment 1 representing the segment with the least average total number of financial assets (0.68) and segment 8 representing the segment with the highest average number of total assets (4.27).

This study was the first to look at APA of financial assets over a significantly long period (7 years), therefore providing the benefits of longitudinal analysis. The study confirmed the existence of a pattern in the acquisition of financial services.

The study allowed for a realisation that "the reported acquisition pattern is not only relevant when households develop their financial product portfolios by acquiring an additional asset, but also when discarding assets." (Paas et al. 2007, p. 239). For example, in segment 3, on average everyone owns the savings account. However, from segment 4 to segment 8, the ownership rate of the savings account is less than 1, suggesting that as individuals move up in the financial assets acquisition hierarchy, they drop the Savings account.

At segment 3, the ownership acquisition is as follows:

1. Savings account
2. Pension fund
3. Life insurance
4. Investment trust
5. Shares and Bonds

With the exception of the order of investment trusts and shares appearing reversed, which corresponds with Paas (1998) the order of acquisition at segment 3, which may be the least segment affected by disowning of acquired services, is in line with

Dickinson and Kirzner (1986); Soutar and Cornish-Ward (1997); Stafford et al. (1982).

2.3.4 Summary

- The literature reviewed supports the existence of discernible patterns in the acquisition of financial services in North America, Australia, and Western Europe. Safe assets, like savings and cheque accounts, are bought first and then fairly safe assets and finally fairly risky assets.
- However, as individuals move up in the financial assets acquisition hierarchy, they discard some of the assets that they acquired earlier. The savings and transmission account appears to be one of the entry-level products that suffers from this phenomena.
- The government policies that were studied, aimed at encouraging savings or directing it to certain assets, achieved some level of the desired success.
- Acquisition and ownership patterns appear to be dynamic and responsive to external factors and not just demographic factors and the life cycle stage of the individuals in question.
- Higher error terms in an APA do not necessarily mean that the methodology itself is incorrect. Various factors affect households with different budgets, plans and ambitions in different ways. Error terms from analysis of a data set may therefore "represent increased choice" in the ability or perceived ability of households to meet their objectives(Stafford et al. 1982, p. 414). Similarly, to the extent that the APA methodology confirms the uptake of certain assets at a certain stage, e.g. of the life cycle, this may imply that the financial objectives embedded in selecting such assets are being met in a relatively choice-restrained environment (p. 414).
- Declines in entry, information, and other transactional costs mean that past APA results may need to be used after adjustments when predicting or understanding the current household's buying of financial services.
- The work of Bertaut and Starr-McCluer (2002); Galbraith (1994) on the rise of equity ownership by households suggests that some owners of household portfolios may suffer from naive expectations, with periods of bull markets

resulting in net buys at high prices, and periods of bear markets resulting in net sales at low prices.

- A willingness to acquire a financial services product appears to be relatively less important, as a predictive variable, than ability to acquire it. Consequently, the level of income is relatively more important in predicting ownership of financial services than education and age.

2.3.5 Hypothesis 2

There is a discernible order in the acquisition of customer financial services in South Africa.

This hypotheses will be tested using the Mokken scaling procedure.

FINANCIAL ASSETS	Stafford and Kasulis (1982)	Dickenson and Kirzner (1986)	Soutar and Comish-Ward (1997)	Kamakura, Ramaswami and Srivastava (1991)	Paas (1998)	Paas (2001)	Paas and Molenaar (2005)	Paas, Bijmolt and Vermunt (2007)	Bertaut and Starr-McCluer (2002)	NOTES
Foundation services										* husband's life insurance
Savings account	3	2			1		2	1+		** wife's life insurance
Checking account	1	1	2	1		1&, 2&&	1			*** trusts
Cash dispenser card						3				^ Superannuation (Australian structure)
Bank credit card				2		4				^^ fixed term deposit with (traditional) bank
Home Mortgage			1	3						^^^ fixed term deposit withcredit society
Other Loans				4						^^^^ equity trusts
										# Insurance bonds
Risk management and cash reserves										## (other) corporate bonds
Life insurance	2*, 4*	3*, 4**	4	5	2$$		5	3+		$ investment trusts
Pension Plan				6				2+		$$ lump sum policy
Individual Retirement Account			3^	7						& bank account
Money Market				8						&& cheque book
Fixed term deposits			5^^, 7^^^							+ using segment 3
Property insurance							3			** Significant at 5%
Car insurance							4			*** Significant at 1%
Growth to offset										
Corporate Stocks	5	5	6	9	4			5+		
Cash management trust			9	10						
Mutual funds	8	6	8^^^^	11	3$			4+		
Risky, tax protection assets										
Travel or Entertainment card				14						
Tax Shelters	7***			12						
Corporate Bonds / Debentures	6	7	11#, 13##	13				5+		
Government Bonds			12					5+		
Real Estate other than home				18						
Current income -post retirement										
CD's or Treasury Bills				15						
Time deposits				16						
Annuities				17						
Other										
Collectables			10							

RESULTS OF TESTS, POPULATION, METHODOLOGY, AND OTHER NOTES	Stafford and Kasulis (1982)	Dickenson and Kirzner (1986)	Soutar and Cornish-Ward (1997)	Kamakura, Ramaswami and Srivastava (1991)	Paas (1998)	Paas (2001)	Paas and Molenaar (2005)	Paas, Bijmolt and Vermunt (2007)	Bertaut and Starr-McCluer (2002)	NOTES
Test supported a common order of acquisitio	Y	Y	Y	Y	Y	Y	Y	Y		
Country of Population	USA - Oklahoma	Canada	Australia	USA - continenta	Holland	estern Europe (1	Holland	Holland		* husband's life insurance
Acquisition was revealed by	Guttman, Green	Guttman, Green	Rasch							** wife's life insurance
Internal validity checked and confirmed	Y	Y	N							*** trusts
Longitudinal reliability checked and confirme	Y	Y	N							^ Superannuation (Australian structure)
Regression against predictive variables	N	N	Y						Risky assets only	^^ fixed term deposit with (traditional) bank
i. Income			+ ***	+ **					- log income **	^^^ fixed term deposit withcredit society
ii. Net worth				+ **					+ log wealth **	^^^^ equity trusts
iii. Age (years)				+ **					- for 55 and over *	# Insurance bonds
iv. Education				+ **					+ **	## (other) corporate bonds
v. Occupation				+ **					+ retired **, '- self-employed **	$ investment trusts
Self employed			+ **							$$ lump sum policy
Blue collar worker			- **							& bank account
Unemployed			- ***							&& cheque book
vi.Rent / Own residence				+ **						+ using segment 3
vii. Attitude to life or inveseting									- no risk **, + high risk **	** Significant at 5%
No control over life			- ***							*** Significant at 1%
Confident to invest			+ ***							
viii. Sex										
Male			+ ***							
Female (headed)									not significant	

Chapter 3

Research Methodology

3.1 Introduction

The author has used a sub-population of the All Media and Products Survey (AMPS) undertaken by the South African Advertising and Research Foundation (SAARF) in 2008. This survey covers both the purchase of media products and a wide range of non-media products, including the ownership and acquisition of financial services by households and individuals.

3.2 Research paradigm

The research uses quantitative data, which has been derived by the author from the AMPS and collected into the following categories:

1. Demographic factors of the individual, with most of the variables taking ordinal values — for example, the variable age takes ordinal values per the increasing age groups and income takes ordinal variables per the increasing income groups.

2. The ownership status (whether the individual has a particular financial asset or not) took the ordinal values 1(have) and 0(not have).

The conversion of the data into ordinal numbers was necessary so that a regression of demographic variables on financial asset ownership could be don., This allowed

for a Mokken scaling procedure (MSP) to be applied to the asset ownership data to investigate the order of acquisition of financial assets.

Appendix C shows the format of the data that was imported to MSP program and the software for linear regression calculations.

3.3 Research design

SAARF used an interview method to collect the data for the AMPS surveys. However, all of the questions in the questionnaire form are closed ended, requiring either yes, no or a specific answer, eg. the number of dependent children in the household. The role of the interviewer is both to fill in the questionnaire form for the interviewee and to clarify issues or questions the interviewee might find challenging to comprehend. The interviewer also ensures that the questionnaire is completed on time during the interview and is sent to the SAARF for processing.

3.4 Population and Sample

3.4.1 Population

The target population for the survey is the whole population of South Africa. To this end, SAARF used the 2008 population estimates supplied by the Bureau of Market Research(BMR) of the University of South Africa (UNISA), which had prepared these estimates for population projections for the period 2001 to 2021 (SAARF 2008).

The population excludes those above 16 years in prisons, hostels, military personnel and minority sub-populations in some geographical areas (SAARF 2008, p. 25).

3.4.2 Sample and the sampling method

3.4.2.1 Sample

The data is a combination of

- 2007B: July to December 2007 fieldwork research, which covered only large urban areas (SAARF 2008) — specifically 'Metropolitan', 'City' and 'Large Town' as per the SAARF's definitions
- 2008A: January to June 2008 fieldwork research, which covered a full national sample with both urban and rural components.

The data is also referred to as the 2008B rolling average data.

The total sample is per Table 3.1.

TABLE 3.1: Sample composition

Period	Total	Men	Women
July to December 2007	31,109	15,501	15,608
January to June 2008	31,305	15,600	15,705

3.4.2.2 Sampling method

SAARF (2008) applied a sampling method as follows:

Selection of communities All metropolitan areas and urban communities with a total population of 100 000 or more were automatically included in the sample. Urban communities within a province were first listed, in alphabetical order, within a specified range of population size categories/ Using a standard random start, a sample of communities, within which households would be chosen, were drawn. For rural areas, samples were allocated to provinces and Magisterial districts pro-rata to population on the basis of the 2007 population estimates (SAARF 2008).

Selection of addresses Residential addresses in most urban communities are listed in the Nielsen GeoFrame and this was utilised to select actual addresses from the selected communities. The system of GPS coordinates were utilised in selecting addresses in areas not covered in the address register. By electronically overlaying the grid, random coordinates could be selected and supplied to the interviewers who themselves used GPS devices to move to the target points. By instructing interviewers to move three dwellings to the right for the second respondent clusters were formed (SAARF 2008).

Selection of respondents Each address was pre-designated at SAARF head office to provide a specifically male or female respondent. At each address, the individual to be interviewed was determined by means of a random grid, using the number of adults of the relevant gender within that household. Irrespective of his or her language, once the respondent was identified, he had to be interviewed (SAARF 2008).

3.5 The research instrument

All the questions in the questionnaire form dealing with demographic factors and ownership and acquisition of financial services were closed ended. This enabled ease of establishing consistency in the answers between respondent.s It also minimised any influence that might be played by the researcher's value judgement.

The data on demographics and financial asset ownership addresses the testing of whether demographic factors have an effect on saving and the form of saving. More specifically, this refers to the financial services utilised for such savings (Hypothesis 1). The data on financial asset ownership and acquisition also addresses the testing of the hypotheses that there is a discernible pattern in acquisition of financial services by South African customers (Hypotheses 2).

3.6 Procedure for data collection

Relevant data from the AMPS relating to demographic factors and ownership of financial services was selected and then converted into ordinal values of 0 and 1 to enable their use in regression and in the Mokken scaling procedure.

3.7 Data analysis and interpretation

The effect of demographic factors on financial asset ownership was analysed using linear regression.

Whether there was an order to the acquisition of financial services or not, was tested by incorporating the financial asset ownership data into the Mokken scaling

procedure. The Mokken scaling procedure is not an independent statistical model but is one of the procedures to test that the items (financial services products) confirm to a non-parametric Item Response Theory (IRT) model with the following conditions:

1. Unidimensionality: The ownership of any financial service depends on only one latent trait — e.g. ability
2. Local independence: Other than the influence of the ability to purchase, the acquisition of any two services is not correlated
3. Monotonicity: Given any two individuals, the one with higher ability will have more of the same product or own more products than the other person, and
4. Double monotonicity: This assumption allows us to order the items or financial services with respect to the ease with which they can be acquired, so that any level of ability would reflect the same order of their acquisition.

Non Parametric Item Response Theory (NIRT) models and the Mokken scaling procedure are explained in detail in Appendix A.

3.8 Limitations of the methodology

- The closed ended nature of the questions in the questionnaire limits the ability of the survey to capture dynamics in the household acquisition of financial services which are outside the yes/no response dimensions.
- The demographic factors are regressed as explanatory variables on financial asset ownership using a linear regression model. It is possible that some, or all, of the demographic variables portray a non-linear relationship with financial asset ownership and a resulting observed weak link would therefore be misleading.
- The Mokken scaling procedure uses financial asset ownership as a reasonable estimate of financial asset acquisition - services and products with higher ownership are assumed to have been bought earlier in the acquisition process. This may not be the case, especially in a dynamic world where exogenous factors may render earlier services and products obsolete or unpopular.

- Mokken scaling and the standard models of non-parametric IRT fail to capture the observable fact that in their accumulation of financial services, individuals and households also de-accumulate some of their acquired services and products.

3.9 Validity and reliability

3.9.1 Internal validity

The objective of the AMPS 2008B is to measure the extent to which the designated products are bought, by whom they are bought, what other products are bought by such persons and what demographic factors influence these purchase events.

Internal validity measures the extent to which the research is measuring what it purports to measure despite, namely, the interpretation by the researcher, interpretations by the respondents, and the clarity and directness of the research question in asking what it seeks to be answered (Cano 2001).

While there are factors that may affect or disturb either the researcher or the respondent during an interview, the large sample (greater than 30,000), the fact that almost all the questions are closed-ended, demographic differences, and the geographical spread of the respondents, suggests that the effects of these disturbances are likely to be low.

The author therefore concludes that the research has internal validity.

3.9.2 Extenal validity

The other side of validity is 'external validity,' which refers to the extent to which the research results, derived from data from the sample, can be generalised to the target population.

Cano (2001) suggests that research results are likely to be generalisable if

1. Random sampling is used

2. The sample is heterogeneous across the target population, which means that it has been selected from various 'segments' of the target population, and

3. The sample is sufficiently large

The SAARF method of collecting the AMPS data meets these requirements and, accordingly, it is concluded that there is external validity.

3.9.3 Reliability

Reliability is the extent to which the instrument, that is, the SAARF questionnaire, used in measurement would yield the same results were it replicated (Cano 2001). Reliability addresses the accuracy of the research method and techniques in producing data. Cano (2001) suggests that the reliability of the research instrument may be assessed by asking the question "How certain are you that any person using the same interview script will not sway the answers of the interviewees?"[p. 3].

Unclear, open ended questions are usually the culprits where reliability is poor. The time since the event being recalled worsens also plays a role in lessening reliability.

The move by SAARF to change the financial question "Which financial service(s) have you opened in the last twelve months?" to simply "Have you opened a financial services account in the last twelve months?" aids reliability because the time lapsed might be too long for others to remember the specific financial services product bought - especially in a tense competitive environment.

It is concluded that the SAARF questionnaire is sufficiently reliable.

Chapter 4

Presentation of Results

4.1 Introduction

This chapter presents and describes the results of the analysis, which are explained and discussed in detail in the next chapter, Chapter 5.

This chapter has the following sections:

- Section 4.2 presents information relating to the demographic profile of the sample.
- Section 4.3 presents the results of analysis in testing Hypotheses 1, which assumed that the following demographic factors influence financial services acquisition: age, marital status, number of children in the household, income, education, house or dwelling status (whether it is rented or owned), and work status.
- Section 4.4 briefly discusses the ownership profile of the financial services owned by the entire sample of interest, who have income of $>$ R5,000 per month.
- Section 4.5 presents the results of testing Hypotheses 2, that in South Africa there is a discernible order in the acquisition of financial services.
- The Summary section provides concluding comments.

4.2 Demographic profile of respondents

This section describes briefly the various demographic profiles of the sample. These demographic variables, together with their definitions and categorical values are shown in Table 4.1.

TABLE 4.1: Demographic variables analysed

Cat.	Income	Education	Age	Work status	Marital	Dwelling	No. of children
0	excluded	no schooling	16 - 29	Unemployed	Not married or living together	Not owned	1 child
1	excluded	some primary school	20 - 24	Student	Married or living together	Owned	2 children
2	excluded	primary school completed	25 - 34	Housewife	-		3 children
3	excluded	some high school	35 - 44	working part time	-		4 children
4	R5,000 - R7,999	matric (grade 12)	45 - 49	Retired	-		5 children
5	R8,000 - R10,999	secretarial	50 - 54	Working full time	-	-	-
6	R11,000 - R19,999	technical education	55 -64	-	-	-	-
7	R20,000+	artisan	65+	-	-	-	-
8	-	post matric degree/diploma	-	-	-	-	-
9	-	professional	-	-	-	-	-
10	-	university degree	-	-	-	-	-

4.2.1 Gender

Figure 4.1 presents the gender profile of respondents.

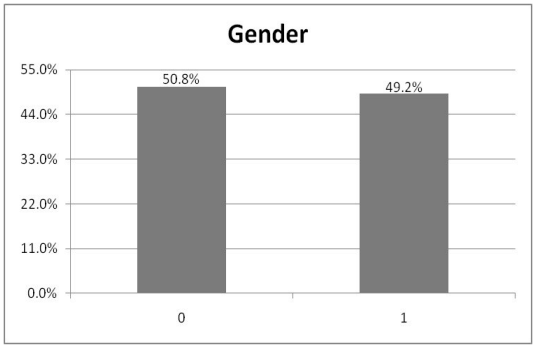


FIGURE 4.1: Gender profile of respondents

The sample had 50.8% male respondents (category 0) and 49.2% female respondents (category 1). It is thus likely that the results have not been influenced by gender effects.

Whether or not gender affects the acquisition of financial services has not been tested in this study as the literature did not suggest that this demographic factor was significant.

4.2.2 Age

Figure 4.2 presents the age profile of respondents.

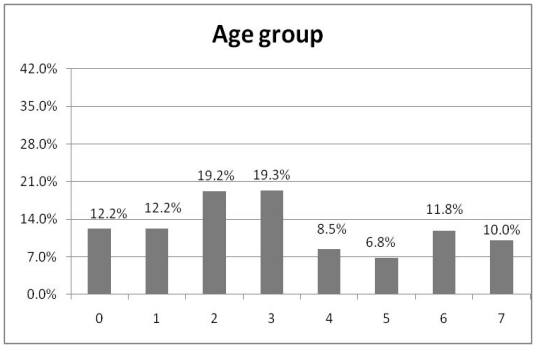


FIGURE 4.2: Age profile of respondents

The sample had respondents split up, in terms of age groups, as follows: 12.2% of age 16-19 (category 0); 12.2% of age 20-24 (1); 19.2% in ages 25-34 (2); 19.3% in ages 35-44 (3); 8.5% in ages 45-49 (4); 6.8% in ages 50-54 (5); 11.8% of ages 55-64 (6); and 10.0% in ages 65 or beyond (category 7).

The influence of age on the acquisition of financial services has been tested as the literature suggested that this demographic factor was significant.

4.2.3 Marital status

Figure 4.3 presents the marital status of respondents.

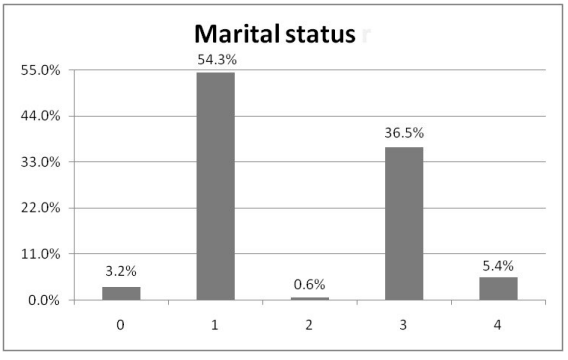


FIGURE 4.3: Marital status data

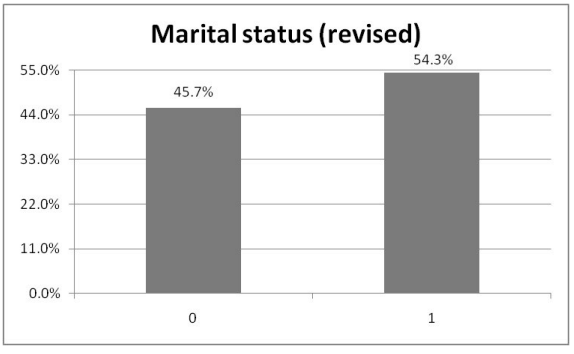


FIGURE 4.4: Marital status revised

Divorced respondents (category 0) comprised 3.2% of the sample. Married or living-together respondents (1) comprised 54.3% of the sample while separated (2)

respondents made up 0.6% of the sample. Single (3) and widowed (4) respondents constituted 36.5% and 5.4% of the sample respectively.

For the regression analysis, however, the respondents were grouped into two groups: not married or not living together, and married or living together, as depicted in Figure 4.4.

The effect of marital status on the acquisition of financial services has been tested as the literature suggested that this demographic factor was significant.

4.2.4 Number of children in the household

Figure 4.5 shows that 49.3% of the respondents (category 0) had no child in the household while 50.7% (1) had at least one child.

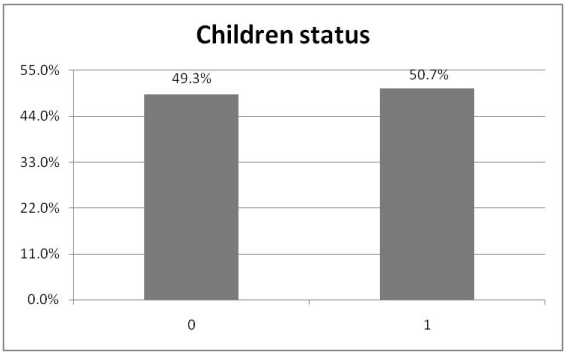


FIGURE 4.5: Children status

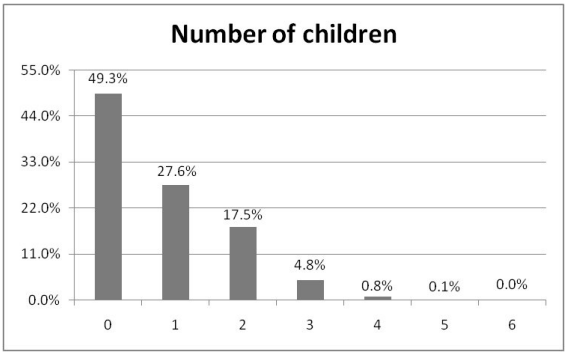


FIGURE 4.6: Number of children

Figure 4.6 shows that, in terms of the actual number of children in the household, 27.6% of respondents (category 1) had 1 child, 17.5% (2) had 2 children, 4.8% (3) had three children, 0.8% (4) had four children, 0.1% had five children, and none (of the sample with incomes at or above R5,000 per month) had 6 or more children (category 6 in the graph).

The impact of a child or children on the acquisition of financial services has been tested as the literature suggested that this demographic factor was significant.

4.2.5 Income

Figure 4.7 shows that in the selected data of individuals earning at least R5,000, per the delimitations of the study, 25.8% earned in the range R5,000–R7,999 (category 4), 23.6% earned in the range R8,000–R10,999 (5), 27.3% earned in the range R11,000–R19,999 (6) and 23.2% earned at least R20,000 (category 7).

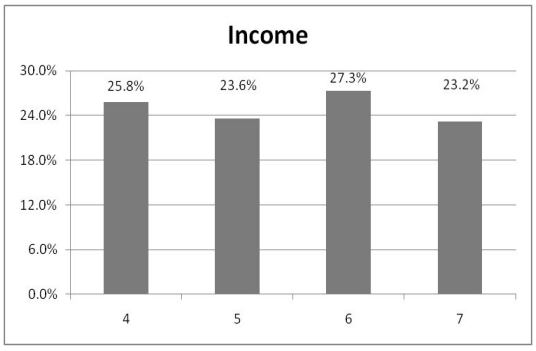


FIGURE 4.7: Income profile

4.2.6 Education

Figure 4.8 shows that the sample contains respondents of various educational and professional levels. The respondents' profile appears biased toward those with only some high school education (category 3: 27.8% of the sample), those with only matric or grade 12 (4: 40.3%), those with post-matric degree/diploma (8: 12.8%)and those with university education (10: 8.6%). It is noted that the categories have some overlap, for example categories 8 to 10 are likely to overlap. In particular, a person with a university degree may either be in 8, or 9 or 10.

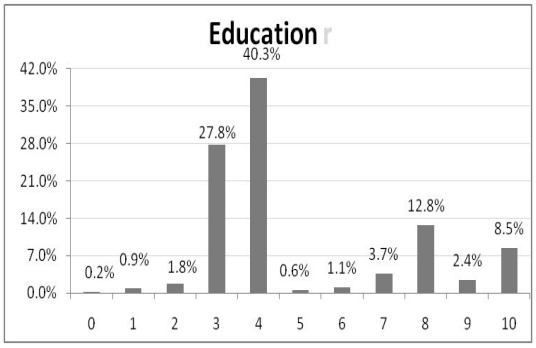


FIGURE 4.8: Education profile

The literature suggests that education is significant in the acquisition of household portfolios. Accordingly, this demographic variable was tested as part of testing of Hypothesis 1.

4.2.7 Dwelling status

The respondents' profile, as depicted in Figure 4.9, has 77.9% owning their dwelling (category 0), 0.1% being children still staying at home, 0.1% occupying company owned houses and 21.9% renting.

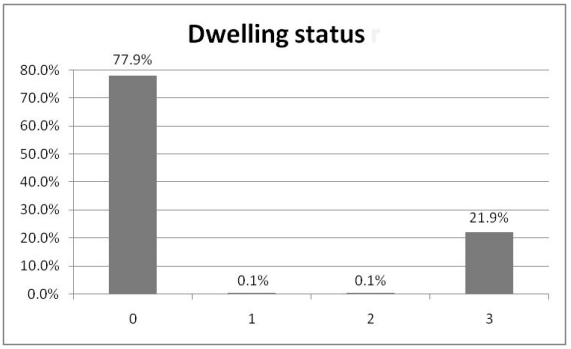


FIGURE 4.9: Dwelling (per data)

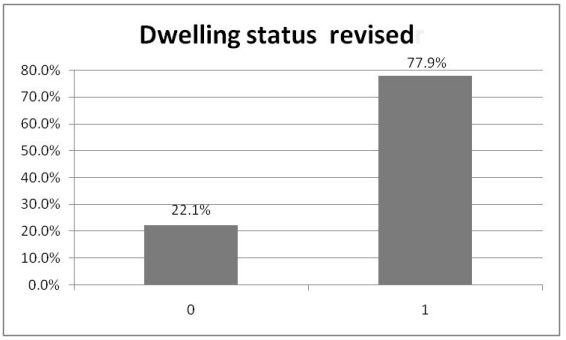


FIGURE 4.10: Dwelling (revised)

For the regression analysis, however, the respondents were grouped into two groups: not owning their dwelling (0), and owning their dwelling (1), as depicted in Figure 4.10.

The dwelling status' effect on the acquisition of household financial services has been tested as part of testing Hypothesis 1.

4.2.8 Work status

Figure 4.11 shows the work status profile of the sample.

The emergence from the data is that, of the sampled population earning or receiving in some form at least R5,000 per month, there are also students and some people who are unemployed. This is surprising and suggests the possibility, inter alia, that there was a technical problem in the recording of some of the respondent findings or some respondents possibly lied.

Work status' effect on the acquisition of household financial services has been tested as part of testing Hypothesis 1.

4.3 Results pertaining to Hypotheses 1

The results of the multilinear regression exercise are shown in Table 4.2, and suggest that:

- Income and education are positively significant in the acquisition of all the financial services products in the final Mokken scale: savings account, check account, credit card, unit trusts, garage card, mortgage facility, vehicle finance, overdraft facility, (JSE) exchange related investments, and other or non-exchange related investments.
- Age is positively significant in the acquisition of savings account, check account, credit card, unit trusts, garage card, mortgage facility,(JSE) exchange listed investments and other or non-exchange related investments. It is negatively related to the ownership of mortgage financing and vehicle financing facilities.
- Other than in the acquisition of non-exchange related investments, work status appears to be positively significant in the acquisition of savings account, cheque account, garage card, unit trusts, mortgage facility, vehicle finance, ovedraft facility, and (JSE) exchange listed investments.
- Marital status is positively significant in the acquisition of financial services products, except regarding unit trusts and non-exchange related investments.
- The number of children in the household is positively significant in the acquisition of mortgage facility, vehicle finance, and the overdraft facility.
- Whether dwelling is rented (0) or owned (1) is positively significant in the acquisition of cheque account; unit trusts; garage card; mortgage facility;

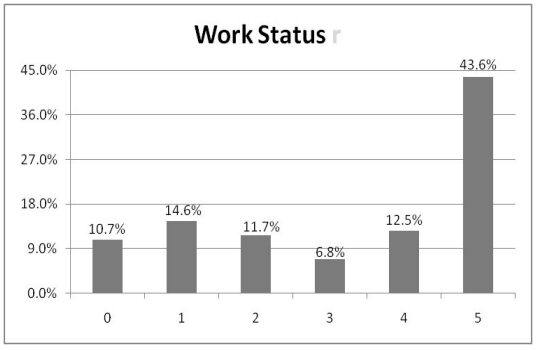


FIGURE 4.11: Work status

and overdraft facility. The dwelling status is negatively significant in the acquisition of either the ATM card or vehicle finance.

4.4 Profile of ownership of financial services

Figure 4.12 shows the ownership profile of the financial services of interest by entire sample of interest, which has income of less than R5,000 per month. From this graph the following is noted:

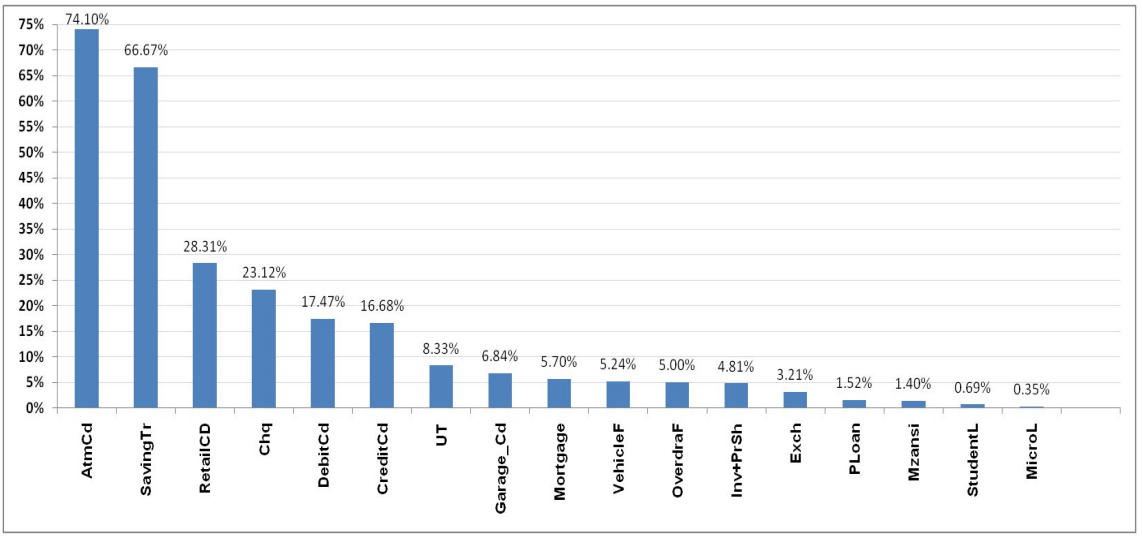


FIGURE 4.12: Ownership profile for the entire group with income > R5,000

- About 66.7% of respondents have a savings account or ATM card linked to a bank product of some form.
- Just below 25% of respondents have a cheque account.
- About 17% have either a debit card or credit card.
- Unit trusts are owned by approximately 8.3% of the respondents.
- About 5%–7% have a garage card; mortgage facility, vehicle finance facility; overdraft facility; and some form of non-exchange traded investment.
- About 3% have exchange traded investments, like publicly traded shares.
- About 1.5% or less have personal loans; Mzansi account; student loans; or micro loans.

TABLE 4.2: Multilinear regression results

Variable coefficient and standard error	**Adj. R^2 /S.E**	**Constant**	**Income**	**Education**	**Age**	**Work status**	**Marital**	**Dwelling**	**No. of children**	**1**	**2**	**3**
ATM card coefficients	13.19%	0.530	0.069	0.031	0.030	0.117	0.044	-0.102	removed	Work status	Income	Marital
ATM card standard error	0.81641	0.039	0.007	0.003	0.004	0.005	0.017	0.018	removed	-	-	-
Cheque account coefficients	21.33%	-1.060	0.070	0.100	0.117	0.088	0.044	0.060	removed	Age	Education	Work status
Cheque account standard error	0.74787	0.036	0.016	0.015	0.006	0.003	0.004	0.004	removed	-	-	-
Credit card coefficients	17.35%	-0.914	0.114	0.067	0.026	0.052	0.078	removed	removed	Income	Marital	Education
Credit card standard error	0.67784	0.032	0.006	0.003	0.003	0.004	0.014	removed	removed	-	-	-
Unit Trusts coefficients	8.20%	0.786	0.021	0.022	0.009	0.010	removed	0.016	removed	Education	Income	Dwelling
Unit Trusts standard error	0.26473	0.013	0.002	0.001	0.001	0.001	removed	0.006	removed	-	-	-
Garage card coefficients	10.13%	-0.518	0.059	0.039	0.006	0.016	0.071	0.032	removed	Marital	Income	Education
Garage card standard error	0.47853	0.023	0.004	0.002	0.002	0.003	0.010	0.011	removed	-	-	-
Mortgage facility coefficients	9.23%	-0.422	0.038	0.023	-0.009	0.028	0.052	0.105	0.048	Dwelling	Marital	No. of children
Mortgage facility standard error	0.44168	0.021	0.004	0.002	0.002	0.003	0.010	0.010	0.005	-	-	-
Vehicle finance coefficients	8.57%	-0.390	0.051	0.027	-0.008	0.025	0.034	-0.017	0.027	Income	Marital	Education
Vehicle finance standard error	0.42634	0.020	0.004	0.002	0.002	0.002	0.009	0.009	0.004	-	-	-
Overdraft facility coefficients	6.28%	-0.364	0.043	0.023	0.005	0.012	0.040	0.027	0.018	Income	Marital	Dwelling
Overdraft facility standard error	0.42209	0.020	0.004	0.002	0.002	0.002	0.009	0.009	0.004	-	-	-
Non-exchange Investment coefficients	5.05%	-0.227	0.021	0.026	0.025	removed	0.016	removed	-0.008	Education	Age	Income
Non-exchange Investment standard error	0.41693	0.020	0.004	0.002	0.002	removed	0.009	removed	0.004	-	-	-
Stock exchange investments coefficients	4.29%	0.887	0.013	0.010	0.005	0.002	removed	removed	removed	Income	Education	Age
Stock exchange investments standard error	0.17230	0.008	0.001	0.001	0.001	0.001	removed	removed	removed	-	-	-

Assuming that the ownership rates follow a Guttman scale, the following observations can be made:

- Very few (8.3% or less) are able to save beyond placing their savings in a saving account, cheque account, or other form of banking account associated with a credit card or debit card.
- Unit trusts appear to be the first investment product to be bought which has a potential to assist with building long-term portfolios.
- Increasing income beyond a level enabling investing in unit trusts, results in the individual initially taking on more debt rather than more investments. These debts are associated with:
  - Garage card (6.8%)
  - Mortgage facility (5.7%)
  - Vehicle finance facility (5.2%) and
  - Overdraft facility (5%)
- Thereafter, and as these debts are paid out over time, the individual's net worth increases due to a combination of:
  - An increasing share of equity in the assets initially bought on credit, e.g. a house that was acquired through a mortgage,
  - An increasing percentage allocation of income into savings
  - The effect of interest compounding of earlier investments
- The proportion invested in exchange (3%) and non-exchange investments (5%) suggests that at least half of those who qualify for the debt facilities above (at maximum of 6.2% for garage card owners) do end up owning some form of investment other than unit trusts after acquiring the debt facilities.

The hierarchical acquisition development of the individual in the financial services continuum using a Guttman scale can be depicted as in Figure 4.13. The results of the final run, which are shown in Table 4.3, support this observation.

4.5 Results pertaining to Hypotheses 2

The Mokken scaling procedure suggests that financial services in South Africa are acquired as depicted in Table 4.3.

TABLE 4.3: Overview of final scales

Item	Entire group	Income =4	Income =5	Income =6	Income =7
AtmC	1	1	1	1	1
Cheque account	2	2	2	2	2
Credit card	3	3	3	3	3
Unit trusts	4	4	4	4	5
Garage card	5	6	6	7	4
Mortgage	6	7	8	5	7
Vehicle fin.	7	10	9	6	6
Overdraft fac.	8	8	7	8	8
Investments	9	5	5	9	9
JSE shares	10	9	10	10	10
H score	0.44	0.33	0.36	0.37	0.43

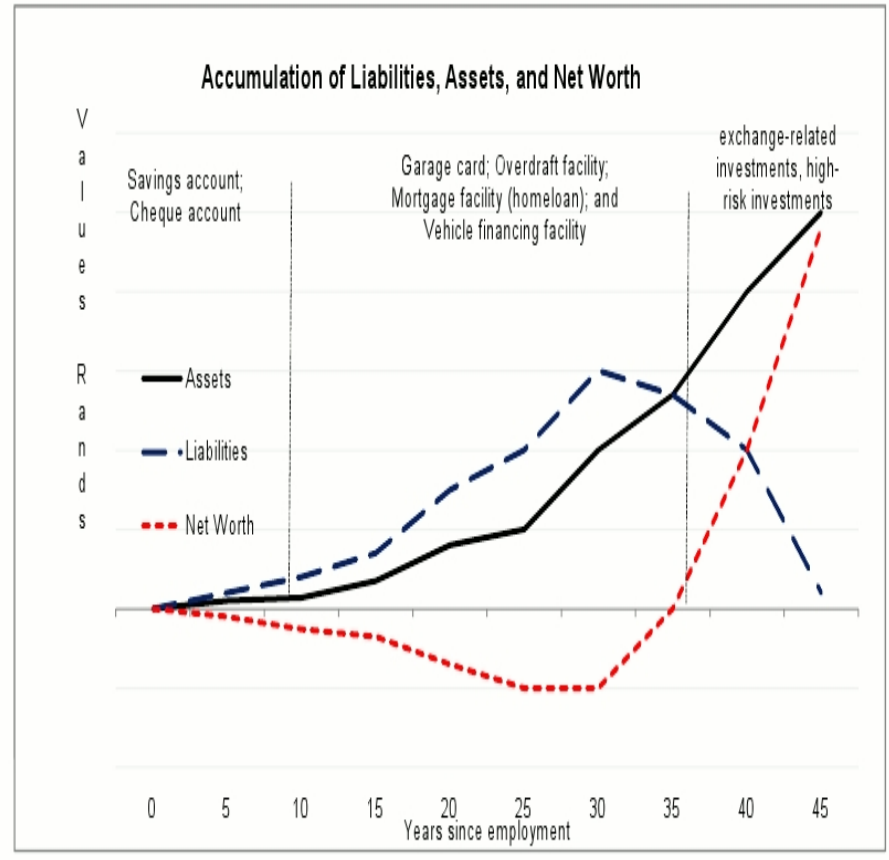


FIGURE 4.13: Accumulation of liabilities, assets and net worth over time

The acquisition patterns emerging were not the same for all income groups.

There is higher ownership of mortgage facilities in the subgroup with an income demarcated as 6 than in subgroup with an income demarcated as 7, suggesting that, possibly because of their higher net worth, the latter may have a larger percentage of individuals with fully paid houses.

The *itemH* are all above 0.30, ranging from 0.33 to 0.44.

It is concluded that the results of the entire sample and for the sub groups support Hypotheses 2.

4.6 Summary of Results

As portrayed in Tables 4.2, which summarises the results of testing Hypothes 1, and Table 4.3, which summarise the results of Hypotheses 2, data analysis confirmed the reviewed literature that:

- Demographic factors of age, marital status, number of children in the household, income, education, whether dwelling is owned or rented and work status are significant determinants in the acquisition of financial services and build-up of household portfolios.
- Financial products are acquired in a hierarchical pattern according to the level of difficulty to acquire.

Chapter 5

Data Analysis and Discussion

5.1 Effects of demographic factors

5.1.1 Introduction

The regression results of demographic variables on financial services products which fitted the final Mokken scale are shown in Table 4.2.

In general, the explained variation is low, and ranges between 21.33% and 4.29%. The standard error ranges from 0.17 and 0.82. Most of the variables, notably income, education, and age were significant at 1% or less and the F test, a test for the general fit of the model (actual vs. predicted values) was significant for all the regressions on financial service products at 0.1%.

Income, education, and age affect the acquisition of all of the financial services that are in the final run of the Mokken scale, as depicted in Table 4.2, with p-values below 1%. Age had significant effect on the acquisition of cheque accounts (highest coefficient), non-exchange related investments (second highest coefficient), and (stock) exchange related investments (third highest coefficient). Income was significant in the acquisition of an ATM card (second highest coefficient), credit card (highest coefficient), unit trusts (second highest), vehicle finance (highest coefficient), overdraft (highest coefficient), non-exchange related investments, e.g. own business (third highest coefficient), and exchange related investments, e.g. stocks (highest coefficient). Education was significant in the acquisition of cheque accounts (second highest coefficient), credit cards (third highest coefficient), unit

trusts (highest coefficient), garage cards (third highest coefficient), vehicle finance (third highest coefficient), non-exchange related investments (highest coefficient), and exchange related investments (second highest coefficient).

Age has negative coefficients with the acquisition of mortgage facility and that of vehicle finance, although the absolute values of these coefficients are low compared to coefficients of other influencing variables. The low coefficient with age of mortgage facility may suggest that there is higher likelihood of purchasing a house or purchasing a house through a mortgage facility at a lower age than later in life. Similarly, the negative coefficient with vehicle finance may suggest that there is higher likelihood of purchasing a vehicle or purchasing a vehicle through a mortgage facility at lower ages than at older ages. Indeed (Wilkes 1995, p. 39) found that "young newlyweds ... are especially disposed toward higher automobile expenditures." He also noted that, after this period in the family life cycle, acquisition of automobiles decline to later peak at the start of the "empty nest" stage when children leave home, and are no longer dependents. (Wilkes 1995, p. 36) findings are depicted in Figure 5.1.

The significance of age is also notable in the acquisition of non-exchange related investments (e.g. own business) and exchange related investments (e.g. traded government bonds, and listed shares). This may suggest that:

- Even without structured education (e.g. a tertiary qualification), with increasing age and associated experience, individuals may gain sufficient understanding of business and investment matters to be confident in investing in such endeavours.
- With increasing age and movement through the lifecycle stages, significant debts (e.g. mortgage facility, vehicle finance, and financing of furniture) may become fully paid and therefore increase the amount available to invest.

Income appears overall to have the highest influence on the acquisition of basic financial assets and certain liabilities in terms of the size of coefficients and the fact that it has a p-value of less than 1%. However, income alone, appears to be an insufficient condition for the accumulation of most long-term and wealth-building instruments. Individuals appear to need both education and income to invest in unit trusts, non-exchange related investments -like own business-and in exchange traded investments, like bonds and derivative instruments.

Marriage and the presence of children in the household appear to have more influence (high coefficients) in the ownership of own dwelling than demographic factors like income, and therefore higher influence in the acquisition of a mortgage facility. Mortgage facilities are owned largely by those who dwell in their own properties.

Those dwelling in their own homes also appear to be significant holders of unit trusts and overdraft facilities. The holding of unit trusts is in line with the work of Avery and Kenickell (1991); Bosworth et al. (1991) that saving is higher for homeowners than renters. There may, however, be interaction effects. For example, they may be over-representation of married / living-together couples among home owners. Smith (1994) showed that there is a positive relationship between

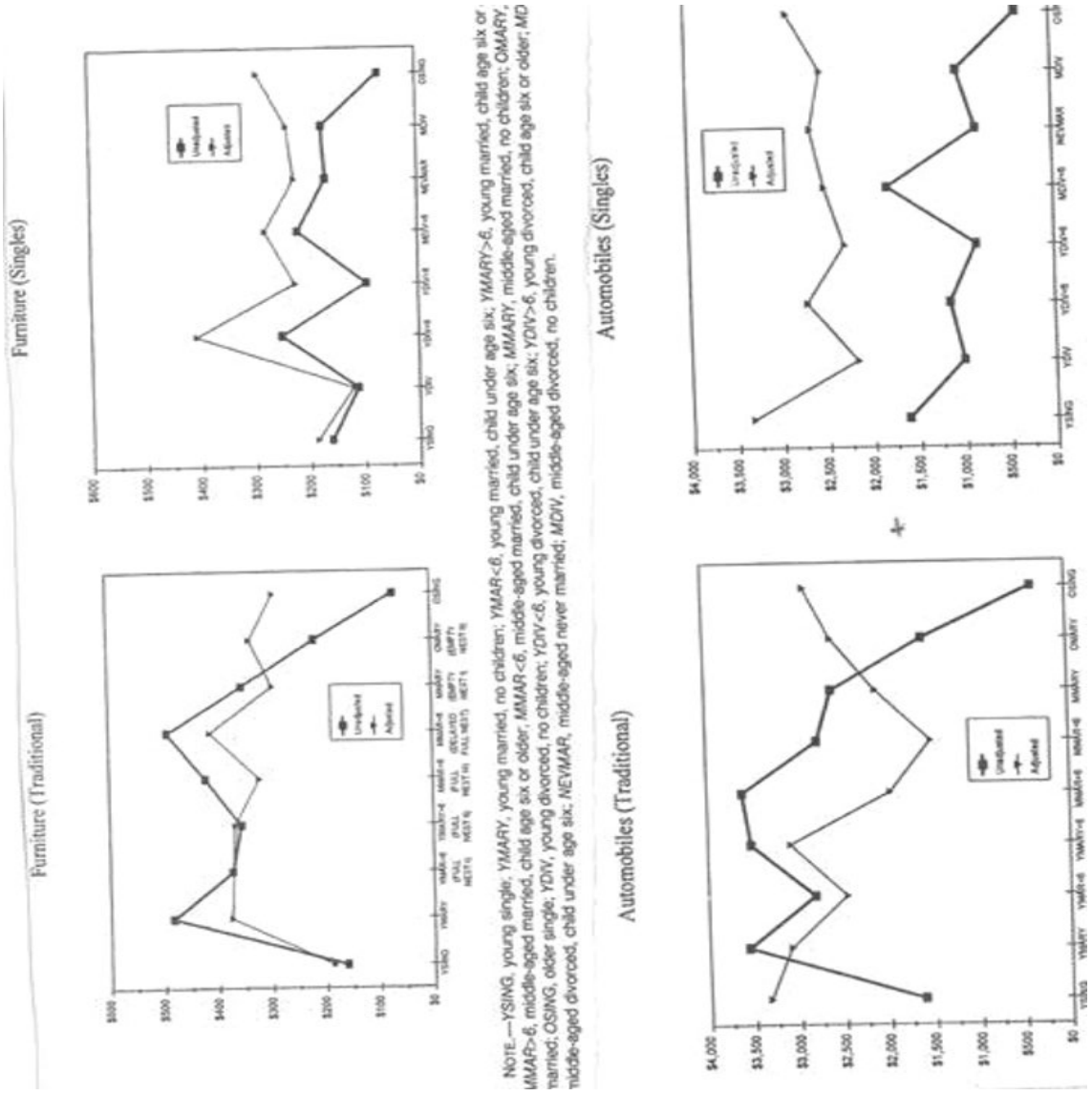


FIGURE 5.1: Acquisition of automobiles over the life cycle (Wilkes 1995)

saving and marriage. Also, the innovativeness of banks has created comprehensive products wherein one's cheque account is linked to vehicle finance facility, overdraft facility, mortgage facility, and other products with the bank — e.g. the ABSA One account for their Platinum and Private bank clients (Narshi 2010). This also results in married / living together individuals and home owners having a higher number of financial services than the rest of the population.

It is noted that dwelling status has negative coefficients with the ownership of an ATM card, and vehicle finance. This is in line with the work of Paas et al. (2007), which showed that as individuals' ability to acquire higher level financial assets increases; they tend to de-accumulate some of the assets acquired earlier in the acquisition chain. Home owners are more likely to own a cheque account and/or debit card than to have a (savings account based) ATM card. The relative lack of exposure to the vehicle finance facility may indicate that individuals and households have to make sacrifices to acquire a house of their own, and the fact that banks may not be willing to be overexposed in large sums, to the house value and the vehicle value, with one individual or household.

The intercept of 0.8031 for unit trust acquisition suggest that unit trust may be influenced significantly by factors other than demographics. Indeed the (ASISA 2007, pp. 5-6) found that, according to those not invested in unit trusts, "the main reason why individuals never owned a unit trust investment is *lack of knowledge*[1] — they claim not to know enough about it or where/how to buy it; they also *feel* that they do not have enough money to buy unit trusts [while those already invested in unit trusts view them as investments] for the *average man* in the street and not for sophisticated investors only ... they *disagree* that you need a lot money to invest in unit trusts." This suggests that it is rather the lack of knowledge about this asset class that affects acquisition rates, as even with a moderate amount, one can invest.

Improved work status is significant in the acquisition of financial services. Its coefficients are however, with the exception of an ATM card acquisition, low. This suggests that it is not just that an individual works that is important, but also how much he earns doing that work - hence the ubiquitous significance of income.

[1] emphasise mine

Sensitivities of non-exchange related investments to the demographic variables of income; education; and age are about twice the sensitive of exchange related investments to the same demographic variables. This may suggest that investing in non-exchange related investments may be more difficult as, for example, this requires information that is not as easily obtainable as information on publicly traded instruments.

5.1.2 Summary on demographic variables

The results of the multilinear regression exercise suggest that:

- Income and education are positively significant in the acquisition of all the financial services products in the final Mokken scale including savings accounts, cheque accounts, credit cards, unit trusts, garage cards, mortgage facilities, vehicle finance, overdraft facilitie, (JSE) exchange related investments and other or non-exchange related investments. It is noted, however, that products like savings accounts and retail cards may be discarded as the income of the individual improves.

- Age is positively significant in the acquisition of savings accounts, cheque accounts, credit cards, unit trusts, garage cards, mortgage facilities, JSE) exchange listed investments and other or non-exchange related investments. It is negatively related to the ownership of mortgage financing and vehicle financing facilities.

- Other than in the acquisition of non-exchange related investments, work status appears to be positively significant in the acquisition of savings account, cheque account, garage card, unit trusts, mortgage facility, vehicle finance, overdraft facility, and (JSE) exchange listed investments. Its effect is not pronounced with the ownership of non-exchange related investments.

- Other than the acquisition of unit trusts, marital status is positively significant in the acquisition of financial services products.

- The number of children in the household is positively significant in the acquisition of mortgage facility, vehicle finance, and the overdraft facility.

- Whether the dwelling is rented (0) or owned (1) is positively significant in the acquisition of cheque accounts; unit trusts; garage cards; mortgage facilities; and overdraft facilities. The dwelling status is negatively significant in the acquisition of either the ATM card or vehicle finance.

5.2 Pattern analysis using the MSP program

5.2.1 Introduction

A sequence of analyses will be discussed based on the data as per file data0.dat from the AMPS results. Actual responses ranged from "No," "Not Applicable," and "Yes." The item responses were then dichotomized so that both "No" and "Not applicable" are allocated the number 0, while the response "Yes" is allocated 1 respectively.

Only individuals earning more than R5,000 were considered because the purpose of the thesis is to understand the acquisition of financial assets by the middle to high income groups. Accordingly,

- As further analysis may warrant, the income level for inclusion might move up and not down.
- Beginning with a low middle income group earning at least R5,000 per month may help confirm the items that are bought earlier in the life cycle before individuals are higher income earners, without material distortions that may happen when pooling together the lowest earners and highest earners in their extremes.

Only data relating to individuals, and not to households, was used. Use of household data, e.g. responses to "Does your household have a medical aid?" was avoided as the product in consideration may not only be used by its financial sponsor (the person who pays for it or owns it) but also by others, even at times including children. Unless the consideration is of the product sponsor, the existence of the product in the ownership patterns of the rest of its users may be considered a distorted APA order since they may not yet be at that level of ability/product difficulty continuum to have it.

The income-groups variable, *Groupvariable*, was also used to divide the total sample into 5 groups as shown in Table 5.1.

TABLE 5.1: Total sample and subgroups by income

Category	Income range description	Size
entire group	all income >R4,999	12,814
income = 4	R5,000-R7,999	3,312
income = 5	R8,000-R10,999	3,012
income = 6	R11,000-R19,999	3,503
income = 7	R20,000+	2,978

The items, together with their item names and description, are as per Table 5.2.

TABLE 5.2: Financial services variables and corresponding questionnaire item

Variable	Questionnaire item
Ploan	Financial services - personally have Other Personal Loan
MicroL	Financial services - personally have Micro Loan
VehicleF	Financial services - personally have Vehicle Finance with Financial Institution
Mortgage	Financial services - personally have Home loan/Mortgage Bond
AtmC	Financial services - personally have ATM Card
StudentL	Financial services - personally have Student Loan
GarageC	Financial services - personally have Petrol/Garage Card
DebitC	Financial services - personally have Debit Card
CreditC	Financial services - personally have Credit Card
InvPrSh	Financial services - personally have Investments/Sub/Paid-up Shares
Mzansi	Financial services - personally have Mzansi account
SavingTr	Financial services - personally have Savings/Transmission account
OverdraF	Financial services - personally have Overdraft Facility
Chq	Financial services - personally have Cheque account
RetailC	Do you personally have a retail store card such as a clothing store , furniture store or supermarket card?
UT	Investments in unit trusts or a mutual fund
Exch	Invest on Stock Exchange/Security Exchange
Tshare2h	Ownership of timeshare unit

5.2.2 First run

The *summary line per scale for (sub)groups* output showed the results in Table 5.3.

TABLE 5.3: Summary line per scale for the first run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	18	12,813	0.29	0.74	-0.07 Mzansi	415(12)	105(15)	143(15)
Income = 04	18	3,312	0.26	0.71	-0.03 Mzansi	0(01)	95(14)	183(05)
Income = 05	18	3,021	0.26	0.71	-0.03 Mzansi	0(11)	45(08)	86(12)
Income = 06	18	3,503	0.26	0.71	-0.06 Mzansi	0(11)	76(15)	86(12)
Income = 07	18	2,977	0.25	0.72	-0.11 Mzansi	364(12)	122(12)	128(9)

The first two columns k and n are the number of items and subjects respectively. *ScaleH* (or H in Mokken scaling) and reliability *Rho* are the scale of the test, and reliability respectively. The next column gives the worst value across items for the *itemH*. The last three columns show the worst value of the results of checks

of model assumptions of monotonicity, intersection — using the P(1,1) matrix, and (last column) another test of intersection using restscores. For each of these three tests, a value of 0 to 40 is considered not significant enough to violate the assumption of significance. A value larger than 80 is considered a violation.

Without a detailed explanation, Table 5.3 shows that the 18 items do not form a satisfactory scale as:

- The item Mzansi has a negative *itemH* throughout the groups, including the entire group, and is therefore a candidate for removal.
- Both in the entire group and the in the subgroups, the *scaleH* is below the acceptable lower bound of 0.30.
- There are a number of violations of Monotonicity, and Intersection, most notably by the items Savings and Transmission (12), and Retail Credit Card (15).

The above appear enough reasons to reject the item Mzansi, and further detailed tests of model assumption checks with respect to this item, appear unnecessary.

The item is therefore rejected in order to do a second run of the data.

5.2.3 Second run

The *summary line per scale for (sub)groups* output is shown in Table 5.4.

TABLE 5.4: Summary line per scale for the the second run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	17	12,813	0.30	0.74	+0.10 StudentL	382(11)	105(14)	114(14)
Income = 04	17	3,312	0.30	0.72	+0.08 StudentL	0(01)	91(13)	0(01)
Income = 05	17	3,021	0.28	0.72	+0.09 Tshare2h	0(17)	45(08)	65(11)
Income = 06	17	3,503	0.27	0.71	+0.10 StudentL	0(06)	76(14)	70(11)
Income = 07	17	2,977	0.25	0.72	-0.05 SavingTr	363(11)	122(11)	128(9)

Table 5.4 shows that although Mzansi has been removed, the remaining 17 items do not form a satisfactory scale. In addition, the following is noted:

- Removing the item Mzansi, which was in the first run, only improves the *scaleH* slightly. For the entire group, it improves from 0.28 to 0.30, and for

each of the income groups it improves by a marginal 0.01 to 0.02. While the reliability, *Rho* also shows some improvement, this is suspect as the results of reliability may be misleading if the assumption of non-intersection is violated, which is also the case here.

- For the entire group, there is no longer an *itemH* with a negative value. It is noted, however, that data for the group income = 7 (R20,000 per month or above) has at least one negative *itemH* for the item Savings and Transmission accounts (11 'SavingTr'). Other than this group though there are no other sub groups with a negative *itemH*.

- For the entire group the item StudentL or student loans has the lowest *itemH* at 0.10, which is far below the lowerbound of 0.30. For the sub groups the results are mixed. Sub groups income = 4, and income = 6 display the same results as the entire group. Sub group income = 5 shows item Tshare2h, or time share and second home, with lowest *itemH*, while sub group income = 7 shows a negative *itemH* for SavingTr.

- Checks of monotonicity, and non-Intersection of IRFs show the following items violating at least one of these assumptions: SavingTr; Chq (cheque account); TShare2h; DebitC (debit card); CreditC (credit card); RetailC (retail credit card); and PLoan (personal loan).

- The *scaleH* for the entire group at 0.30 just meets the acceptable lower bound and, considered together with number of violations of assumptions, suggest a better model should be sought.

Of the above susceptible items student loan (StudentL) shows up in most of the sub groups as troublesome:

Very low *itemH* StudentL has pairwise $H_{i,j}$ greater than 0.30 only with debit card (DebitC) and ATM card (AtmC). It has no *itemH*, or H_i which is greater than 30.

Violating Monotonicity This is logical because once graduates become earners, i.e. start working, they begin to pay off, and not accumulate,student loans. Accordingly the number and size of student loans is expected to decrease and not increase over time — a clear violation of the assumption of monote non-decreasing items in MHM and DDM.

Intersecting other IRFs The IRF of StudentL intersects with those of personal loan, micro loan, JSE shares, and overdraft facilities.

The item StudentL is therefore rejected in order to do a third run.

5.2.4 Third run

The *summary line per scale for (sub)groups* output showed the results of Table 5.5.

TABLE 5.5: Summary line per scale for the third run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	16	12,813	0.31	0.74	+0.16 Tshare2h	382(10)	105(13)	114(13)
Income = 04	16	3,312	0.31	0.72	+0.10 Tshare2h	0(01)	92(12)	0(01)
Income = 05	16	3,021	0.29	0.72	+0.09 Tshare2h	0(16)	45(08)	64(10)
Income = 06	16	3,503	0.27	0.71	+0.11 Tshare2h	0(16)	76(13)	70(10)
Income = 07	16	2,977	0.26	0.72	-0.05 SavingTr	363(10)	122(10)	132(10)

Table 5.5 shows that our 16 items do not form a satisfactory scale. Also, the following is noted:

- Removing the item StudentL only improves the *scaleH* or H very slightly — at best by 0.01 and sometimes there is no improvement at all.
- Tshare2h (time share) item has the lowest *itemH* or H_i for the entire group and for all sub groups except sub group income = 7 (earners receiving R20,000 or more). Thus while Tshare2h does not fit well with the overall data, it appears *for now* that it may tell us something about the acquisition behaviour of the highest income level. Accordingly the researcher is reluctant to drop this item, at least at this point of data analysis.
- Checks of Monotonicity, and Non-Intersection of IRFs show the following items violating at least one of these assumptions: SavingTr (5 counts); Chq (1 count); TShare2h (3 counts); DebitC (1 count); RetailCC (3 count); and PLoan (2 counts).
- With the exclusion of StudentL, the CreditC item ceases to show as the worst violation of the non-intersection assumption in the *summary line per scale for sub group income = 7* as tested using rest scores.

- The H for the entire group at 0.30 just meets the acceptable lower bound and, considered together with number of assumptions that are violated, the researchers suggests that a better model should be sought.

Of the above susceptible items, SavingsTr look, on first inspection, to be the item that may be dropped. Below the researcher presents further analysis on this item.

SavingTr	*itemH*	Z	Mean
Entire group	+0.19	24.46	0.67
Income = 04	+0.47	28.71	0.64
Income = 05	+0.36	21.58	0.67
Income = 06	+0.16	10.23	0.70
Income = 07	-0.05	-3.53	0.65

TABLE 5.6: Summary scaling group results for item SavingTr

The data shows the mean ownership of savingTr is at 0.64 for sub group income = 4, increases to 0.67 for sub group income = 5, and increases further to 0.70 for sub group income = 6. However, for highest income level, sub group income = 7, the mean ownership reduces drastically to almost levels for sub group income = 4 (at 0.65).

The item SavingTr has negative pairwise $H_{i,j}$ for the following items at entire group level: MicroL (-0.10); OverdrF (-0.46); GarageC (-0.14); CreditC (-0.12), and Chq (-0.54).

The $H_{i,j}$ is lowest for SavingTr and Chq at -0.54, while Chq has $H_{i,j}$ of 1 with OverdrF and pairwise $H_{i,j}$ of greater than 0.50 with GarageC, and CreditC. This is not surprising as the cheque account is usually an upgrade for a savings and transmission account. The cheque account usually has all the benefits of a savings and transmission account, usually at cheaper fees per transaction. Moreover, the cheque account has other benefits not available in a savings account, e.g. the option or invitation by the bank to open a credit card and garage card and link them with one's cheque account - hence the high absolute pairwise H.

In this context, the behaviour of the IRFs of SavingTr as shown in the next page becomes meaningful and confirms the argument of Paas et al. (2007), that with increasing ability to acquire financial products, including those with higher level of difficulty, previously acquired products may be discarded. New higher-level complexity products acquired may, in addition to satisfying distinct objectives,

also satisfy those objectives that were satisfied or 'housed' through the ownership of the old assets.

Because dropping SavingTr will limit the ability to discern historical acquisition patterns, unless a 'proxy' item is found, the item is retained for now in this third run of data.

If we look at ownership rates of all the items, without restricting ourselves to just Table 5.6, it emerges that the item with the mean of almost zero throughout, is micro loans (MicroL). Because of its very limited ownership rates in the sample, this product (MicroL) comes out as the most difficult to acquire in the final scale of the Mokken Scaling.

In practice in South Africa, however, this product is offered by micro-lenders and usually those who apply and get it do not have any or sizable personal loans with traditional banks. This suggests that this product is sought by the market that is hardly represented in the selected sample. This, together with the potential of this item to distort the Mokken scaling outcomes, result in the recommendation that it be dropped.

The item is therefore rejected in order to do a fourth run of the data.

5.2.5 Fourth run

The *summary line per scale for (sub)groups* output shows that the results of this run are not materially changed from those of the last run. Also, similar to previous run of the data, the item SavingTr's share of items with strongest violations in the summary Table 5.7, continues to be high at 33.3% (5/15), suggesting that meaningful improvement in test scores for the entire group are likely to be gained by dropping item SavingTr.

TABLE 5.7: Summary line per scale for the fourth run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	15	12,813	0.31	0.74	+0.16 Tshare2h	382(09)	105(12)	119(12)
Income = 04	15	3,312	0.31	0.72	+0.10 Tshare2h	0(01)	92(11)	0(01)
Income = 05	15	3,021	0.29	0.72	+0.09 Tshare2h	0(15)	45(06)	64(9)
Income = 06	15	3,503	0.27	0.71	+0.11 Tshare2h	0(15)	76(12)	71(9)
Income = 07	15	2,977	0.26	0.72	-0.05 SavingTr	363(9)	122(9)	132(15)

While the researcher is reluctant to drop the savings transmission account, it is now clearer that a significant deviation from the expected Mokken results stem

from this item. It would be recommended, if possible, to remove it while retaining its history of acquisition in some way.

Noting that the item AtmC, or ATM card, is a combi card issued by banks that is usually, if not always, linked to one's savings and transmission account it appears that using the AtmC as proxy for savingTr might relieve the researcher of the burden of keeping an item for the sake of its historical significance in pattern analysis, while it restricts further refinement and improvement of the model.

Looking at the overview of the final scale for the entire group suggests that AtmC is bought prior to SavingsTr. This is logical as banks do not usually, if ever, issue AtmC not linked to a form of transmission account. This anomaly, might be reflecting the fact that savingtr is discarded as the individual moves up the hierarchy, while the AtmC is re-aligned or, in bank terminology, linked as a combination to the new account, like the transaction account.

The next page has, in Figure 5.2, graphs of the behaviour of SavingTr's IRF to other items' IRFs. When comparing it with AtmC's IRF shows that the two start with very similar proportions of ownership at sub group income = 4 (about 0.6). Increased level of ownership are also similar at sub group income = 5 (about 0.8). From there onward however, there is observed divergence as AtmC continues to increase while SavingTr becomes monotonely decreasing. Graphs on the right hand side in Figure 5.2 refer to the IRF of saving and transmission account for the income groups of interest in this study (i.e. those who earn at least R5,000 per month), while the left hand side depicts the IRF for all income groups (including the lower income groups).

For the fifth run, the item SavingTr is dropped.

5.2.6 Fifth run

The *summary line per scale for (sub)groups* output shows that the effect of removal of SavingTr to the overall H is as follows:

- Entire group: 0.33 from 0.31 (+0.02)
- Income = 4: 0.26 from 0.31 (-0.05)
- Income = 5: 0.28 from 0.29 (-0.01)

- Income = 6: 0.29 from 0.27 (+0.02)
- Income = 7: 0.30 from 0.26 (+0.04)

The overall test score of the model, H, improves from 0.31 to 0.33. While the intermediate income groups (income = 4, and income = 5) experience reduced overall Mokken scaling score, the higher income groups, income = 6, and income = 7, experience an improvement in Mokken scaling.

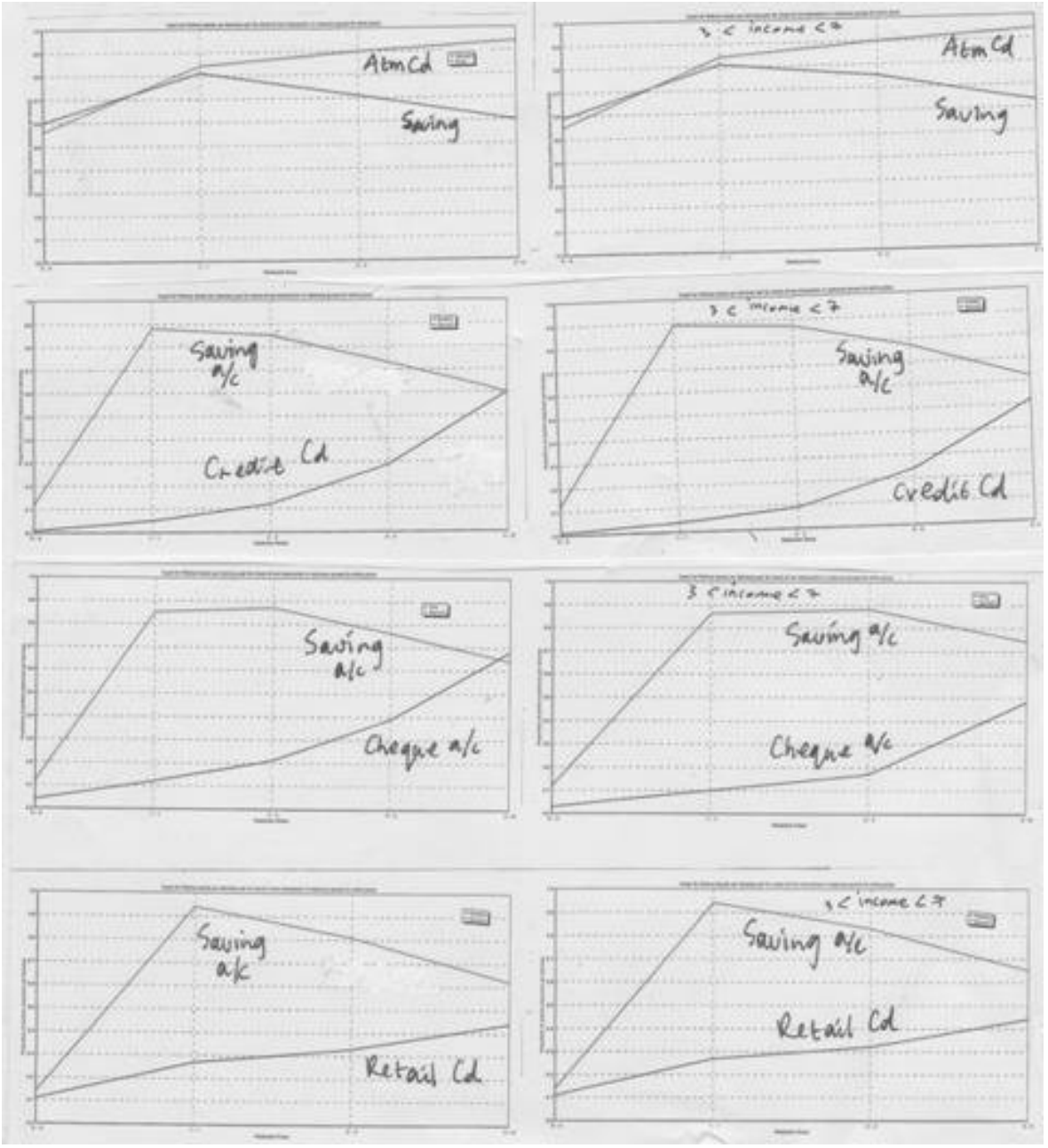


FIGURE 5.2: Behaviour of IRF of savings account

In Table 5.8 it is noted that Time share's (Tshare2h) tests of monotonicity and non-intersection show, for most times, almost a zero value. This is due to the small number of people holding the product.

For sub group income = 7, the tests of monotonicity and intersection on timeshare show meaningful numbers greater than zero. Surprisingly the results show that at sub group income = 7, the item's IRF fails to satisfy the assumption of non-intersection with other items' IRFs, on both types of tests.

It appears that this inappropriateness of item Tshare2h to satisfy the assumption of non-intersection of IRFs was previously hidden by the impact of the item SavingTr in the previous runs (1–4).

Accordingly this item, Tshare2h is dropped out.

5.2.7 Sixth run

The *summary line per scale for (sub)groups* output is shown in Table 5.9.

The effect of removal of Tshare2h to the overall H is as follows:

- Entire group: 0.33 to 0.35 (+0.02)
- Income = 4: 0.26 to 0.29 (+0.01)
- Income = 5: 0.28 to 0.30 (+0.02)

TABLE 5.8: Summary line per scale for the fifth run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	14	12,813	0.33	0.73	+0.17 Tshare2h	0(14)	81(6)	119(6)
Income = 04	14	3,312	0.26	0.62	+0.09 Tshare2h	0(01)	0(14)	0(14)
Income = 05	14	3,021	0.28	0.67	+0.09 Tshare2h	0(14)	0(14)	0(14)
Income = 06	14	3,503	0.29	0.70	+0.11 Tshare2h	0(14)	54(06)	58(06)
Income = 07	14	2,977	0.30	0.75	+0.14 RetailCC	0(11)	90(14)	157(14)

TABLE 5.9: Summary line per scale for the sixth run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	13	12,813	0.35	0.73	+0.23 RetailCC	0(11)	81(6)	132(11)
Income = 04	13	3,312	0.29	0.62	+0.11 Exch	0(01)	0(13)	0(13)
Income = 05	13	3,021	0.30	0.67	+0.20 PLoan	0(01)	0(01)	0(01)
Income = 06	13	3,503	0.29	0.70	+0.21 Exch	0(13)	54(06)	61(06)
Income = 07	13	2,977	0.32	0.76	+0.15 RetailCC	0(11)	74(11)	137(11)

- Income = 6: 0.29 to 0.31 (+0.02)
- Income = 7: 0.30 to 0.32 (+0.02)

The total test score H moves up by 0.02, which is good although not a significant improvement. It is noted though that this happens for all the scores.

The results for the tests of monotonicity and non-intersection of IRFs, using both the P Matrix and the Restscore test, are shown in Table 5.10.

TABLE 5.10: Items with strongest violations in sixth run

itemH	Monot.	Pmatrx	Restsc.	Total
RetailCC	2	1	2	5
Exch	1	1	1	3
PLoan	2	1	1	4
DebitC	na	2	1	3

For the entire group it is items RetailC and DebitC that show the strongest violations.

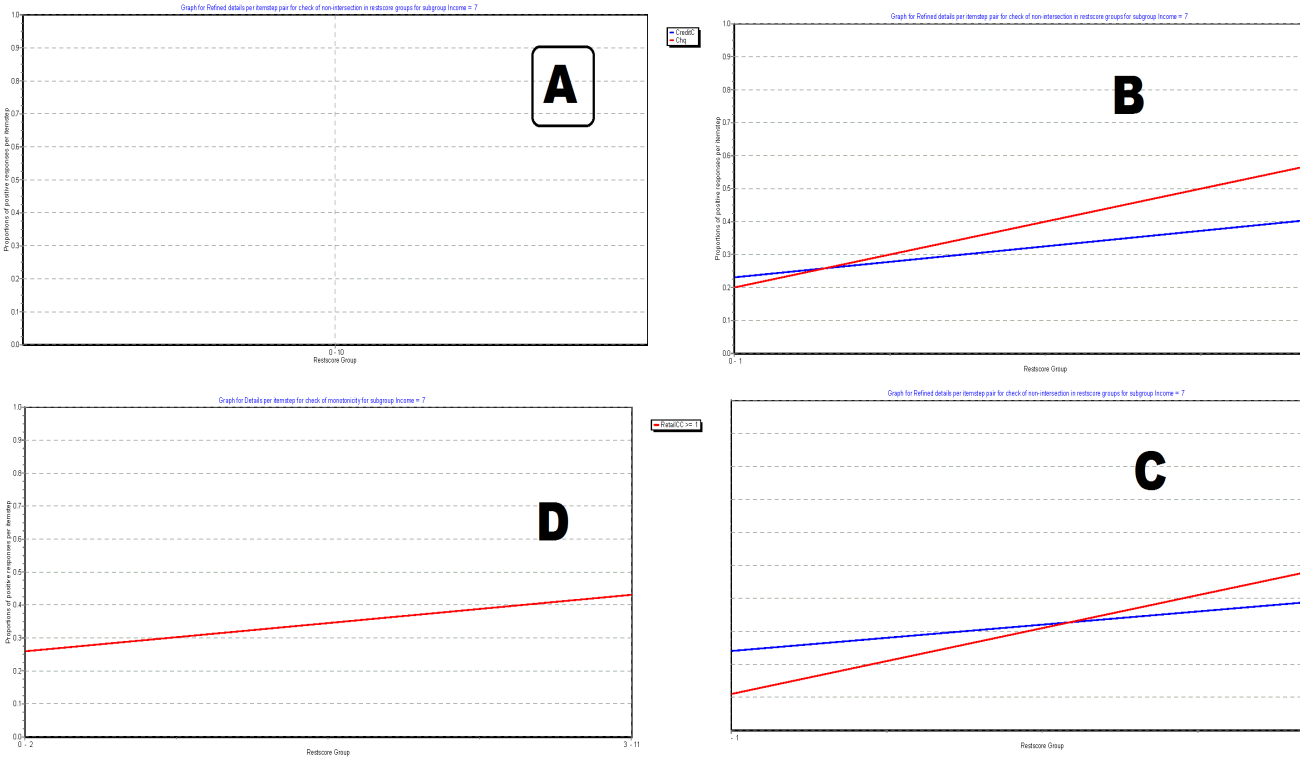
When data is divided into income groups, RetailC only shows up in the sub group income = 7 as an item with monotone and non-intersection violations. As discussed with item SavingTr, this item is one of those products which are likely to be discarded as the individual moves up in the ability/ difficulty in product acquisition continuum.

Figure 5.3 shows a number of graphs and printouts of the check for non-intersection using Restscore groups. All the data are for sub group income = 7.

It is noted that:

- RetailC's IRF is monotone increasing (graph 'D') although from about 0.27 to only 0.33. It is an almostflat graph.
- The IRFs for Chq (cheque account) and CreditC (credit card) (graph 'A') are highly positively correlated
- With very small Restscore groups, there are more persons with retail cards than those with cheque accounts (graph 'B'). Because a retail credit card in this income group is likely a legacy asset acquired earlier, it is sensible to assume that for this group, those in a lower level of asset acquisition will have more of this legacy asset than a cheque account.

- Because the ownership of credit cards is highly correlated with the ownership of a cheque account, despite the fact that the relationship is lower than 1:1, it follows that if the IRF for retail card crosses that of the cheque account, it will also cross that of the credit card (graph 'C').
- To the extent that some of the retail cards offer purchase on credit, the ownership of credit cards will depress the uptake of retail credit cards (graph 'C').




```
[Analysis  1      Details per itemstep pair for check of non-intersection in restscore groups for subgroup
Income =  7]

See below for summary table per item
Diagnostics for itemstep pairs (rowwise)
Pairs without violations > MINVI will be omitted
Minimum violation = 0.03  Significance level= 0.05  Minimum group size= 1224

RetailCC with list below
------------------------

                  #ac  #vi #vi/#ac   maxvi     sum  sum/#ac    zmax #zsig
CreditC  total      1    1    1.00    0.13    0.13   0.1279    9.31     1
Chq      total      1    1    1.00    0.03    0.03   0.0324    2.12     1
other pairs         9    0
                  ---  ---                    ----
                   11    2    0.18    0.13    0.16   0.0146    9.31     2

Chq      with list below
------------------------

                  #ac  #vi #vi/#ac   maxvi     sum  sum/#ac    zmax #zsig
RetailCC total      1    1    1.00    0.03    0.03   0.0324    2.12     1
other pairs         8    0
                  ---  ---                    ----
                    9    1    0.11    0.03    0.03   0.0036    2.12     1
```

FIGURE 5.3: Sixth run: checks of monotonicity and intersection

- The printout of the check for non-intersection using Restscore groups shows that the intersection of the IRFs (using Restscore groups) for cheque account and for retail card is at the minimum of the significant region (equals the critical value of 0,03). It may therefore be argued that this intersection is not as significant as it first appears. It is a borderline result.

The author therefore concludes that, at least at this stage of analysis, the dropping of the retail card is not supported. The only itemof significance left, at the entire group level, is the debit card.

A debit card is always backed by a form of transmission account, either a savings account or a cheque account. Funds that are paid to the seller when the card owner buys, are funds that are already in the account backing the card. There is no extension of a credit facility. As such, it may be argued that a debit card cannot stand on its own, like a credit card account, and therefore it is more of a derivative instrument than an underlying financial asset, like a savings or cheque account. The same logic may be extended to instruments such as a cheque book and cheque card.

A debit card has the added benefit, especially in a country where crime is high, of allowing persons who otherwise do not have credit cards, cheque books, etc., to avoid carrying cash, instead simply using their debit card when buying at retail outlets which have the necessary supporting technology. It is accordingly not surprising that at high Restscores the IRF for debit card crosses that for credit card. Also, the IRF for debit card crosses that of the cheque account because once one has a cheque account, he is better able to secure a cheque book, a cheque card, or a credit card which competes with the debit card in that it also allows shoppers the freedom on not carrying cash.

To improve the overall Mokken scale the debit card is dropped from the analysis.

5.2.8 Seventh run

The results for the group show that the retail card (10) fails to meet the assumption of non-intersection of its IRF with IRFs of other items. This item has already demonstrated its lack of fit with the Mokken scaling, because it appears to be

discarded as people progress in their financial maturity. It has been kept for its presumed significance in the history of the acquisition chain.

The sub groups income = 4 and income = 5 have the item PLoan (personal loan) show that because of the very sparse data of persons reporting having a personal loan, the model fails to do tests for monotonicity and non-intersection. The IRF for personal loan shows that it is monotone increasing from a very small range of 0 to about 0.05 because of very sparse data.

This lack of positive respondents results in the Mokken scaling attributing the highest level of product difficulty to this product, making it look more difficult to acquire than the acquisition of, for example, a mortgage, vehicle finance, investments and shares. This appears at odds with expectations. Personal loans are usually for smaller amounts than vehicle finance or mortgage finance, suggesting that more people should qualify for approval of these loans than with the latter. Also, because of smaller amounts involved, it would be expected that more personnel in a bank would be authorised to issue personal loans than the number authorised to approve vehicle and home financing, with processes being shorter and less stringent.

From this perspective it is suggested that this item be dropped.

TABLE 5.11: Summary line per scale for the seventh run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	12	12813	0.38	0.74	0.24 RetailCC	0(10)	0(10)	147(10)
Income = 4	12	3312	0.31	0.60	0.12 Exch	0(01)	0(12)	0(01)
Income = 5	12	3021	0.32	0.67	0.19 PLoan	0(01)	0(01)	0(01)
Income = 6	12	3503	0.33	0.70	0.21 Exch	0(12)	52(10)	0(12)
Income = 7	12	2977	0.35	0.75	0.15 RetailCC	0(10)	75(10)	240(06)

TABLE 5.12: Summary line per scale for final run

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	10	12813	0.44	0.76	0.33 Exch			45(10)
Income = 4	10	3312	0.33	0.61	0.12 Exch	0(01)	0(10)	0(01)
Income = 5	10	3021	0.36	0.68	0.20 Mortgage	0(01)	0(02)	0(01)
Income = 6	10	3503	0.37	0.72	0.41 Exch	0(10)	0(10)	0(10)
Income = 7	10	2977	0.43	0.77	0.33 UT		39(01)	

5.2.9 Ninth and final run

The item PLoan or personal loan is excluded as per the above discussion. However the impact on the Mokken scales is marginal. The improvement is not significant, suggesting that it might be a more influential item in distorting the behaviour of the sample to MHM and DMM conditions of Mokken scaling. With this in mind, item RetailC (the retail card), is dropped out of the Mokken scale to see how the scale improves. The results are shown in Table 5.12.

5.2.10 Summary of the MSP results

The results of the final scales are reproduced as Appendix B. The Mokken scaling procedure suggests that the products are acquired as depicted in Table 4.3 in Section 4.5.

The acquisition patterns emerging were not the same for all income groups. The results for the entire group seem to mirror those of sub group income = 6 and sub group = 7. For sub groups income = 4 and income = 5 the appearance that non-exchange related investments (e.g. owning a business) are acquired earlier in the acquisition hierarchy may not reflect reality. However, it is possible that these groups may be over-represented, compared to subgroups income = 6 and income = 7, in terms of respondents who run small, medium and micro enterprises (SMME), e.g. a hairdresser.

There is higher ownership of mortgage facilities in subgroup income = 6 than in subgroup income = 7 suggesting that, possibly because of their higher net worth, subgroup income = 7 may have a larger percentage of individuals with fully paid houses.

The *itemH* are all above 0.30, ranging from 0.33 to 0.44 satisfying the critical test values, below which the model would be rejected.

It is concluded that the results of the entire sample and for the sub groups are reasonable.

Chapter 6

Summary and Conclusions

This chapter concludes the research and offers scope for further research.

6.1 Summary and conclusions

The reviewed literature suggests that financial services products are acquired in a pattern and that demographic factors have a significant role to play in the acquisition of financial services. In particular, the literature review suggested that:

- Demographic factors, including age, marital status, number of children in the household, income, education, whether dwelling is owned or rented, and work status are significant determinants in the acquisition of financial services and build-up of household portfolios
- Financial products are acquired in a hierarchical pattern according to the level of difficulty of acquisition and financial ability continuum.

The results of this research confirmed the outcomes of the literature review in terms of the effects of demographic factors in the acquisition of financial services. Table 4.2 summarises the results of testing Hypothes 1.

Income, education and age are significant variables in the ownership of most of the considered assets. Marriage and presence of children are significant in the acquisition of home ownership and mortgage facility.

The willingness to acquire a financial services product was shown to be less important as predictive variable than the ability to acquire the product. The level of income showed that it is an important variable in predicting ownership of financial assets. In particular, dividing the data into sub groups using income yielded different orders of acquisition for each of the sub groups.

Other demographic factors, especially education, age, work status, and marital status are also important in the acquisition of financial services products.

The outcomes of this research also confirmed that there is a pattern in the order of acquisition of financial services in South Africa. Table 4.3 summarize the results of testing Hypotheses 2. As depicted in Figure 4.13:

- Products, like savings and transmission accounts, that meet the basic survival needs, are bought first. Then unit trusts are bought as, relatively, it is easier to acquire this product (a R100 per month is acceptable with some institutions) than most of the products that the MSP suggests lie above it (unit trusts) in acquisition difficulty.
- Increasing income beyond a level enabling investment in unit trusts results in the individual using leverage to acquire certain assets or to improve lifestyles, in terms of vehicle financing, the associated garage/petrol card facility, mortgage facility, and the overdraft facility.
- Thereafter, as these debts are paid off over time and the individual is able to allocate a higher percentage to saving, the individual's net worth increases.

Acquisition pattern analysis is disadvantaged by the following factors:

Discarding of products Individuals discard some of their earlier-acquired financial services products as they move up the financial ability/product difficulty continuum. They get presented with opportunities to acquire products that embed both complexity and comprehensiveness.

Naivity Both the regression and MSP models fail to incorporate the fact that individuals have shown a tendency to easily build naive expectations about the returns from financial assets: in bull markets acquisition of certain financial products (like stocks), may overshoot relative to periods of normalcy.

Time effects While some of the authors reviewed discounted the effects of time on household portfolios, this could not be fully explained away.

Geographical effects Different geographical studies portrayed different acquisition patterns

Developing literature The subject is not yet well developed, with most of the literature classifying and studying products from their local context and description. The author could not find work that had studied APA of financial services across geographies and continents with standardised asset classifications. This is suggested as scope for further research.

Despite these disadvantages, however, most literature reviewed confirmed the existence of a pattern in the samples studied. In addition, most of the literature agreed that government policies aimed at encouraging savings or directing it to certain policies were effective.

6.2 Suggested scope for further research

1. The person of interest in this research is one who already has a financial product with a financial institution. This research did not concern itself with enhancing access to financial services for those that do not yet have a financial product, or do not have it with a formal institution. Promotion of access to financial services by the unbanked (usually poor) is suggested as scope for further research.

2. The focus of this research was on the low middle-income to high-income segments of the population. It is therefore not directly helpful in the analysis of acquisition, retention, and attrition of such products as Mzantsi accounts, aimed to the poorer segments of the population, nor can its outcomes of purchasing patterns be said to be relevant to this group. Research directly studying this group and its relevant products is suggested as scope for further research.

3. This research looked at the extent to which Mokken scaling only fits the given data. It is suggested as scope for further research that in addition to this, the procedure's (MSP) predictive power be tested.

4. This research limited itself to only Mokken scaling in statistically test-fitting the South African experience. It is possible that their results would be contradicted by the results of application of alternative models. Application of other models, such as latent class analysis, parametric IRT (e.g. the Rasch model), waiting theory (e.g. through use of the Poisson distribution), Markov chains, and so on is suggested as scope for further research.

5. The sample used was drawn from the All Media and Products Survey. It is possible that different data would lead to different results. This is suggested as scope for further research as a different survey or population may either confirm or challenge this research's findings. In particular, data from a bancassurance institution would be more relevant to the population being studied.

6. The data used is cross-sectional. It is possible that a longitudinal data would provide different or clearer results (e.g. cohort effects would be more easily understandable with longitudinal data.) This is suggested as scope for further research.

7. The effect of changes in legislation, e.g. the Financial Intelligence Centre Act (FICA), the Financial Advisory and Intermediary Services (FAIS) Act, the National Credit Act (NCA) in South Africa, on this study have been ignored. It is recommended, however, as scope for future research, that the impacts of these legislative changes on household financial portfolios be studied.

8. Mokken scaling has shown itself not be accommodative to the empirical observation that as individuals accumulate financial services products, they also discard some; that is, they prune their portfolios. It is suggested as scope for further research that alternative models be identified and applied to the SA experience. Also, it would be an enrichment of the field of NIRT if the mathematical-statistical properties of Mokken scaling were improved to accommodate this fact.

9. It is suggested as scope for further research that APA of financial services be analysed across geographies and continents with standardised asset classification.

Appendix A

Technique used in testing the order of acquisition

A.1 Rationale for chapter inclusion

The use of NIRT and Mokken scaling in the analysis of data invoving latent traits is not as common as the use of such methods as regression and multivariate analysis. The author has, accordingly, identified a need to briefly describe the model.

A.2 Introduction to NIRT and MSP

Item response theory (IRT) studies the test and item scores based on mathematical models that describe the relationship between ability, or other latent trait, of the persons being tested and their item responses (Baker 2001).

The Item Response Function (IRF) gives the probability that a person with a given latent trait,Θ, will answer the item or question correctly. For dichotomous items X_i the item score for item i, takes the values 0 (false) and 1 (true) and its IRF can be written as $P(X_i = 1|\Theta) = P_i(\Theta)$

In non-parametric item response theory (NIRT) the actual mathematical function, and parameters, describing the IRF are not important and not stated. Instead the theory progresses from a specific set of assumptions about he behaviour of the IRFs. These assumptions are discussed in the next section.

A.3 Basic Assumptions of NIRT

Unidimensionality All the items in the test measure the same latent trait. In other words the given data set has one latent trait that accounts for its structure. Thus if Θ is the measure of this trait, $\theta\epsilon\Theta$ would take on values in real numbers.

Local independence Given a person with a particular level,θ, of the latent trait, Θ being measured, the individuals' response to item i cannot be influnced by his responses to other items in the test Sijtsma and Molenaaar (2002). Mathematically, this assumption can he stated as follows:

$$P(X_i = x_i|X_j = x_j, \Theta) = P(X_i = x_i|\Theta)$$

for all $i \neq$ and

$$P(X_i = x_i, X_j = x_j|\Theta) = P(X_i = x_i|\Theta)P(X_j = x_j|\Theta)$$

Monotonicity of IRFs The conditional probability $P(X_i = x_i|\Theta)$ or $P_i(\Theta)$ is monotone non-decreasing in Θ. In other words,

$$P_i(\Theta_a) \leq P_i(\Theta_b)$$

for any $\Theta_a \leq \Theta_b$

These three assumptions define the monotone homogeneity (MH) model, which is useful when needing to order subjects on their ability with regard to Θ by means of $X_+ = \sum_i X_i$ for example, for 2 scores t and s, $s < t \leq$, MH implies that:

$$P(\Theta > c|X_t = s) \leq P(\Theta > c|X_t = t)$$

and similarly

$$P(X_t \geq x_t|\Theta = \Theta_a) \leq P(X_t = x_t|\Theta = \Theta_b)$$

for $\Theta_a \leq \Theta_b$

The Double Monotonicity (DM) model adds a fourth assumption to the assumptions of the MH model, namely:

Non-intersecting NRFs The IRFs $(P_1(\Theta), P_2(\Theta), ..., P(\Theta))$ are non intersecting in Θ. The implication of this assumptions is that all IRFs can be (re-) numbered and ordered such that

$$P_A(\Theta) \leq P_B(\Theta) \leq .... \leq P_I(\Theta)$$

The MH model allows us to order persons according to their ability with respect to Θ. The DM model allows us to order the items $i = 1, 2, ..., I$ according to their level of difficulty.

A.4 Steps in assessing model fit

The word 'scale' is used to have the same meaning as the word 'test'. The Mokken scaling procedure or MSP is a tool of assessing model fit of an NIRT.

The discussion below on MSP is due to the work of Mokken (1971); Mokken and Lewis (1982); Sijtsma and Molenaaar (2002).

1. *Scaling an item pair* (i, j)

   Let (i, j) be a pair of items with i denoting the more difficult item, so that

   $$P_i(\Theta) \leq P_j(\Theta) \quad i \neq j$$

   We will now compare the model probability with the maximum possible correlations possible. Let us define H to be the ratio of model probability of $(i, j$ and the maximum possible correlations possible between (i, j). Then

   $$H_{ij} = \frac{cov(X_i, X_j)}{cov_{max}(X_i, X_j)}$$

   Which means that

   $$H_{ij} = 1 - \frac{P_i - P_{ij}}{P_i(1 - P_j)}$$

   Thus H_{ij} is the difference of one and the ratio of the probability given the observed frequencies over the probability expected under the null hypotheses of statistical independence. This is an adusted Loevinger's H Loevinger (1947).

2. *Scaling an item* i

   Let $R(i)$ represent the sum score across the $i - 1$ items other than item i. The items are ordered from lowest (popularity) to highest so that $P_i \leq P_j$ for $i \leq j$

   The item variability coefficient H_i is defined

   $$H_I = \frac{cov(X_i R_{(i)})}{cov_{max}(X_i, R_{(i)})}$$

   Sijtsma and Molenaaar (2002) suggest that this value be estimated by

$$H_i = 1 - \frac{\sum_{\ell \neq i} F_{ij}}{\sum_{\ell \neq i} E_{ij}}$$

where F_{ij} is the sum frequency of all observed Guttman errors, and E_{ij} is the expected value of frequency assuming statistical independence.

3. *The scalability of the test*

   This refers to the overall score of the test, H, which is defined as:

$$H = \frac{\sum_{i=1}^{I} cov(X_i, R_{(i)})}{\sum_{i=1}^{I} cov_{max}(X_i, R_{(i)})}$$

   Sijtsma and Molenaaar (2002) suggests that this value can be estimated by

$$H = 1 - \frac{\sum_i \sum_{\ell \neq i} F_{ij}}{\sum_i \sum_{\ell \neq i} E_{ij}}$$

   where F_{ij} and E_{ij} have the same meanings as in the above subsection.

4. *Measuring observed scales against critical values of MSP*

   The following are suggested critical values for the test (Mokken 1971, p. 185)

   - $0.5 \leq H$ the scale is strong
   - $0.4 \leq H < 0.5$ the scale is medium
   - $0.3 \leq H < 0.4$ the scale is weak
   - $H < 0.3$ the hypotheses of statistical independence is expected

   These values are recommended for both the MH and the DM models

Appendix B

Results of the final MSP run

Summary line per scale for all groups

Group	k	n	H	Rho	itemH	Monot.	Pmatrx	Restsc.
Entire group	10	12813	0.44	0.76	0.33 Exch			45(9)
Income = 4	10	3312	0.33	0.61	0.12 Exch	0(1)	0(10)	0(1)
income = 5	10	3021	0.36	0.68	0.20 Mortgage	0(1)	0(2)	0(1)
Income = 6	10	3503	0.37	0.72	0.24 Exch	0(10)	0(10)	0(10)
Income = 7	10	2977	0.43	0.77	0.33 UT		39(01)	

Matrix of H values per item pair for entire group

Items	Exch	InvPrSh	OverdraF	VehicleF	Mortgage	GarageC	UT
Exch							
InvPrSh	0.23						
OverdraF	0.18	0.18					
VehicleF	0.17	0.24	0.27				
Mortgage	0.16	0.19	0.30	0.38			
GarageC	0.27	0.35	0.42	0.37	0.30		
UT	0.65	0.36	0.25	0.22	0.19	0.24	
CreditC	0.42	0.51	0.60	0.62	0.53	0.66	0.34
Chq	0.53	0.48	1.00	0.53	0.55	0.70	0.46
AtmC	0.58	0.87	0.77	0.89	0.86	0.77	0.59

Items	CreditC	Chq
CreditC		
Chq	0.51	
AtmC	0.76	0.58

Number of items in matrix : 10
Total number of H-values : 45
Total number of negative H-values: 0

Overview final scale for entire group
for scale tested, Number of Items: 10

n = 12813 Scale coefficient H = 0.44 Scale Z = 160.94

Item coefficients

Item	Label	Mean	ItemH	Z
Exch	Invest on Stock Exchange/Secur	0.03	0.33	54.82
InvPrSh	Financial services - personall	0.05	0.34	67.28
OverdraF	Financial services - personall	0.05	0.41	82.66
VehicleF	Financial services - personall	0.05	0.37	76.92
Mortgage	Financial services - personall	0.06	0.35	72.25
GarageC	Financial services - personall	0.07	0.44	89.86
UT	Investments in unit trusts or	0.08	0.34	67.46
CreditC	Financial services - personall	0.17	0.54	95.08
Chq	Financial services - personall	0.23	0.57	90.28
AtmC	Financial services - personall	0.74	0.71	45.02

Overview final scale for subgroup Income = 4
for scale tested, Number of Items: 10

n = 3312 Scale coefficient H = 0.33 Scale Z = 42.00

Item coefficients

Item	Label	Mean	ItemH	Z

VehicleF	Financial services - personall	0.01	0.16	12.69
Exch	Invest on Stock Exchange/Secur	0.01	0.12	7.50
OverdraF	Financial services - personall	0.01	0.31	25.06
Mortgage	Financial services - personall	0.01	0.20	15.33
GarageC	Financial services - personall	0.02	0.33	25.09
InvPrSh	Financial services - personall	0.03	0.23	23.47
UT	Investments in unit trusts or	0.04	0.22	15.77
CreditC	Financial services - personall	0.06	0.43	29.62
Chq	Financial services - personall	0.10	0.47	27.71
AtmC	Financial services - personall	0.66	0.71	16.04

Overview final scale for subgroup Income = 5
for scale tested, Number of Items: 10

n = 3021 Scale coefficient H = 0.36 Scale Z = 54.20

Item coefficients

Item	Label	Mean	ItemH	Z
Exch	Invest on Stock Exchange/Secur	0.02	0.23	17.83
VehicleF	Financial services - personall	0.02	0.24	20.91
Mortgage	Financial services - personall	0.03	0.20	17.25
OverdraF	Financial services - personall	0.03	0.33	29.61
GarageC	Financial services - personall	0.03	0.37	32.00
InvPrSh	Financial services - personall	0.04	0.26	26.08
UT	Investments in unit trusts or	0.06	0.30	24.02
CreditC	Financial services - personall	0.10	0.45	34.01
Chq	Financial services - personall	0.17	0.55	35.58
AtmC	Financial services - personall	0.70	0.63	16.58

Overview final scale for subgroup Income = 6
for scale tested, Number of Items: 10

n = 3503 Scale coefficient H = 0.37 Scale Z = 70.96

Item coefficients

Item	Label	Mean	ItemH	Z
Exch	Invest on Stock Exchange/Secur	0.03	0.24	18.45
InvPrSh	Financial services - personall	0.05	0.26	26.73
OverdraF	Financial services - personall	0.05	0.35	36.15
GarageC	Financial services - personall	0.06	0.35	38.32
VehicleF	Financial services - personall	0.06	0.32	34.69
Mortgage	Financial services - personall	0.07	0.30	32.57
UT	Investments in unit trusts or	0.08	0.28	29.20
CreditC	Financial services - personall	0.17	0.49	44.38
Chq	Financial services - personall	0.25	0.50	40.10
AtmC	Financial services - personall	0.78	0.68	21.02

Analysis 1 Overview final scale for subgroup Income = 7
for scale tested, Number of Items: 10

n = 2977 Scale coefficient H = 0.43 Scale Z = 87.28

Item coefficients

Item	Label	Mean	ItemH	Z
Exch	Invest on Stock Exchange/Secur	0.08	0.35	32.10
InvPrSh	Financial services - personall	0.09	0.39	38.13
OverdraF	Financial services - personall	0.12	0.40	43.31

Mortgage	Financial services - personall	0.12	0.37	40.60
VehicleF	Financial services - personall	0.13	0.38	41.80
UT	Investments in unit trusts or	0.17	0.33	35.69
GarageC	Financial services - personall	0.17	0.44	47.17
CreditC	Financial services - personall	0.34	0.52	46.52
Chq	Financial services - personall	0.42	0.54	43.96
AtmC	Financial services - personall	0.83	0.62	22.22

Summary per item for check of monotonicity for entire group
Minimum violation = 0.03 Significance level= 0.05 Minimum group size= 1224

	ItemH	#ac	#vi	#vi/#ac	maxvi	sum	sum/#ac	zmax	#zsig	crit
VehicleF	0.37	6	0							
Mortgage	0.35	6	0							
AtmC	0.71	3	0							
GarageC	0.44	3	0							
CreditC	0.54	6	0							
InvPrSh	0.34	6	0							
OverdraF	0.41	3	0							
Chq	0.57	6	0							
UT	0.34	6	0							
Exch	0.33	6	0							

Summary per item for check of non-intersection via restscore groups for entire group
Minimum violation = 0.03 Significance level= 0.05 Minimum group size= 1224

	ItemH	#ac	#vi	#vi/#ac	maxvi	sum	sum/#ac	zmax	#zsig	crit
VehicleF	0.37	26	0							
Mortgage	0.35	26	0							
AtmC	0.71	18	0							
GarageC	0.44	26	1	0.04	0.05	0.05	0.0020	3.77	1	40
CreditC	0.54	25	0							
InvPrSh	0.34	26	0							
OverdraF	0.41	26	0							
Chq	0.57	25	0							
UT	0.34	26	1	0.04	0.05	0.05	0.0020	3.77	1	45*
Exch	0.33	26	0							

Summary per item for check of non-intersection via P-matrices for entire group
Minimum violation = 0.03 Significance level= 0.05

	ItemH	#ac	#vi	#vi/#ac	maxvi	sum	sum/#ac	zmax	#zsig	crit
VehicleF	0.37	72	0							
Mortgage	0.35	72	0							
AtmC	0.71	72	0							
GarageC	0.44	72	0							
CreditC	0.54	72	0							
InvPrSh	0.34	72	0							
OverdraF	0.41	72	0							
Chq	0.57	72	0							
UT	0.34	72	0							
Exch	0.33	72	0							

P(+,+) matrix, ++ probabilities and estimation of reliability (marked *) for entire group

		Exch	InvPrSh	OverdraF	VehicleF	Mortgage
		0.03	0.05	0.05	0.05	0.06
Item	P					
Exch	0.03	0.01*	0.01	0.01	0.01	0.01
InvPrSh	0.05	0.01	0.01*	0.01	0.01	0.01
OverdraF	0.05	0.01	0.01	0.01*	0.02	0.02

VehicleF	0.05	0.01	0.01	0.02	0.02*	0.02
Mortgage	0.06	0.01	0.01	0.02	0.02	0.02*
GarageC	0.07	0.01	0.02	0.02	0.02	0.02
UT	0.08	0.02	0.02	0.02	0.02	0.01
CreditC	0.17	0.02	0.03	0.03	0.04	0.03
Chq	0.23	0.02	0.03	0.05	0.03	0.04
AtmC	0.74	0.03	0.05	0.05	0.05	0.05

(..continued)

	GarageC	UT	CreditC	Chq	AtmC
	0.07	0.08	0.17	0.23	0.74
Item P					
Exch 0.03	0.01	0.02	0.02	0.02	0.03
InvPrSh 0.05	0.02	0.02	0.03	0.03	0.05
OverdraF 0.05	0.02	0.02	0.03	0.05	0.05
VehicleF 0.05	0.02	0.02	0.04	0.03	0.05
Mortgage 0.06	0.02	0.01	0.03	0.04	0.05
GarageC 0.07	0.02*	0.02	0.05	0.05	0.06
UT 0.08	0.02	0.02*	0.04	0.05	0.07
CreditC 0.17	0.05	0.04	0.07*	0.10	0.16
Chq 0.23	0.05	0.05	0.10	0.12*	0.21
AtmC 0.74	0.06	0.07	0.16	0.21	0.61*

Summary per item for check of equal itemstep ordering across groups for entire group
Check of equal itemstep order in groups specified by GROUPVAR=Income
Minimum violation = 0.03 Significance level= 0.05

	ItemH	#ac	#vi	#vi/#ac	maxvi	sum	sum/#ac	zmax	#zsig	crit
VehicleF	0.37	36	0							
Mortgage	0.35	36	0							
AtmC	0.71	36	0							
GarageC	0.44	36	0							
CreditC	0.54	36	0							
InvPrSh	0.34	36	0							
OverdraF	0.41	36	0							
Chq	0.57	36	0							
UT	0.34	36	0							
Exch	0.33	36	0							

Details for the assumption of equal itemstep ordering across groups for entire group
Check of equal itemstep order in groups specified by GROUPVAR=Income
Minimum violation = 0.03 Significance level= 0.05

		Groups as defined by values for Income				
Itemstep	Entire Group	3	4	5	6	7
Exch	0.03	0.00	0.01	0.02	0.03	0.08
InvPrSh	0.05	0.00	0.03	0.04	0.05	0.09
OverdraF	0.05	0.00	0.01	0.03	0.05	0.12
VehicleF	0.05	0.00	0.01	0.02	0.06	0.13
Mortgage	0.06	0.00	0.01	0.03	0.07	0.12
GarageC	0.07	0.00	0.02	0.03	0.06	0.17
UT	0.08	0.00	0.04	0.06	0.08	0.17
CreditC	0.17	0.00	0.06	0.10	0.17	0.34
Chq	0.23	0.00	0.10	0.17	0.25	0.42
AtmC	0.74	0.00	0.66	0.70	0.78	0.83

Appendix C

Data for the MSP program

TABLE C.1: Data used for the MSP program

Obs	Ploan	MicroL	VehicleF	Mortgage	AtmCd	StudentL	Garage_Cd	DebitCd	CreditCd	Inv+PrSh	Mzansi	SavingTr	OverdraF	Chq	RetailCD	UT	Exch	Tshare2h
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	2	0	0	0	0	0	0	2	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

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