AN EMPIRICAL ANALYSIS OF THE RELATIONSHIP BETWEEN FOOD INFLATION AND PASSENGER VEHICLE PURCHASES IN SOUTH AFRICA

by

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ABSTRACT

Food inflation in South Africa has been viewed as an important source of underlying inflationary pressures in the economy due to its persistence beyond that of other commodities. Although several studies found food to be one of the factors that influence purchase decisions, there still appears to be an absence of research that directly links food inflation to consumers' decisions, especially when financing the purchase of new passenger vehicles in South Africa. In this regard, this study investigated whether the increase in the prices of food products has a significant effect on passenger vehicle purchases in South Africa. Leaning on the literature that argues that economic factors do not play much of a role in passenger vehicle purchase decisions in South Africa, it was hypothesised that there is no supported relationship between food inflation and passenger vehicle purchases in South Africa.

Using secondary time series data, the Pearson correlation test revealed a negative but insignificant relationship between food inflation and vehicle purchases in South Africa. The ordinary least squares estimate of the purchase function, taking into account several economic factors that influence passenger vehicle purchase decisions in the literature, showed that disposable income of households along with vehicle purchases of the previous period are to be considered as main determinants of vehicle purchases in South Africa. In addition, it was also revealed that new vehicle prices are also a significant determinant of vehicle purchases. The Johansen cointegration test revealed that the variables in the vehicle purchase function were cointegrated in the long run. The vector error correction model showed a long-run relationship, albeit insignificant, between food inflation and vehicle purchases and no relationship between the two variables in the short run. The Granger causality test revealed that food inflation and vehicle purchases are independent from each other, meaning that no causal effect was found between the variables, regardless of the direction of the test.

This study concluded that economic factors such as interest rate and fuel price have an insignificant influence on passenger vehicle purchases in South Africa. In the same line, the impact of food inflation on passenger vehicle purchases in South Africa was found to be insignificant, therefore, the conclusion was drawn that the increase in the prices of food products will not play a considerable role in consumers' decisions regarding passenger vehicle purchase in South Africa.

Keywords

Passenger vehicle purchases ; food inflation; correlation; ordinary least squares; Granger causality; cointegration; vector error correction model

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DECLARATION

I declare that “An empirical analysis of the relationship between food inflation and passenger vehicle purchases in South Africa” is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references.

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SIGNATURE DATE

(MR ERIC KATETA TSHIAKAMBILA)

CHAPTER 1:
INTRODUCTION AND BACKGROUND

1.1 BACKGROUND

The need for mobility is inherent to both individuals and businesses in all parts of the world. According to Shimpi (2013:29), there is no doubt regarding the fact that automobiles have become an integral part of human lives. Life without a vehicle is simply unimaginable these days. At a micro level, an individual's social status can be measured in terms of the automobiles used by him or her for daily trips to work, as well as for pleasure, happiness, prestige and style. Car travel or mobility derived from the use of a motor car is strongly associated with economic productivity (Cervero, 2000; Prud'homme & Lee, 1998). Out of all the various means to satisfy the need for mobility, passenger vehicles seem to be the most preferred and regularly used type of transport. Indeed, there were 1 015 billion motor vehicles[1] in use throughout the world in 2010, of which approximately 70% were passenger vehicles and 30% were trucks and buses (Wikipedia, 2010). With the global population of cars in use being more than that of trucks and buses, there is more substance to the belief that the passenger vehicle is the most frequently used means of mobility or transportation in the world.

During the period 1995 to 2005, the new passenger car market accounted for 60% of the total market share in the South African automotive industry, thereby confirming its strategic place in the industry (Zide, 2012). South African vehicle production rose to 539 538 vehicles in 2012 from 532 542 units produced in 2011 – an increase of 6 993 vehicles, or 1.3%. According to the National Association of Automobile Manufacturers of South Africa (NAAMSA) (2012), the production of new models of passenger vehicles has witnessed substantial growth, which has been largely supported by credit purchases. Car ownership in South Africa increased from 6 million in 2000 to more than 10 million in 2013 (eNaTIS, 2014).

[1] This figure represents the number of cars; light-, medium- and heavy-duty trucks; as well as buses, but does not include off-road vehicles or heavy construction equipment.

The South African automotive industry has become an increasingly important contributor to the country's gross domestic product (GDP), mainly through strong growth in the motor vehicle and component exporting sector (Chris & Anthony, 2004). The automotive industry accounts for approximately 30% of South Africa's manufacturing output. Although South Africa produced 72% of Africa's vehicle production in 2013, the industry remains relatively small in the global context and was ranked 24th in respect of global vehicle manufacturing, with a global market share of 0.63%. The significance of this industry is premised on its overall contribution to the economy, export earnings, investments, employment, GDP contribution and multiplier effects in the economy (NAAMSA, 2014).

The South African automotive sector is considered the leading manufacturing sector, contributing 6% to the country's GDP and creating more than 300 000 jobs in 2013. This sector has been regarded as one of the priority sectors to fast-track growth and development (dti, 2007). Its backward and forward linkages to other industries have made it a strategic factor in the country's economic development. For 2013 alone, automotive exports as a percentage of total South African exports amounted to 11.1%. The import value of vehicle and automotive component imports under the Automotive Production and Development Programme (APDP) in 2013 amounted to R126.7 billion. The import value of vehicles amounted to R63.6 billion, compared to the export value of R60.5 billion.

However, the South African automotive industry experiences increasing operational complexities, rising fuel prices and higher human resource costs. This is a result of higher living costs and growing pressure from China and India to remain competitive (Gabru, 2008).

Based on the above trend in passenger vehicle productions in South Africa, it can be confirmed that the domestic passenger vehicle market has witnessed considerable growth over the years. The implementation of the Motor Industry Development Programme (MIDP) has played a significant role in this growth, by doubling the size of the automotive industry since 1994. With the implementation, in 2013, of its successor, the Automotive Production and Development Programme (APDP), this growth is expected to increase significantly. This new programme aims to stimulate the expansion of local production from an average of 441 730 vehicles produced annually under the MIDP (from 1995 to 2012) to 1.2 million vehicles a year by 2020, while significantly increasing local content at the same time (SouthAfrica.info, 2012).

Nevertheless, NAAMSA (2014) reports that the aggregate industry production figures for 2014 were revised downwards by approximately 20 000 units following less favourable business conditions in the first quarter of 2014. Indeed, the 2014 first quarter aggregate industry new car sales of 126 485 units recorded a decline of 7 377 units, or a fall of 5.5%, compared to the 133 862 new cars sold during the corresponding quarter of 2013.

According to NAAMSA (2014), subsequent to successive years of growth in domestic new vehicles, prospects for 2014 will be affected by subdued economic growth, above-average new vehicle price inflation and higher interest rates.

As a result of the challenging macro-economic environment, NAAMSA anticipated that the domestic market in 2014 was likely to register a decline in aggregate terms of around 3.5% compared to 2013. The same macro-economic climate has also led to the revision of the APDP's ambitious vision (Furlonger, 2014).

Nevertheless, the above reality does not alter the fact that the South African automotive industry's significance is premised on its overall contribution to the economy, export earnings, investments, employment, GDP contribution and multiplier effect in the economy (NAAMSA, 2014). The successive years of growth in domestic new vehicles do more justice to the image of the motor vehicle industry in South Africa. Indeed, over the past few years, the purchase of new passenger vehicles in South Africa has witnessed considerable growth (Moodley, 2007). New passenger vehicle sales slowed down in 2009, with 258 129 units being sold following the 2008 global meltdown, in comparison with the average of 416 335 units sold per year over the four previous years (OICA, 2014). Nevertheless, new passenger vehicle sales recovered by 5.67% by December 2011 year on year, compared to the same period in the previous year, and reached 450 440 units sold in 2013 (OICA, 2014).

1.1.1 The motor vehicle market in South Africa: Literature review

It is practically impossible to elaborate on the South African automotive industry in isolation from the global automotive history. This can be attributed to the level of parent company, global supply chain and global distribution integration present in the industry across the world (Gaskin, 2010). An overview of the global automotive industry is therefore of considerable importance.

1.1.1.1 Overview of the global automotive industry

The motor vehicle industry comprises the largest manufacturing sector in the world, with an output equivalent to that of the world's sixth largest economy (Nag, Banerjee & Chatterjee 2007:1; OICA, 2008). Gaskin (2010) affirms that this industry has been considered as the foundation of the manufacturing industry in the United States of America (USA), Japan and various parts of Western Europe since the conclusion of World War II. This has qualified the motor vehicle industry with the title of 'industry of industries'. It is also one of the largest investors in research and development (R&D), hence playing a strategic role in society-wide technological development (Commonwealth of Australia, 2008; OICA, 2008). Gaskin (2010) states further that this industry is considered a driver of technological improvement and a key R&D driver, and that the industry's effects on all cutting-edge technological development has only ever been rivalled by that of the computer or information technology industry since the early 1980s.

Global vehicle production is concentrated in the European Union, China, the USA and Japan, which are also the four largest motor vehicle markets. In recent years, production has been increasingly shifted towards regions that are not members of the Organisation for Economic Co-operation and Development (OECD), in particular Asia. Between 2000 and 2007, the share of the USA and Japan in global production decreased from 40 to 30%, while the share of the non-OECD regions enhanced from producing one car in ten to one car in five (OECD, 2008). A study by the US Trade Commission, published in May 2013, examined trends in the production and sales of passenger vehicles in developed and developing economies that diverged during the period 2007 to 2012. In developed economies, the general trend was a decline in sales, production and trade in 2008 and 2009 due to the economic recession, and thereafter an increase in 2010 and 2011.

According to the International Organisation of Motor Vehicle Manufacturers (OICA), vehicle production rose from 84.2 million in 2012 to 87.3 million in 2013. Just four countries, namely China, the USA, Japan and Germany, produced 55.6% of all vehicles produced worldwide. At 22.1 million vehicles, China produced more than the USA (11 million) and Japan (9.6 million) combined (BCS Africa, 2014). Table 1.1 below, gives an overview of the global vehicle production from 2009 to 2013.

Table 1.1: Vehicle production (global), 2009–2013

Year	2009	2010	2011	2012	2013
European Union	17 055 8	19 822 6	20 954 0	19 826 2	19 726 4
North-American Free Trade Agreement (NAFTA)	8 782	12 177 5	13 477 7	15 797 8	16 478 1
South America	3 779	4 463	4 316	4 288	4 658
Asia-Oceania	31 760 1	40 900 5	40 575 5	43 722 6	45 800 8
Africa	413 451 00	493 084 0	556 637 00	586 396 00	636 519 00
Total	61 791 8	77 857 7	79 880 0	84 221 6	87 300 1

Source: OICA (2014)

Table 1.1 shows that Africa was the lowest contributor to global vehicle production with 0.73% and Asia-Oceania was the highest contributor with 52.5% of the vehicles produced globally. With the vehicle production of 45.8 million units in 2013, Asia confirmed its place as leader in global vehicle production. The Americas took second place with 21.1 million, followed by Europe with a contribution of less than 20 million in 2013. Although Africa's global contribution for 2013 was still insignificant compared to other regions of the world, its production grew by 8.5% in 2013. The global vehicle production presented an increase of 3.7% compared to the year 2012 as per table 1.1.

Table 1.2: Global vehicle sales

Year	2009	2010	2011	2012	2013
European Union	18 644 1	18 808 3	19 739 7	18 665 8	18 282 4
NAFTA	12 859 3	14 203 9	15 597 6	17 526 6	18 764 3
South America	4 654	5 479	5 942	6 146	6 239
Asia-Oceania	28 255 4	35 128 7	35 337 9	38 228 3	40 454 4
Africa	1 181	1 273	1 472	1 599	1 653
Total	65 594 5	74 894 0	78 090 9	82 166 7	85 393 8

Source: OICA (2014)

With regard to global sales, Table 1.2 shows that 85.4 million new vehicles were sold globally in 2013, of which Asia-Oceania and the Middle East contributed 47.4%, representing almost half of global sales. China took the lead, accounting for 25.7% of the global sales figure with a considerable growth in sales of 13.4%, followed by the NAFTA region with a 7.1% growth in sales. The European Union, however, registered a decrease in sales of -2.1% (BCS Africa, 2014).

1.1.1.2 History of the automotive industry in South Africa

The South African automobile sector has always been minor in global terms, but it has always caught the consideration of South African policy makers and therefore has had some form of intervention from government (dti, 2008). According to Flatters (2002:2), one thing that differentiates the automotive industry from other industrial sectors is the importance of government policies in directing its development. The policies that have driven the South African automotive sector are consequently central to understanding the sector's history and its recent accomplishments (Lamprecht, 2009). TISA (2003:8) confirms that the South African automotive industry began receiving support from government in the 1920s. From 1961 onwards, the industry was built through protectionist policies. Humphrey and Memedovic (2003:38) state that during this time, the heavy import duties on imported motor cars (100% + 15% surcharge) promoted the development of an industry of small assembly plants producing a relatively wide range of models in small volumes at high cost. The Department of Trade and Industry (dti) states that 50% import duty was levied on all imported components for assembled motor cars (dti, 2008). The low levels of value added led government to target this industry for development measures after World War II. In the same line, Lorentzen, Robbins & Barnes (2004) note that involvement of state entities in the form of financing regimes, imposing import quotas and tariffs and repressing labour unions have all played their part in the development of the automotive sector.

During the import substitution process, widespread trade barriers, such as high import duties, quotas and subsidisation to protect local industries against foreign competition, were created (Hough, Neuland & Bothma, 2003:42). This resulted in the improvement of balance of payment, as fewer products were imported and the export of gold, diamonds and agricultural products fuelled the economic growth of the country (Hough et al., 2003:41). However, after World War II, South Africa began to show an ongoing deficit in its current balance of payments. The deficit

was principally caused by a decrease in the level of dependence on the main source of foreign currency (gold and agricultural products). This drop in the level of trust in the main source of foreign currency was explained firstly by the decreasing ore reserves and bad weather affecting agricultural products. Secondly, the drop was caused by the unpredictable international supply and demand patterns. Furthermore, toward the end of the 1960s, import controls and devaluation of the rand became necessary to correct the increase of the deficit in balance of payment.

According to Lorentzen et al. (2004), the protectionism policy resulted in the fact that South African automotive firms operated at levels of productivity, quality and innovation well below international automotive standards. In this same line, Van Biljon (1998:6) indicates that protective policies, in terms of high import duties placed on imported vehicles and components and local content requirement, led to the rise of low-volume assemblers supplied by low-volume, high-variety component manufacturers. Low volumes and lack of economies of scale resulted in the cost of locally produced components not being competitive, hence leading to the South African assembly industry being uncompetitive.

Barnes and Black (2003:5) emphasize that the main objectives of the MIDP were to increase the competitiveness of the industry, encourage industry growth through export, stabilise employment levels, improve the industry's trade balance and make vehicles more affordable in the domestic market. According to Alfaro et al. (2012), the MIDP was introduced to help the small, protected automotive industry integrate with the global market within the context of economy-wide liberalisation following the end of apartheid. Initially it was planned to be phased out by 2012. The MIDP is widely regarded as a major success of South Africa's post-apartheid trade and industrial policies.

On 1 January 2013, the MIDP was replaced by a new national automotive policy, the APDP.

The aim of the APDP is to double vehicle production in South Africa by 2020 to 1.2 million vehicles, in the process driving South Africa's share of global production to over 1%. This programme was designed to take the automotive industry from an export-based incentive by focusing on value addition and scale of production with an OEM production target of 50 000 vehicles per annum, without consideration of the place where the motor vehicles are sold, be it locally or abroad (BSC Africa, 2014).

Table 1.3 below, compares the MIDP key performance indicators between 1995 and 2012.

Table 1.3: MIDP key performance indicators: 1995 vs. 2012

Activity	1995	2012
Capital expenditure by the OEMs	R847 million	R4.7 billion
Export value (vehicles and components)	R4.2 billion	R86.9 billion
Total vehicles exported (units)	15 764	277 893
Top vehicle export destinations	1. China	1. USA
	2. Zimbabwe	2. United Kingdom (UK)
	3. Malawi	3. Algeria
Top automotive components exported	1. Stitched leather seat parts	1. Catalytic converters
	2. Catalytic converters	2. Engine parts
	3. Tyres	3. Silencers / exhaust pipes
Top vehicle countries of origin: Imports	1. Germany	1. Germany
	2. Japan	2. India
	3. UK	3. Japan
Productivity (average number of vehicles produced per employee)	10.0	18.5
Automotive industry contribution to GDP	6.5%	7.0%
Number of passenger car model derivatives	356	2 159
Export destinations for vehicles and components	62	152
Total vehicles produced (units)	389 392	539 538
Total new vehicle sales (units)	399 967	624 035
Number of model platforms	41	13
Models with production volumes > 40 000 units	0	5

Source: AIEC (2013)

Among the main achievements of the MIDP were the move from short production runs and a switch from an uncompetitive, inward looking industry to an internationally competitive industry, integrated into global manufacturing. During the year 2012, the industry's performance reflected industry exports increasing by R4.7 billion, or 5.7%, to R86.9 billion from R82.2 billion in 2011 (AIEC, 2013).

However, it is critical to mention that the significant growth in the automotive sector in South Africa since 1995 (date of the implementation of the MIDP), as per Table 1.3 above, cannot be ignored. Employment figures for the manufacturing, components and sales sector put together reveal that this sector supplies work to around 319 700 people (DEDT, n.d.). This important statistic cannot be overlooked.

1.1.1.3 The position of the South African automotive industry

Considering all the different sub-sectors of the industry, such as production, supply, servicing and maintenance of cars and parts, the South African automotive sector plays a significant role in the economy (Zide, 2012). The South African automotive sector was identified in government's 2007 and 2010 revised NIPF and IPAP as one of the priority sectors to fast-track growth and development. Its backward and forward linkages to other industries have placed this sector as a strategic sector in the South African economic development. For 2013 alone, automotive exports as a percentage of total South African exports amounted to 11.1%.

The automotive industry can be divided into two different sectors, the first being vehicle manufacturing and sales and the second being components manufacturing and sales. Both of these sectors have proven to be very significant to the automobile sector as a whole, with at times the component sector being labelled as the 'lifeblood' of the automotive industry (DEDT, n.d.). The component sector comprises the following role players:

- OEMs or automotive assemblers: This category comprises both passenger and commercial vehicle assemblers.
- Automotive component manufacturers (ACMs): The ACMs supply components to OEMs, original equipment suppliers (OESs) and the independent aftermarket. The ACMs can be seen as the first-tier supplier in the automotive supply chain.
- OESs: This category comprises automotive parts and accessory sales through the OEMs.
- Automotive retail and aftermarket: This category consists of automotive parts and accessory sales, through independent retailers and repair shops. (Naudé, 2009)

The South African automotive industry has experienced significant changes in the last 20 years. Globalisation, the implementation of lean production and the development of modularisation

have had major influences on the relationships between OEMs and their suppliers, particularly those in the first tier, the ACMs (Morris, Donnelly & Donnelly, 2004:129). According to Gabru (2008), the South African automotive industry experienced increasing operational complexities, rising fuel prices and higher human resource costs. This is a result of higher living costs and growing pressure from China and India to remain competitive. Furthermore, the South African automotive industry also suffered under the same economic climate (recession) as the international industry, where governments had to intervene with aid packages to save the industry from total downfall. In South Africa, this recession led to the reduction and even closing down of operations, resulting in employee retrenchment in the industry. In December 2008, 36 000 people were employed by OEMs and 81 500 were employed by ACMs. Since the global economic crisis, the number of employees in the domestic automotive industry has declined with 16 000 job losses (approximately 20% of the total) in the ACM sector. Therefore, as at March 2009, employment figures at ACMs were estimated to have fallen to 65 500 employees (NAACAM, 2009:1). However, BCS Africa (2014) estimated employment in the automotive sector to amount to 133 863 in 2013.

The motor vehicle manufacturers (OEMs) consist of eight light vehicle (passenger car and light commercial vehicle) manufacturers in South Africa, namely BMW SA (Pty) Ltd, Fiat Auto SA (Pty) Ltd, Ford Motor Company of Southern Africa (Pty) Ltd (incorporating Mazda), General Motors SA (Pty) Ltd, Mercedes-Benz SA (Pty) Ltd, Nissan SA (Pty) Ltd, Toyota SA Motors (Pty) Ltd and Volkswagen of SA (Pty) Ltd. With the exception of BMW SA (Pty) Ltd, all the OEMs are also involved in commercial vehicle assembly activities (Lamprecht, 2009).

1.1.1.4 The South African automotive industry in the global context

Table 1.4 below presents a comparison of the South African vehicle production with the global vehicle production for the period 2008 to 2013.

Table 1.4: South African vehicle production versus global production

Year	2008	2009	2010	2011	2012	2013
Global vehicle production	70.52 M	61.7 M	77.9 M	80.1 M	84.2 M	87.4 M
SA vehicle production	0.563 M	0.374 M	0.472 M	0.533 M	0.540 M	0.546 M
SA share of global production	0.8%	0.61%	0.61%	0.66%	0.64%	0.62%

Source: NAAMSA (2013)

1.1.2 The passenger vehicle market in South Africa

1.1.2.1 Trends in passenger vehicle sales

South Africa has seen its car ownership increase from 6 million in 2000 to more than 10 million in 2013 (eNaTIS, 2014). Zide (2012) found that over the period 1995 to 2005, the new passenger car market accounted for 60% of the total market share in the South African automotive industry, thereby confirming its strategic place in the industry. According to NAAMSA (2012), the production of new models of passenger vehicles has witnessed substantial growth, which has been largely supported by credit purchases (NAAMSA, 2012). For the period January to June 2014, the sales of new vehicles have increased by 7% year on year since 2013 (NAAMSA, 2014).

The South African passenger vehicle sales contribution to global passenger vehicle sales for the period 2012 to 2013 decreased slightly from 0.73% to 0.72%. Table 1.5 below presents the new car sales figures and Figure 1.1 showcases the evolution of new car sales in South Africa from 2005 to 2013.

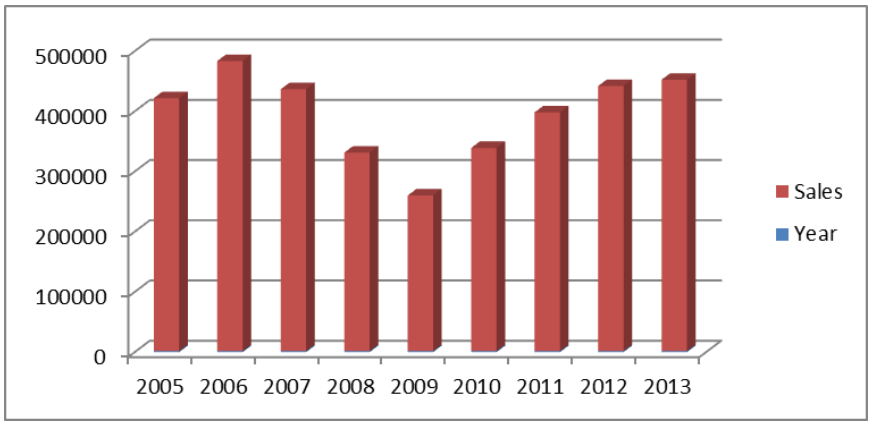

Figure 1.1: Evolution of new passenger vehicle sales in South Africa 2005–2013

Source: NAAMSA (2014)

1.1.2.2 The structure of the South African passenger car market

Figure 1.2 below portrays the structure of South Africa's new passenger car market, which is divided into 12 segments.

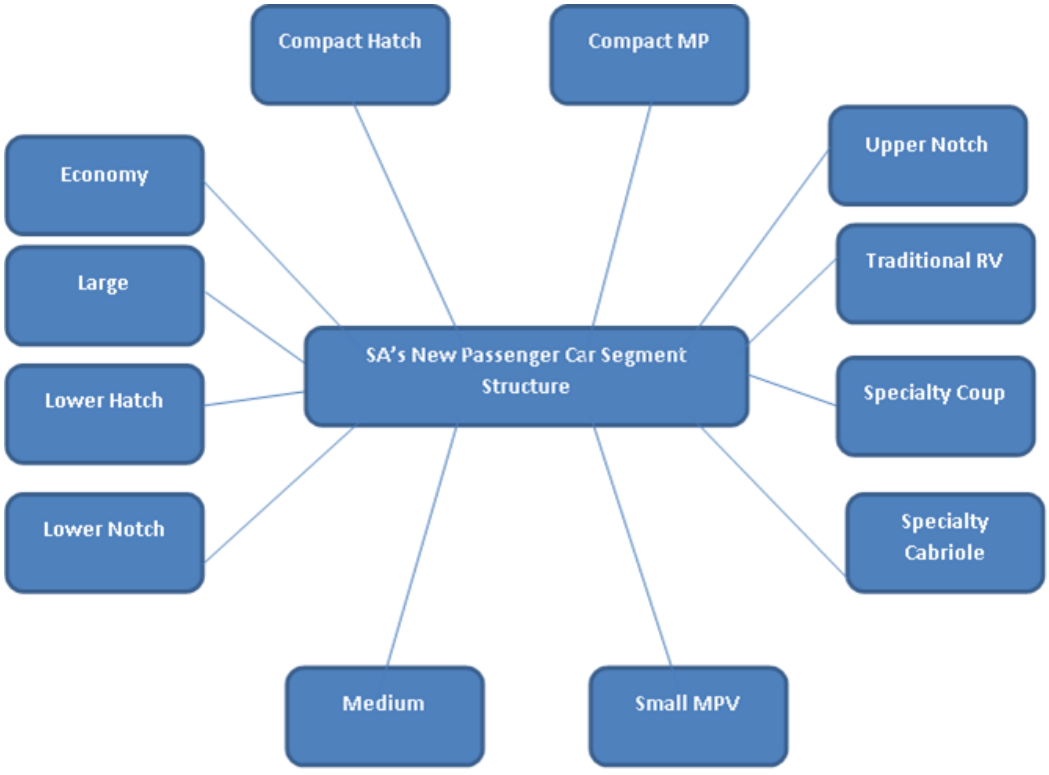

Figure 1.2: South Africa's new passenger car segment structure

Source: Zide (2012)

The criteria used to split up the different passenger car types/models into the segments are presented below (Zide, 2012):

- Footprint – vehicle size, body shape (not strictly dimensions), vehicle application
- Engine specification – power, performance, engine design application
- Brand value – premium, luxury or mainstream
- Trim level – specific model (e.g. flagship, basic)
- List price.

It must nevertheless be mentioned that segment structures will depend on manufacturers. For this study, General Motors' global segment configuration was considered. Listed below are segments and examples of South African passenger cars fitting into this segment during the year 2005 (Zide, 2012).

- Economy – Chevrolet Spark, Opel Corsa
- Compact hatch – Opel Corsa, Chevrolet Aveo
- Lower hatch – Opel Astra, Opel Kadett
- Compact MPV – Chevrolet Vivant, Opel Zafira
- MPV – VW Caravelle, Mercedes Vito
- Medium – Opel Omega, Opel Rekord
- Small MPV – Opel Mariva
- Recreational RV – Toyota Condor, Renault Scenic
- Speciality calrio – Opel Tigra, SAAB 9-3
- Specialty coupe – Opel Astra, Opel Calibra, SAAB 9-3
- Specialty other – Porsche 911
- SUVKV – VW Touarang, Lexus RX
- Large – Chevrolet Lumina, SAAB 900, SAAB 9-5
- Lower notch – Chevrolet Aveo, Opel Astra, Opel Corsa, Opel Monza
- Traditional RV – Chevrolet Blazer, Isuzu Frontier
- Upper hatch – BMW 1-series, Toyota RunX
- Upper notch – Chevrolet Optra, Opel Astra, Opel Monza

By 2005, the South African automotive industry had more than 60 brands, with over 190 car lines and more than a thousand individual models. In April 2010, there were 60 marques and 1 187 models in the South African passenger car market (Pitot, 2010).

It's worth noting that, this fairly attractive picture of the South African automotive industry in general and its passenger vehicle market in particular is in stark contrast to the simultaneous increase in bank repossessions and black-listing of defaulting borrowers. With roughly 50% of all vehicles bought in South Africa being financed, it is easy to see why the financial services industry is such a pivotal part of the country's economy. If it was not for the corporate sector being responsible for nearly 85% of vehicles that are bought, this percentage would be much higher, as many large companies prefer to make cash purchases rather than to conclude motor finance transactions (Econometrix, 2008). This reality highlights the necessity for understanding borrowers' decisions to purchase passenger vehicles in South Africa.

According to Lane and Potter (2007:1050), a large number of factors influence private car-purchasing behaviour, and these factors can be categorised as personal, economic and social, and include regulatory environments, vehicle performance and application. In addition to such objective factors are equally important subjective psychological factors, which include attitudes, lifestyle, personality and self-image. These psychological factors are of particular interest because not only do they influence behaviour directly, but they also mediate the more objective situational issues. For example, the way in which consumers perceive the economic environment often influences their purchasing behaviour, rather than the actual costs.

Several studies have been conducted on passenger vehicle purchase decisions in South Africa (Chisasa & Dlamini, 2013; Moodley, 2007; Pieterse, 2009). In these studies, interest rates, prices of cars, fuel prices and household income were identified as factors that influence vehicle purchase decisions in South Africa. In his empirical research, Pieterse (2009) found that an increase in the price of basic food was one of the factors that also influenced consumers' vehicle purchase decisions. In fact, based on the primary data collected via questionnaires from both consumers and credit providers in South Africa, the above author found that the cost of basic foods had a significant influence on consumers' decision regarding whether or not to apply for motor vehicle finance.

1.2 PROBLEM STATEMENT

There is a depth of research that measures the impact of macro-economic variables on new passenger vehicle purchase in South Africa. Among all the macro-economic variables, it is agreed that inflation poses serious economic challenges to businesses and consumers. This is mainly due to its effect on the loss of consumer buying power, social instability and loss of

confidence in the currency (Ashraf, Gershman & Howitt, 2013). In the same light, food prices in South Africa, have been found to have an indirect impact on inflation, through their effect on inflationary expectations, wages and the prices of other components in the consumer price index (CPI) (Rangasamy, 2010). Considering the fact that macro-economic behaviour has an influence on consumer consumption and therefore, on demand (DeLong, 2002; Dornbusch, Fischer & Startz, 1999), it is important to analyse the effect of particular macro-economic variables such as food inflation on South Africa's new passenger vehicle market.

Several studies have established a significant correlation between inflation and automobile sales (Apec, 2012; Chifurira, Mudhombo, Chikobvu, & Dubihlela, 2014; McGowan, 1984; Muhammad, Hussin, Razak, Rambeli & Tha, 2013; Muhammad, Hussin & Razak, 2012; Zide, 2012). A recent study by Chifurira et al. (2014) examined the impact of inflation on automobile sales in South Africa. The author found that inflation and new vehicle sales in South Africa are cointegrated in the long run, hence supporting the existence of a long-run equilibrium relationship between the two variables. Furthermore, a one-way causal effect (unidirectional causality) running from inflation to new vehicles sales at a 5% level of significance was found, thereby confirming the considerable influence of inflation on new vehicle sales in South Africa.

In view of the fact that food inflation in South Africa has been more persistent than the inflation of other commodities, and could therefore be an important source of underlying inflationary pressures in the economy (Rangasamy, 2010), this study proposed to determine the relationship between food inflation and passenger vehicle purchases in South Africa. This study will contribute to the literature by explaining the impact of food inflation on the purchase of new passenger vehicles in South Africa.

Although several other studies also found food to be one of the factors that influence purchase decisions (Cheng, Sims & Teegen, 1997; Makatouni, 2002; Munchanda, Ansari & Gupta, 1999; Pieterse, 2009; Rimal, Moon & Balasubramanian, 2005), there still appears to be an absence of research that directly links food inflation to consumers' decisions when financing the purchase of new passenger vehicles in South Africa.

1.3 AIM OF THE STUDY

This study aimed to explore the influence of food inflation on consumers' decisions to purchase a passenger vehicle. The sales figures for passenger vehicles in South Africa for the period

January 2008 to August 2015 were compared with the figures for food inflation over the same period in order to establish the relationship between these two variables.

1.4 RESEARCH QUESTION

This study attempted to answer the following research question: Does the increase in prices of food products have a significant effect on passenger vehicle purchases?

1.5 OBJECTIVES OF THE STUDY

One primary and two secondary objectives were identified for the study:

1.5.1 Primary objective

1) To determine the relationship between passenger vehicle purchases and the increase in the prices of food products in South Africa

1.5.2 Secondary objectives

1) To describe the relationship between household income and passenger vehicle purchases in South Africa
2) To identify the trends in price increases of food products, passenger vehicle sales and household income in South Africa.

1.6 CHAPTER SUMMARY

The aim of this chapter was to establish the background of the study and to present the problem to be addressed as well as the aim of the study. The research questions and objectives of the study were also presented.

In the next chapter, a detailed literature review with regard to purchase decision and inflation will be presented.

CHAPTER 2:
THE PURCHASE DECISION AND INFLATION: A LITERATURE REVIEW

2.1 CONCEPTUAL FRAMEWORK FOR PURCHASE DECISIONS

2.1.1 Understanding consumer buying behaviour

A consumer is defined as any person engaged in the consumption process, and can be categorised according to two different types: industrial and final consumers. This study focused on final consumers, namely those individuals who buy for personal consumption or to meet the collective needs of their family and household (Ushadevi, 2013).

According to Ushadevi (2013), the major theories of consumer behaviour can be grouped in the following manner: (a) economic theories, (b) psychological theories, (c) psycho-analytical theories and (d) socio-cultural theories. All these theories find their origin in the basic law of consumption, which states that when aggregate income increases, consumption also increases by a somewhat smaller amount, and is based on assumptions such as spending habits remaining the same, political conditions remaining normal and the economy being free and perfect.

Economic theories were central to this study, the basic elements of which include the marginal utility theory; the psychological law of consumption; the absolute, relative and permanent income hypothesis, etc. Among these theories, the marginal utility theory, which states that consumers will continue to buy products that will deliver maximum utility or satisfaction at relative prices, was most relevant to this study. Economists hold the view that humans are rational in all activities, and that purchasing decisions are the result of economic calculations.

With regard to the determinants of consumer behaviour, Ushadevi (2013) states that the theory broadly classifies these determinants into economic, sociological and behavioural factors. Although economic factors were the main focus of this study, it is important to highlight the importance of the sociological and behavioural determinants of consumer behaviour. These sociological and behavioural factors that influence consumer behaviour include the following: family, reference group, opinion leaders, cultural factors, social class and caste, and individual

determinants of consumer behaviour, such as age and lifecycle stage, occupation, economic situation, lifestyle, personality, education , beliefs, attitudes and motivation.

Moodley (2007) states that consumers purchase products not only to satisfy their needs, but to express their personality. The gestalt theory, coined by the German psychologist Christian Von Ehrenfels, views personality as a result of the interaction between the person and the total environment, and emphasises that the two must be jointly considered as a patterned event. Moodley further states that consumers attempt to stabilise their psychological field by providing meaning to their surrounding world. In this regard, the type of house, clothes, furniture, appliances, automobiles and jewellery that people buy may reflect their personalities (Ushadevi, 2013). Moodley (2007) contends that in the quest for a positive reception, consumers' daily buying decisions are influenced by multiple economic, social and personal factors. Using the example of products such as vehicles, Moodley (2007) asserts that social gatherings and events present opportunities for consumers to show off their new products. Nevertheless, he presumes that this type of behaviour tends to create irrational buying behaviour, leading ultimately to overspending and poor money management.

In the same vein, Ushadevi (2013) states that personality can also be viewed as a dynamic complex of psychological and physical systems that determine an individual's thoughts and behaviour. Ushadevi (2013) emphasises the fact that consumers are willing to purchase a particular product, for instance a car, with less consideration of the cost attached to the purchase, as long as the product helps the consumer to make a statement about him- or herself. Moodley (2007) contends that such irrational buying behaviour happens because purchasers frequently do not have relevant information.

Jeddi, Atefi, Jalali, Poureisa and Haghi (2013) state that one of the relatively modern concepts in marketing is that certain products suit specific types of personalities in the target market. For instance, a car can be matched with the following personality types: elitist and distinct, elegant and aristocratic, young and athletic, family-oriented, practical and economic, popular, powerful and gigantic. Jeddi et al. (2013) conclude that through all these personality types, related target markets can be approached.

Even though it is agreed that personality traits affect consumer perceptions and purchase behaviour, the behaviour of a particular personality cannot be predicted with certainty. Other factors, in addition to personality traits, affect purchase decisions, as mentioned earlier in this

section. Although personality may explain differences in consumer purchasing, it is extremely difficult for sales people to judge accurately how extrovert or introvert, conventional or unconventional a customer is. Indeed, reliable personality measurement has proved to be difficult, even for qualified psychologists. This study focused more on economic factors affecting consumer buying behaviours, rather than psychological ones.

2.1.2 Stages of consumer buying

The thought process that consumers undergo in order to arrive at their decisions is commonly referred to as the consumer decision process. Sheth, Mittal and Newman (1999) contend that decision making for purchasing durable products incorporates questions such as whether to purchase, what to purchase, when to purchase, from whom to purchase and how to pay for it. Underlying the tangible action of making a purchase is a decision process that needs to be taken into consideration. The buying decision process generally consists of the following steps (Gilaninia, 2010):

a. Problem identification

This is the very first stage of the buying decision process, where the consumer may feel the differences between his or her current and desired situation, and try to resolve these differences.

b. Data collection

At this stage, information is collected, with the aim of trying to solve the problem. There are two kinds of information, namely internal information (for example experiences) and external information (for example family and exhibits).

c. Assessment of options

After gathering information, the consumer is ready to make a decision. Different options will be evaluated and products that meet the consumer's demand will be chosen.

d. Purchase

According to the information already obtained, the consumer will identify a product that satisfies his or her need and buy it.

e. Post-purchase behaviour

Consumers compare purchased products with ideas, products, competitors, perceptions and expectations of the product, which results in either satisfaction or dissatisfaction, which may occur for different reasons.

In order to purchase some goods, consumers do not need to pass through all stages of the buying decision process. However, Jeddi et al. (2013) state that some purchases are so important that the consumer is forced to follow all the steps depicted in Figure 2.1 below carefully and thoroughly.

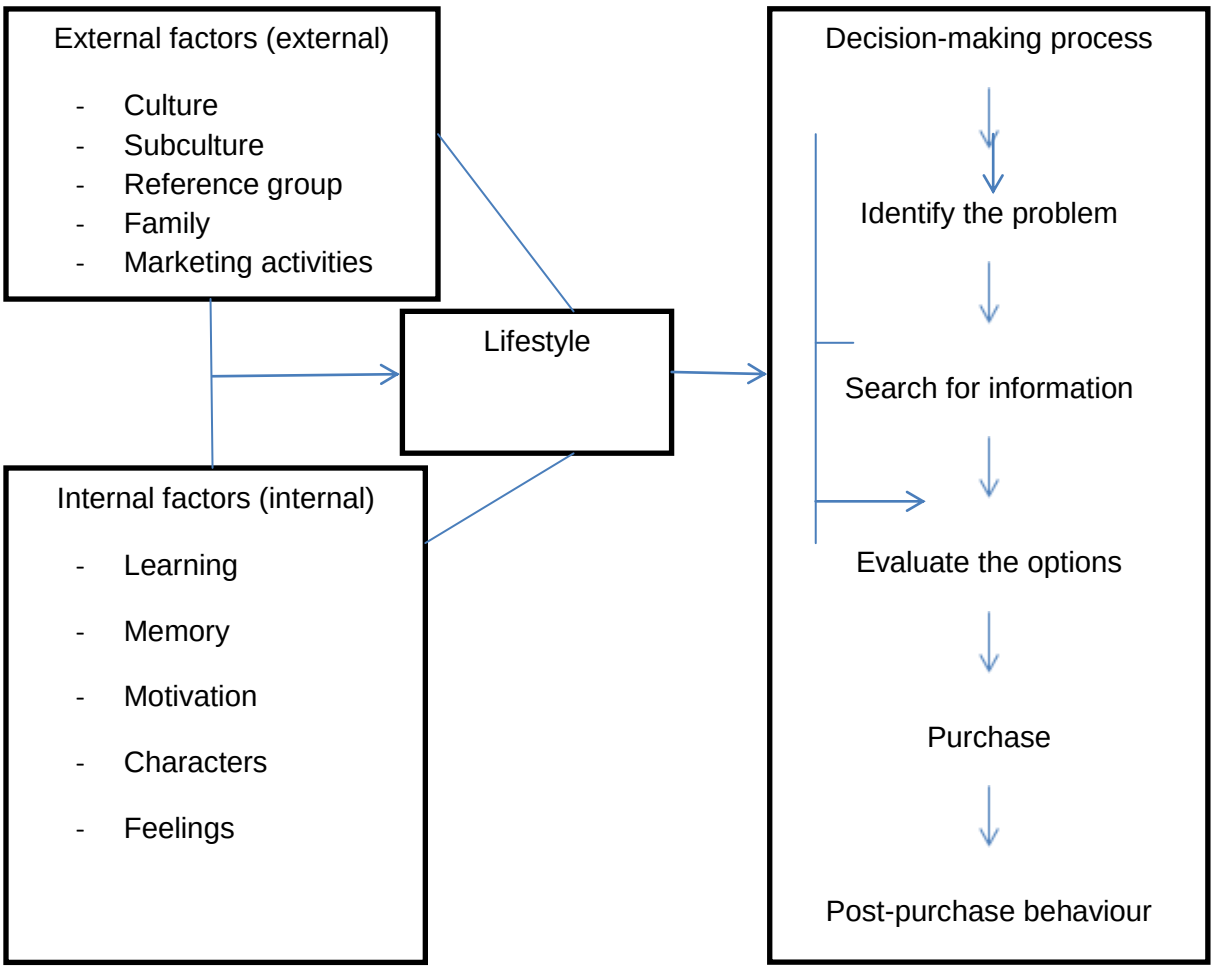

Figure 2.1: General model of consumer behaviour

Source: Jeddi et al. (2013)

For most people, purchasing a car is the second most important and expensive decision after purchasing a house (Shende, 2014). In this regard, the process for purchasing a personal

vehicle is as complex as the one described in Figure 2.1 above, and therefore needs to be given considerable attention. Kapoor, Dlabay and Hughes (2010) suggest that this complex exercise consists of four phases: pre-shopping activities, evaluation of alternatives, determination of purchase price and post-purchase activities. Kapoor et al. (2010) also emphasise that the actual purchasing is only one stage of the purchasing process, and that not all decision processes lead to a purchase. Figure 2.2 below presents the phases of the consumer decision-making process for purchasing personal vehicles.

Figure 2.2: Phases of the consumer decision-making process for purchasing a personal vehicle

Source: http://rci.rutgers.edu/~boneill/presentations/FPF-Chapter-6.ppt

2.2 FACTORS INFLUENCING PERSONAL VEHICLE PURCHASING

There are a number of internal and external factors that influence consumer buying decisions, whether they are individual or household members. Examples of external factors are price, marketing strategies, finance, availability and cost. Examples of internal factors are personal influences directly linked to the consumer, for example age, gender, lifecycle stage, occupation, economic circumstances, lifestyle and personality; social and cultural factors, for example peer and family pressure, social status, ethical and environmental issues; and psychological factors, for example motivation, beliefs and attitudes (Ushadevi, 2013).

As mentioned earlier , regarding personal vehicle purchase decisions, Lane and Potter (2007:1050) suggest that a large number of factors influence private car purchasing behaviour, and these factors can be categorised as personal, economic and social, and include regulatory environments, vehicle performance and application. In addition to such objective factors are equally important subjective psychological factors, which include attitudes, lifestyle, personality and self-image. This study focused on the economic factors that influence vehicle purchase decisions. In the following sections, interest rates, new vehicle prices, personal disposable income, availability of credit, fuel price, fuel efficiency and food inflation are discussed in detail.

2.2.1 Interest rates

Bannock, Baxter and Davis (1998) define interest as the price that a borrower pays to enjoy the use of cash that he or she does not own, and the return that a lender enjoys for deferring consumption or parting with liquidity.

Mehta (2015) posits that interest rates are one of the most influential factors in relation to the consumer purchasing decision. This is mainly because financial contracts for consumer durables consist largely of multiple terms and conditions that include a price (interest rate) as well as a payment period, which therefore makes it unlikely that the financial costs of different contracts will be exactly the same.

Banerjee (2010) found that most consumers are more likely to lease than to finance cars with higher maintenance costs. This was explained by the fact that this option allows consumers to return the car before maintenance costs become too high. Wonder, Wilhelm and Fewings (2009), on the other hand, state that the respondents in their study preferred low interest rates, a high rebate and a down payment.

Smusin and Makayeva (2009) verify the hypothesis that the rise of the interest rate lessens the availability of credit, leading to a decline in car sales. These authors studied the situation in Belarus, and found that the rapid rise in credit interest rates in foreign currency starting in October 2008 corresponded to a sharp decline in car sales in November 2008. In March 2009, interest rates evidenced a declining trend (although not returning to the mid-2008 level), and April 2009 saw a significant rise in car sales. This finding confirms that car sales are quite sensitive to credit interest fluctuations.

In his study of the National Credit Act (NCA) of South Africa and the motor finance sector, Pieterse (2009) established that the prime interest rate is one of the factors that influence the number and value of motor financing granted in South Africa. Eatwell, Milgat and Newman (1987:282) define the prime rate as "the lowest rate at which a clearing bank will lend money to its clients on overdraft". Ahern (1968) suggests that rising interest rates and a high proportion of new vehicle purchases (65–70%) being made on credit combine to make this an important area for consideration.

Pieterse (2009) indicates that there was a possible negative correlation between prime interest rate movements and new vehicle sales in South Africa. The author considered the steady increase in the prime rate for the period between 2001 and 2003, and again since 2005 to the end of 2008. The corresponding periods recorded a dramatic decline in year-on-year new vehicle sales growth. However, from 2002 to 2005, the prime rate took a downwards turn. In contrast, the year-on-year new vehicle sales growth figures recorded for the related period showed positive growth. It was concluded that higher interest rates ultimately result in a smaller demand for motor vehicles and, therefore, fewer applications for motor finance. In this same line, Cokayne (2007) reports that the six consecutive prime rate increases since 2005 had a dramatic negative impact on South African new vehicle sales.

Analysing the demand for new passenger vehicles in South Africa over a period of 10 years, Zide (2012) found that changes in interest rates had a statistically significant influence on the growth rate of the new passenger car market during the period under review. For instance, the author suggests that between 1995 and 1998 the new passenger car market had shrunk by 13%; in 1995 the average interest rates were 17.9%. By 1998, the average interest rates were 21.6%; an average increase of 4%. The inverse effect was identified between 1997 and 2003, where interest rates fell from 17.9% in 1999 to 15% in 2003, yet the new passenger car market rose by a cumulative 31% during the same period (Zide, 2012). Zide (2012) suggests that through their effect on income changes and the economy, interest rates have an influence on changes in the new passenger car market. However, the changes in interest rates typically have a lag effect before filtering through and influencing the new passenger car market.

Examining the link between interest rate and borrowers' decision to purchase a passenger vehicle in South Africa, Chisasa and Dlamini (2013) confirmed the existence of a negative but insignificant relationship between interest rates and passenger vehicle purchases in South

Africa. The authors argue that interest rates have no role to play in the decision-making process involved in purchasing a passenger vehicle, implying therefore that by and large, regardless of whether interest rates are high or low, South African consumers will apply for credit to purchase a passenger vehicle.

Analysing the impact of economic variables on automobile sales in five Asian countries, Muhammad, Hussin and Razak (2012) found that interest rates among other economic variables have a significant long-term correlation with automobile sales in these countries. The authors suggest that spikes in interest rates have a negative impact on car sales. This view contradicts that of Doyle (1997), who postulates that an interest rate increase may not affect real motor vehicle sales if car dealers are able to counteract the rate increases with lower prices.

2.2.2 New vehicle prices

Jobber (2010) contends that a well-chosen price has to contribute to achieving the financial goals of the company, such as profitability. Such price should take marketplace realities into account, support the product's positioning and at the same time be consistent with other variables in the marketing mix. The author posits that price is largely influenced by the type of distribution channel and promotions used, as well as the quality of the product.

For many consumers, the cost of an item is possibly the most important consideration when deciding whether to purchase a particular product or not. The price tag placed on a product by the manufacturer or retailer conveys a range of messages to the consumer. With regard to the purchase of vehicles, Musyoki (2012) suggests that customers have increasingly become price-conscious and dealers with competitive prices tend to attract more customers.

Investigating the impact of motor vehicle retail prices on consumers to purchase new motor vehicles in South Africa, Pieterse (2009) found that of the total 194 valid cases considered, almost two-thirds (62.4%) of the respondents (passenger vehicle consumers) shared the opinion that motor vehicle retail prices were the main impediment to consumers' decision to apply or not apply for motor finance.

Zide (2012), conducting an analysis of the demand for new passenger vehicles in South Africa for the period 1995 to 2005, found that changes in the price of new passenger vehicles have

had a negative impact on the demand for new passenger cars. Nevertheless, the author found that during certain periods of the analysed period, the demand for cars was relatively inelastic to price changes. These include price increases beyond the inflation rate and the partial influence of fringe benefits taxation, which combined to substantially raise hire purchase instalment costs as a proportion of average salaries. The rising new passenger car prices and the declining real incomes resulted in new passenger cars becoming increasingly unaffordable. When examining the hypothesis that the demand for new passenger vehicles was price-elastic, Zide (2012) found that a 1% decrease in relative price led to a 1.709% increase in the new passenger vehicle market and higher new car price inflation corresponded to a smaller demand for motor vehicles. Biswas, Mukherjee & Roy (2014) attempted to find the factors behind car purchase. The authors went further and tried to find the various other aspects of purchasing, the major dimensions or attributes consumers prefer to opt for while exhibiting decisions for car purchase in India. It was found that Indian consumers were mainly comprised of the middle class, and presented changing preferences from being only price-conscious to checking about car technical specifications as well. It was suggested that car technical specifications and technology were emerging as important factors in deciding about the purchase and preference of cars.

Zhan and Vrkljan (2012) explored the knowledge and attitudes concerning vehicle design features with respect to safety. The authors were particularly interested in examining the process of purchasing a vehicle by older drivers (70–80 years) in Ontario, Canada. The investigation revealed that safety was not a strong influence on vehicle purchase consideration, being superseded by other purchasing considerations, most notably price. Price was identified as the principal factor that influenced vehicle purchase decisions.

Alper and Mumcu (2007) investigated the demand for new automobiles in Turkey, using quarterly data on price, quantity, quality, country of origin and product characteristics of the new automobile sales market demand during the period 1996 to 1999. Among the findings of this study, it was observed that the demand for new automobiles is price-inelastic in the short run.

Comparing both the impact of the NCA and of the motor vehicle retail prices when it comes to consumers' decision to apply for motor finance or not in South Africa, Pieterse (2009) found that motor vehicle retail prices were considered to have a larger influence than the NCA.

In a study conducted to analyse consumer attitudes toward cars manufactured by European, American or Japanese manufacturers, country-of-origin effect, brand name and distributors'

reputation emerged as significant predictors apart from the pricing of passenger cars (Srivastava & Tiwari, 2014).

2.2.3 Personal disposable income

According to Mehta (2015), one essential economic factor influencing consumer buying behaviour is income. The author opines that this is mainly because the amount of goods bought by a consumer, as well as the type, differs depending on the wage a consumer earns. He noted that there was a very good chance of a consumer purchasing more luxury goods, such as high-end cars, when he or she has a higher income.

Mogridge (2009, cited in Mehta, 2015) contends that the main factor of consumer buyer behaviour is that the average person of a given income level is likely to spend a given quantity of money on the purchase of cars. In the same vein, Feng, Wang and Zeng (2011) state that recent studies revealed that there is a positive relationship between income levels and vehicle purchase decisions by individuals. In addition, Nagai, Fukuda, Okada & Hashino (2013) indicate that two-and four-wheeled vehicle ownership in Thailand depends largely on the income levels of individuals.

Shende (2014) analysed the behaviour of passenger car customers in India. Results showed that in all segments of this industry in India, such as small and hatchback, sedan, SUVs and MUVs, and luxury cars, buyers have different priorities. However, the main driver for car purchases was found to be disposable income.

John and Pragadeeswaran (2013) conducted a study on small car consumer preference in Pune, India, with the primary aim to investigate the impact of the profile of respondents and factors influencing car-purchasing decisions. It was concluded that income fluctuation and enhanced petrol prices are the factors driving the demand for small cars in India. Investigating car acquisition and ownership trends in motor vehicle-owning households in Surat, India, Barnerjee, Walker, Deakin & Kanafani (2010) found household income as the main determinant of the number and size of cars bought by households. Prieto and Caemmerer (2013) explored factors that influenced car-purchasing decisions in major car markets in France. A representative sample of 1 967 French households, who bought a new or used car within a year of their study, was considered. The research was based on random utility theory and applied multinomial logit modelling. The findings revealed that income has a positive impact on the

decision to buy a new car from higher segments and a negative impact on the decision to buy a used car from lower segments.

Biswas et al. (2014) examined the leveraging factors for consumer car purchase decisions, especially in an emerging economy such as India. Growth in disposable income and higher education were confirmed to be the main drivers of future car purchase decisions.

Analysing the demand for new passenger vehicles in South Africa for the period 1995 to 2005, Zide (2012) found that growth in the disposable income of households would result in better opportunities for the new passenger car market. The author found that income elasticity of demand for new passenger vehicles appears to be inelastic, proving that changes in real disposable income had no influence on the demand for cars. Therefore, consumers will always demand cars irrespective of whether their income increases or decreases.

While consumers' disposable incomes have been linked to vehicle purchase decisions, evidence has been provided that in some cases consumer incomes are insufficient, resulting in some consumers either buying or not buying cars. In some cases, consumers have supplemented their incomes by using credit. Researching on the NCA and motor vehicle finance in South Africa, Pieterse (2009) examined the possible existence of a relationship between application of the NCA, the prime interest rate, motor vehicle retail prices and the amount of motor finance granted in the South African motor finance sector. The author also investigated whether there was a relationship between total household income and consumers' opinion regarding the NCA as the main impediment to their decision to apply for motor finance. A relationship between total household income and the consumers' opinion regarding the NCA as the principal impediment to their decision to apply or not for motor finance was found. Pieterse (2009) argues that consumers with lower total household incomes viewed the influence of the NCA in their decision to apply or not apply for motor finance (purchase or not purchase a vehicle) as more significant than those from higher-income groups. This result indicates that the higher consumers' total household income, the less concerned they are about being disqualified as a result of credit criteria prescribed by the NCA.

Mathios (2012, cited in Mehta, 2015) opines that family income level influences an individual's motor vehicle purchase decision, as it is a reflection of the level of efficiency in collecting information on motor vehicles. It was found that people with a high-income level are likely to

possess the financial support to purchase such vehicles, and this encourages them to buy cars that are more expensive.

Furthermore, Mehta (2015) reports the view of Gould and Lin (2014), who found that the level of income for an individual is positively related to health knowledge, particularly when it concerns the choice and potential use of motor vehicles.

Mehta (2015) posits that there is a positive relationship between income growth and the quality of a car. To explain this further, the author underlines the fact that some studies have demonstrated that income level plays a role in predicting consumers' awareness regarding their attitudes. He also emphasises that in some empirical studies conducted in low income per capita jurisdictions, consumers did not show any improvement in their willingness to spend more on vehicles.

Gronmo (1988) argues that individuals who are unable to satisfy their primary needs, particularly the need related to self-esteem or self-actualisation, are likely to compensate for these desires through alternative means. This means that low-income households, or those facing racial or ethnic discrimination, are more or less likely to spend heavily on socially visible products (for example cars) in order to compensate for their lack of status in society. In this regard, Fontes and Fan (2006) suggest that in the event that traditional indicators of social status, such as wealth or occupational prestige, are not accessible, people will undoubtedly resort to the consumption of status products that are clearly viewed as symbols of a higher status.

Diaz-Olvera, Plat and Pochet (2008) and Blumenberg and Pierce (2012) posit that income or lack of it influences household transportation decisions and the manner in which individuals choose to travel. They argue that low-income households are less likely to own cars and more likely to travel by other modes of transportation other than motor vehicles.

2.2.4 Availability of credit

According to Shende (2014), the availability of easy finance and an increase in disposable income in both rural and urban sectors are the main drivers of high-volume car sales in various segments of the automobile industry in India. Similarly, Prieto and Caemmerer (2013), in exploring the factors that influence car purchase decisions, noted that financing a car or having

access to credit generally has a positive impact on new car purchases. This effect is more visible in lower than higher car segments. The authors emphasise that consumers who can afford to buy a new car are more likely to do so, thereby reducing their perceived as well as actual risk of buying a faulty car. In this regard, Gabbot (1991) mentions that in high-involvement decisions, such as car purchases, favourable economic variables can be used to engage in risk-reducing purchasing decisions. Even consumers who may not have the financial means to buy new cars might try to make use of external means, such as gaining access to credit, in order to reduce the risk associated with buying a second-hand luxury car. This is in line with the view of Dasgupta, Siddarth and Silva-Risso (2007), who suggest that credit access plays a key role in the demand for new cars and permits an 'upgrade behaviour'. Likewise, Abu-Eisheh & Mannering (2002) state that French car buyers use credit to enter new car markets, as well as to gain access to larger cars.

Pieterse (2009) concluded that of the 194 valid cases that he studied, almost three-quarters (71.1%) were of the opinion that the NCA was the major impediment to a consumer's decision as to whether or not to apply for motor finance. The author also emphasises that in terms of the NCA, the process of obtaining vehicle financing has become much tougher due to the fact that the credit applicant has to prove that he or she earns a sufficient income to cover the new instalment, in addition to all his or her existing monthly expenses, which was not the case under the Credit Agreements Act or Usury Act.

Johnson, Pence and Vine (2014) found that 70% of household purchases of new vehicles and 35% of household purchases of used vehicles in the USA are financed through car loans. The authors state that vehicle purchases fell by more than 20% during the 2007–2009 recession, and car loan originations fell by a third. They indicate that vehicle purchases typically account for a large share of the contraction in economic activity during a recession, partly because a concurrent tightening in car loan conditions makes car purchases less affordable for many households. Estimating a vector auto-regression on aggregate data and logit regression on household level data, the authors found that credit conditions have a significant influence on automobile sales, as well as factors such as unemployment and income. From the estimates of the household level model, it was found that the new car purchases of households that are more likely to depend on credit are particularly sensitive to assessments of financing conditions, and that households are more likely to purchase vehicles when they expect interest rates to rise in the following year.

Although the availability of credit is among the factors affecting consumer car purchase decisions, this did not form part of the variables analysed in the purchase decision model discussed later in this study. The variables selected for this model are identified in Chapter 3 of this study.

2.2.5 Fuel price

Banerjee et al. (2010) examined new vehicle choice in India, principally household choice among motorised vehicle segments. Among the findings, the authors observed that consumers are sensitive to fuel cost and that new vehicles are preferred over used vehicles. In this same line, Biswas et al. (2014) state that Indian consumers are very sensitive to operating costs, as the price of gasoline in India is a large fraction of per capita income.

Menon & Raj (2012) found that approximately one-third of car owners in India had diesel vehicles, due to the price difference between gasoline and diesel.

Zide (2012) examined the effect that changes in petrol prices had on the new passenger vehicle market in South Africa during the period 1995 to 2005. A statistical relationship between petrol price and the new passenger vehicle market was identified. It was concluded that increases in the price of petrol only have a short-term effect on the new passenger vehicle market. Nevertheless, petrol price increases have a long-term effect – it is the effect that petrol price increases have on the structure of the demand for new passenger vehicles, as reflected by the demand for small, medium and larger vehicles. Petrol price increases have an effect on the new passenger vehicle market at different levels of income. Duncan (1980) analysed the effect of gasoline prices on automobile sales. The author presents evidence that a change in gasoline prices would not affect total car sales, but only the distribution between large and small automobiles.

McManus (2007) explored the link between fuel prices and sales of motor vehicles and trucks in the USA. He claims that a significant portion of changes in vehicle prices could be attributed to changes in fuel prices. The author concludes that rising fuel prices lower the prices of automobiles. He argues that the negative impact of rising fuel prices on vehicle prices is greater for less fuel-efficient vehicles than for more fuel-efficient vehicles.

2.2.6 Fuel efficiency

Analysing factors influencing the vehicle purchases of older drivers in Ontario, Canada, Zhan and Vrkljan (2012) found fuel efficiency to be one of the key factors that influence vehicle purchase behaviour. In a similar study, Chidambaram and Alfred (2007) suggest that there are certain factors that have an impact on the brand preferences of customers. It was found that customers give more importance to fuel efficiency than any other factor and believe brand name inform them about product quality, utility and technology. Chidambaram and Alfred (2007) further state that customers prefer buying passenger cars that offer high fuel efficiency, good quality, technology, durability and reasonable price. Sundaram (2011) showed that diesel cars are becoming popular in India, and that the announcement of reductions in excise duties by government has helped to boost the demand to some extent.

Turrentine and Kurani (2007) conducted a study on how US consumers think and behave with respect to automotive fuel economy. Their data were collected from semi-structured interviews with 57 households across nine lifestyle 'sectors', and it was found that households did not analyse their fuel costs in a systematic way in their automobile or gasoline purchases. These households may know the cost of their last tank of gasoline on that day, but this information is rapidly forgotten and replaced by typical information. It was emphasised that one effect of this lack of knowledge and information is that when consumers buy a vehicle, they do not have the basic building blocks of knowledge assumed by the model for economically rational decision making, and they tend to make significant errors in estimating gasoline costs and savings over time. Furthermore, it was found that consumer value of fuel economy is not only about private cost savings. Fuel economy can be a symbolic value as well – for example, among drivers who view resource conservation or thrift as important values to communicate. Consumers also assign non-monetary values to fuel prices by, for example, viewing rising prices as evidence of conspiracy. Turrentine and Kurani (2007) indicate that consumer responses to fuel economy technology and changes in fuel prices are more complex than economic assumptions seem to suggest.

Lane and Potter (2006), in their study on the adoption of cleaner vehicles in the UK, found that car consumers conduct a more sophisticated review of issues, including fuel economy, running costs, performance, safety, styling, image, brand and reliability. Regarding fuel economy in particular, an apparent paradox was found concerning the importance attached to it in the mind of consumers. Although the fuel economy is reported to be a key decision factor for private

buyers, the authors noted that among the studies they reviewed, one stated that most car buyers expended little effort in comparisons of fuel consumption during their decision making process (Lane & Potter, 2006). To explain this apparent contradiction, it was argued that it could be observed that although car buyers accept that fuel economy is generally dependent on car size, many assume that there is little difference in fuel economy between cars within a class . Furthermore, another argument is that some consumers consider fuel economy to be an aspect of car design that can only be achieved by compromising performance and safety, while many have little confidence in published fuel economy data. There is also some evidence that the issue of fuel economy only gains importance after the purchase has been made (Lane & Potter, 2006).

Although fuel efficiency is a critical factor affecting consumer purchase decisions regarding passenger vehicles, this variable did not form part of this study, due to the nature of the data used in this study. Indeed, as suggested by Shende (2014), fuel efficiency is classified according to product and technology parameters, rather than economic parameters.

2.2.7 Food inflation

Several studies have found food to be one of the factors that influence purchase decisions (Cheng et al., 1992; Makatouni, 2002; Munchanda et al., 1999; Rimal et al., 2005). Pieterse (2009) examined the impact of living cost on the decision of consumers whether to apply or not for motor vehicle finance. Of the 194 valid cases considered in the study, it was found that 83.5% of the respondents (passenger vehicle consumers) shared the view that living costs were the main impediment to their decision to apply or not apply for motor finance in South Africa. It was concluded that the increase in the cost of basic food products had a significant influence on consumers' decision regarding whether or not to finance a motor vehicle in South Africa.

Bloomberg News (2010) reported on the fact that inflation led to slower automotive sales in China. It was argued that car dealers made use of sales discounts of up to 14% and other incentives to stimulate car sales in the central Chinese city of Zheng Zhou, as rising prices reduced buyers' purchasing power. Car dealers fear that a steady increase in the prices of daily necessities will undermine people's expectations of their future financial security, thereby reducing their desire to buy a car.

Chifurira et al. (2014) investigated the impact of inflation on automobile sales in South Africa. Using cointegration and causality tests, the authors' analysis considered monthly data over the period 1960 through September 2013. Using the Johansen–Juselius cointegration test, it was found that inflation and new vehicle sales are cointegrated in the long run. Using the Granger causality test, the study also confirmed the presence of a one-way causal (unidirectional causality) effect running from inflation to new vehicle sales at a 5% level of significance.

Burke and Ozdagli (2013), in their study on household inflation expectations and consumer spending, attempted to answer an important question in relation to monetary policy, namely whether or not an increase in inflation expectations would propel current consumer spending with nominal interest rates at the zero lower bound. Using survey panel data for the period April 2009 to November 2012, the authors examined the relationship between a household's inflation expectations and its current spending, while also considering other factors, such as the household's wage growth expectations, uncertainty surrounding its inflation expectations, macro-economic conditions and unobserved heterogeneity at the household level. No evidence was found that consumers increase their expenditure on large home appliances and electronics in response to an increase in their inflation expectations. The authors found that in most models, the estimated effects were small, negative and statistically insignificant. Nevertheless, it was found that consumers were likely to purchase a car when their short-run inflation expectations increased. In their findings, the authors suggested that as a policy measure, raising inflation expectations may not be effective in boosting current consumption.

Smusin and Makayeva (2009) studied the macro-economic factors affecting car sales in three national markets: Belarus, Russia and Ukraine. The authors discuss 10 macro-economic variables in connection with car sales; seven of them, including five monthly variables and yearly variables, were statistically compared to car sales data. It was stated that the connection between inflation and car sales was multi-fold. The authors suggest that rising prices in an economy include on one hand, rise of car prices, therefore declining of the quantity of cars bought (by the law of supply and demand). On the other hand, rising prices often coincide with rising salaries and wages, and therefore, the net effect of inflation is merely incidental. It was concluded that inflation was probably the least clear factor from a theoretical point of view with regard to car sales. They further argue that there is little chance that this inflation will prove significant in relation to car sales.

Based on evidence from Statistics South Africa's (Stats SA) consumer price index (CPI) figures, NAAMSA (2013) states that 11 to 14 years since the MIDP was initiated, vehicle prices have risen slower than inflation. This has been mostly highlighted in the years from 2004 to 2006. However, there was a period of three years, from 1998 to 2001, where vehicle CPI was higher than the average CPI, contrary to NAAMSA's suggestion.

The Department of Economic Development and Tourism (DEDT) (N.d) argues that although the rate of car price increases as a whole may have been lower than the average inflation during the MIDP period, it does not really explain off which base vehicle prices have been increasing. The base off which vehicle prices have been increasing may still have been higher than overseas markets, which is the reason why studies such as that of the Competition Commission South Africa show that South African car prices are higher than in European markets.

Rangasamy (2010) suggests that food inflation in South Africa has been more persistent than that of other commodities, and could therefore be an important source of underlying inflationary pressures in the economy. In view of the important contribution of food inflation to headline inflation (CPI), any study directly linking food inflation to passenger vehicle purchases in South Africa will find its place in the existing literature. This study proposes to close the gap in the existing literature by investigating the relationship between food inflation and passenger vehicle purchase decisions in South Africa.

2.3 THE THEORY OF INFLATION LEADING TO FOOD INFLATION

According to early writings by Juster and Wachtle (1972), economists have usually considered the fact that an expected rise in prices promotes an increase in expenditure, leading people to substitute goods for money, and therefore spend more and save less. Therefore, the 'standard' view is that a fully anticipated rise in prices will have no effect on real economic decisions, because all the impacts have been fully discounted and embodied in current prices, interest rates, and so forth. It is suggested that the expectation of a price increase that was previously unanticipated will cause goods, especially durable ones, to be more attractive and money less attractive. The authors add that there is a persuasive alternative view, probably owing its origin more to psychologists and sociologists than economists, which suggests that a rise in prices (anticipated or not) will tend to increase saving and reduce spending. This argument is often viewed in terms of the impact of price increases on consumer confidence or consumer

optimism. Rising prices, according to survey data by the authors, tend to be associated with unfavourable consumer reactions and weaker confidence.

Juster and Wachtle (1972) contend that one interpretation of their survey-based finding is that rising prices create pessimism, which focuses on the effect that it has on consumer expectations regarding real income. They add that if consumers generally believe that the rate of increase in nominal income will be less variable than the rate of increase in prices, the expectation of rising prices will generate a greater dispersion of expectations about real income. A wider dispersion may not have symmetrical effects on behaviour, in that the prospect of declining real income may have a greater influence on consumer decisions than the prospect of rising real income, even though the two are regarded as equally probable. The authors suggest that consumers may be more concerned that price inflation will erode their real income than pleased that rising nominal incomes will outweigh increasing prices. If so, the appropriate reaction to inflationary expectations would be to curtail spending in an attempt to guard against declining real income, thereby improving the savings rate. In conclusion, the authors assert that steady and moderate rates of price inflation would probably have quite different effects on consumer expenditures than high or variable rates. Moreover, the anticipatory buying effects may not be strong at all, unless rates of price inflation are quite high (Katona, n.d.).

Batten (1981) states that because inflation is a continuous rise in the average price level, a one-time increase caused by some random shock (for example a drought or a reduction in the quantity of oil supplied by OPEC) is not considered to be inflation. Although this one-time increase will result in a higher overall price level, the rate of increase of the overall price level (in other words, the rate of inflation) will be unaffected if the economy adjusts to this shock immediately.

González, Gómez, Melo and Torres (2006), in emphasising the relevance of food inflation to the monetary authorities, assert that although, in general, monetary policy should not respond to temporary supply shocks, as is the case with food inflation, large changes in food prices may affect inflation expectations, thereby increasing the permanence of the shock. Rangasamy (2010) posits that food products exert price impacts on overall (headline) inflation. This impact on headline inflation can be both direct and indirect. The direct impact occurs through changes in the prices of food components in the consumption basket. This direct price effect has to do with the weight of food in the CPI. The author contends that food prices could also present an

indirect impact on headline inflation through their effect on inflationary expectations, wages and the prices of other components in the CPI. Also commonly referred to as second-round impacts on inflation in the empirical literature, the indirect impact of food products on headline inflation is characterised by the fact that the net overall impact of food on inflation is not solely dependent on the share of food prices. Therefore, a thorough understanding of the dynamics of food inflation is crucial to establishing the potential implications of food price movements on consumer purchase decisions, especially with regard to car purchases in South Africa, which was the focus of this study.

2.4 THE PLACE OF FOOD INFLATION IN HEADLINE INFLATION

Before attempting to determine the contribution of food inflation to headline inflation in South Africa, theoretical issues pertaining to this concept are first discussed.

In the past few years, rising food prices have had considerable economic and social impacts in South Africa and many other developing countries (Hampton & Weinberg, 2014). Theoretically, domestic food prices are influenced by both international and domestic factors (Rangasamy, 2010). However, a literature review in this regard revealed that the transmission of world food prices to the local market is limited to certain products (ADB, 2011; Hampton & Weinberg, 2014; Johnson, 2008; OECD, 2008; Rangasamy, 2010; Von Braun & Tadesse, 2012). Considering the price transmission between world food prices and African markets, it was established that for some products, such as maize, there was an absence of price transmission, while the price transmission was strong for other products, such as rice. It is suggested that self-sufficiency in some local products, domestic price falling between export parity and import parity, local government interventions and dependence on the import of certain products would determine the presence or absence of the price transmission of world food prices to domestic markets. It is also suggested that international food prices may rise, resulting in the increase in demand or decrease in supply in the international market. Rising input costs, such as oil prices, could also lead to an increase in global food prices. In addition, the exchange rate is also considered to be an important determinant of the net impact of changes in international market conditions on domestic prices (Rangasamy, 2010). It is conceded that the effects of global food inflation on consumers and producers in developed and developing countries are highly differentiated, depending on the degree of transmission of world food prices to domestic markets and the

particular commodity. However, in South Africa, food price movements depend heavily on domestic influences (Hampton & Weinberg, 2014).

Between the 1980s and 1990s, there was a decline in real terms of international food prices. The increase in prices began in 2002, then nearly doubled between 2005 and 2008 for products such as wheat, coarse grains, rice and oilseed crops, before a sharp decrease in 2009, followed by a rise to even higher levels in 2011 than those reached between 2000 and 2007 (OECD, 2008). Although the prices have dropped marginally from their 2011 peak, they are still well above their historical averages. The causes of the price spike are complex, and are due to a combination of mutually reinforcing factors in both demand and supply. These factors are both cyclical and structural in nature, and include droughts in key grain-producing regions, low stocks for cereals and oilseeds, increased feedstock use in the production of biofuels, sharply rising oil prices and a continuing devaluation of the US dollar, the currency in which indicator prices for these commodities are normally quoted (ADB, 2011; Hampton & Weinberg, 2014; OECD, 2008). Some other factors, such as population growth, changing dietary preferences, rising energy prices, energy intensity of the agricultural sector, diversion of land for urban/industrial use and competition for scarce fresh water resources between agriculture, industry and residential areas are also considered as causes of the price increase of food products (ADB, 2011; Hampton & Weinberg, 2014).

The weight of food products in the consumption basket may not be proportional to the overall impact of food price increases on consumer inflation, considering the fact that products exert both direct and indirect price impacts on overall (headline) inflation (Rangasamy, 2010). The direct impact of an increase in food prices on headline inflation occurs through changes in the prices of food components in the consumption basket, while the indirect impact of food prices occurs through their effect on inflationary expectations, wages and the prices of other components in the CPI. The direct price effects are related to the weight of food in the CPI. Considering the fact that most developing countries have a larger weight for food items in their consumption baskets, the increase of food prices will have a large impact on inflation trends in these countries, in comparison to developed countries. However, it is important to note that within a country, the impact on different segments of the population may differ (Rangasamy, 2010).

High food prices are viewed as an incentive for net food producers to produce more food. It was found that whenever food prices are on an upwards trend relative to input prices, farm income will grow, thereby encouraging agricultural investment. On the other hand, rising food prices can present tremendous challenges for poor people, who spend much of their income on food (Johnson, 2008; Von Braun & Tadesse, 2012).

With regard to the indirect impact on headline inflation, it is suggested that the indirect effects, also referred to as second-round impacts on inflation, translate into the fact that the net overall impact of food on inflation is not solely dependent on the share of food in the consumption basket, but also on the interrelationship between food and non-food prices.

In Afghanistan, for instance, increases in the price of wheat flour are associated with declines in several dimensions of well-being for Afghan households. To be more specific, it was found that a 1% increase in the price of domestic wheat flour is associated with a 0.20% decline in real monthly per capita food consumption (D'souza & Jolliffe, 2010).

Durevall, Loening and Birru (2013) suggest that during the global food crisis, Ethiopia, among other African countries, experienced an unprecedented increase in inflation, which was among the highest in Africa. Monthly data over the past decade were used, and models of inflation were estimated to identify the importance of the factors contributing to CPI inflation and three of its major components: cereal prices, food prices and non-food prices. The results showed that inflation in Ethiopia is strongly associated with the dominant role of agriculture and food in the economy. In fact, Ethiopia's inflation was practically synonymous with food price inflation during the study period. It was found that in the long run, food prices seem to be determined in the external sector, in other words, the exchange rate and international food prices explain the evolution of Ethiopia's food prices. In the short run, domestic agricultural supply shocks, as well as inter-seasonal fluctuations, which are probably induced by expectations regarding future harvests, cause large deviations from the long-run relationship between domestic and foreign food prices.

Figure 2.3 below presents the impact of food price increases on consumer inflation.

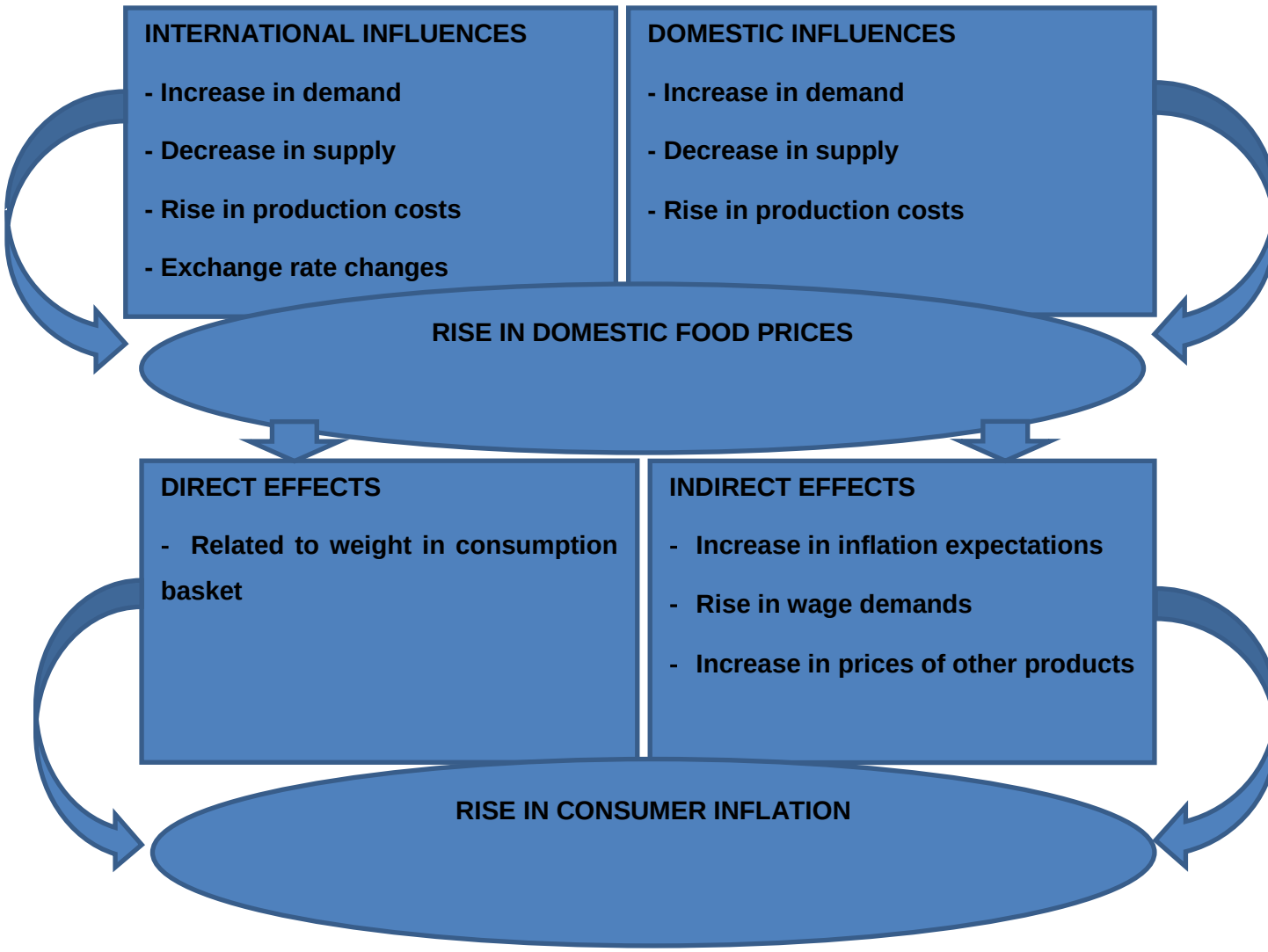

Figure 2.3: Impact of food price increases on consumer inflation

Source: Rangasamy (2010)

2.5 THE IMPACT OF THE INCREASE IN FOOD PRICES ON CONSUMER PURCHASE DECISIONS

It has been demonstrated that consumers react to pressures, including high prices at the petrol pump, economic uncertainty and escalating food costs (McCarty, 2011). Increasing prices affect household consumption patterns in two ways: first, through the percentage of the household's expenditure dedicated to consumption, and second, through the consumer basket mix of goods that are regularly purchased. Indeed, households that allocate a higher percentage of their total income to food experience higher food inflation, as an increase in the price of a consumer

basket will mean more money being spent on consumption, in comparison to those households whose percentage of money spent on food is small (Capehart & Richardson, 2008; McGranahan, 2008). Furthermore, the manner in which households are affected also depends on the magnitude of the price increases in their consumer basket, as the prices of goods and services rise at different rates. This means that different households can experience very different inflation rates. Households spending a large portion of their budget on items whose prices increase rapidly generally have higher inflation than households that spend a smaller portion on these items (Dubihlela & Sekhampu, 2014; Fabrizio, 2012; McGranahan, 2008).

In recent years, there has been a visible rise in prices globally, particularly for food, which makes up a large part of the budget of low-income households (Levell & Oldfield, 2011). These increasing prices lower the purchasing power of a given nominal income and further affect the expenditure decisions of households (UN, 2012).

It is important to mention that rising food prices lead to distress, food riots and declining purchasing power, as well as aggravating chronic poverty and enhancing inequality (FAO, 2008; HLPE, 2011). The higher the prices, the stronger the welfare consequences for consumers (HLPE, 2011). The short-term responses may include a reduction in food consumption and an increase in labour supply through piece jobs and dissaving (World Bank, 2008).

Increasing prices have an uneven impact across population groups and prompt different responses (Wodon & Zaman, 2008). The poor respond by limiting food consumption and adopting less balanced diets, which have short- and long-term negative health consequences. The non-poor do not necessarily reduce food consumption, but will spend less on durables. The fact that the poor spend a greater part of their income on food makes them worse off than the non-poor when there are food price increases (Regmi, Deepak, Seale & Bernstein, 2001; UN, 2012).

A survey conducted in the USA on the impact of rising food prices on consumers' spending found that in-home food products were not the only areas of spending that were affected. Some other areas where respondents would change their spending were also mentioned. These areas included dining out (64%), buying new clothes (55%), spending on snack food (45%), paying for recreation and entertainment (44%) and going on vacation (39%) (Nielsen, 2013).

The Bureau of Food and Agriculture Policy, which is a unit at the University of Pretoria, presented, in their 2009 annual baseline presentation, an analysis of the impact of food inflation during the 2007–2009 period on different consumer groups in South African society. In their findings, it was highlighted that the poorest consumers had to spend 12.8% more of their annual income in 2007/08 to buy the same food basket, while the wealthiest consumers had to pay an additional R1 840 per year for the same food basket. However, the latter was only 0.7% of their annual income, which therefore had a much smaller impact than in the case of poor consumer groups.

In an empirical study on the NCA of South Africa and the motor finance sector, it was found that an increase in the price of basic food in South Africa was one of the factors that also influenced consumers' vehicle purchase decisions (Pieterse, 2009). In fact, based on the primary data collected via questionnaires from both consumers and credit providers in the country, it was found that the cost of basic foods had a significant influence on consumers' decisions regarding whether or not to apply for motor vehicle finance (Pieterse, 2009).

2.6 INFLATION TRENDS IN SOUTH AFRICA

2.6.1 Inflation in South Africa

Inflation is generally defined as the rate at which the general level of prices for goods and services is rising, and, consequently, purchasing power is falling (Investopedia, 2015a). In South Africa, inflation is monitored by the South African Reserve Bank (SARB) and is measured using the CPI, which is a widely used indicator for determining the cost of living (Dupuis, Vachon & St-Maurice, 2013). Since 1980, there have been three distinct monetary policy regimes targeting inflation in South Africa (Aron & Muellbauer, 2007). The first period, from 1980 to 1989, was characterised by high inflation rates, ranging from 11.5 to 18.6%, which indicated the failure of the monetary policy to contain inflation. The second period, from 1990 to 2000, saw a significant drop in inflation to below 10%, which subsequently decreased to 5.2% in 1999. The third period is from 2000 to the present, during which the SARB has been in pursuit of an official and clearly defined inflation target (Burger & Marinkov, 2009).

Svensson (2009) defines inflation targeting as a monetary policy strategy aimed at maintaining price stability by focusing on deviations in published inflation forecasts from an announced inflation target. The targeted inflation bands are publicly announced and any non-conformity is

noted. In South Africa, monetary policy is aimed at reducing inflation and improving the country's international competitiveness (Chifurira et al., 2014).

The SARB is making an effort to maintain the inflation target of 3 to 6%, which was announced by the Minister of Finance in October 2002 (Aron & Muellbauer, 2007). The inflation target is fixed by government after consultation with the SARB. Butler (2010) states that this maintained inflation range has, in some years, fallen outside the range, especially during the period of global economic crisis. According to Kumo (2015), immediately before and after the recession, inflation breached the monetary policy target range, reaching 7.1% in 2007 and 2009, driven primarily by higher food and fuel prices. It declined in 2010 to 4.3%, reaching its lowest level in five years following South Africa's gradual recovery from the impacts of the global economic crisis. In June 2014, the inflation rate was estimated at 6.60%. It averaged 9.44% from 1968 until 2014, reaching a record low of 0.20% in January 2004 (Tabora, 2014).

Potgieter (2010) suggests that although the implementation of inflation targeting in South Africa has not had any observable negative effect on macro-economic stability and growth, it has produced a relatively reduced positive effect. Considering variables such as real GDP growth and inflation, it was found that the 10-year period before inflation targeting witnessed lower growth and higher inflation than the period after inflation targeting. On average, growth during the 2000s increased to 4.10% from 1.61% during the 1990s, and CPI inflation was found to have decreased from an average of 9.51% to 6.44% during the same period (SARB, 2009). The author also mentions that both inflation and growth volatility have declined since the inception of inflation targeting.

Ricci (2005) proposes that the success of inflation targeting in the South Africa economy should be considered in the context of South Africa's emerging market status. It was argued that the small size and lack of diversity in the South African economy leave it more susceptible to external shocks and low investor confidence. These external shocks, such as dramatic increases in global food and oil prices, have direct effects on the balance of current and capital accounts, and can lead to volatile capital flows, thereby amplifying the negative effects on the South African economy. As a result, the implementation of a successful inflation-targeting regime is significantly more difficult in South Africa than in most developed nations. Contrary to the above view, COSATU criticised inflation targeting in South Africa. In their argument,

COSATU stated that the SARB should follow an expansionary monetary policy, allowing inflation to increase in order for unemployment to decrease (Potgieter,2010).

In the same vein, Akinboade, Siebrits and Niedermeier (2002) state that the structural nature of South African inflation is likely to make any inflation-targeting regime slow and costly in terms of output and employment. Potgieter (2010) finds fault with COSATU's argument, and suggests that while there seems to be a link between short-term inflation and output in South Africa, the relationship between inflation and unemployment is non-existent. According to Potgieter (2010), South Africa's unemployment rate is unresponsive to both inflation and growth due to the structural inflexibility of its labour market. Furthermore, he argues that while the effect that inflation targeting has on growth and employment should not be ignored, this effect is trivial when compared to other more prominent barriers to employment creation in South Africa. He suggests, therefore, that COSATU's unwillingness to tackle the policies that they support, such as rigid labour market conditions, which brings limitations to employment creation, reveals that inflation targeting has been singled out, not as the true cause of low growth in South Africa, but rather as a political red herring with which to appease the demands of their members.

Kumo (2015) argues that although inflation-targeting monetary policy in South Africa succeeded in meeting the expectations of financial analysts, it did not seem to have succeeded in meeting inflation expectations around the target range by businesses and trade unions. He furthermore suggests that although the inflation-targeting monetary policy regime has broadly accomplished its main objective of ensuring low and stable inflation in recent years, South Africa needs to raise inflation targets in order to give the SARB more room to lower interest rates in severe economic downturns, such as the one experienced in the country from the first quarter of 2002 to the third quarter of 2013.

Several studies have concentrated on the success of monetary policy in South Africa in terms of curbing inflation during the inflation-targeting era (Aron & Muellbauer, 2007; Gumata, Kabundi & Ndou, 2013; Gupta, Kabundi & Modise, 2010; Kabundi & Ngwenya, 2011). These studies concluded that the SARB has been successful in decreasing inflation during the inflation-targeting regime, in comparison to pre-inflation targeting periods. Kabundi, Schaling and Some (2014) state that the SARB has achieved single-digit inflation for more than a decade, even though there were two instances (2002 and 2008) where inflation rose to more than 10% due to the depreciation of the rand and an increase in food prices.

Figure 2.4 below showcases inflation trends in South Africa from 1980 to 2013.

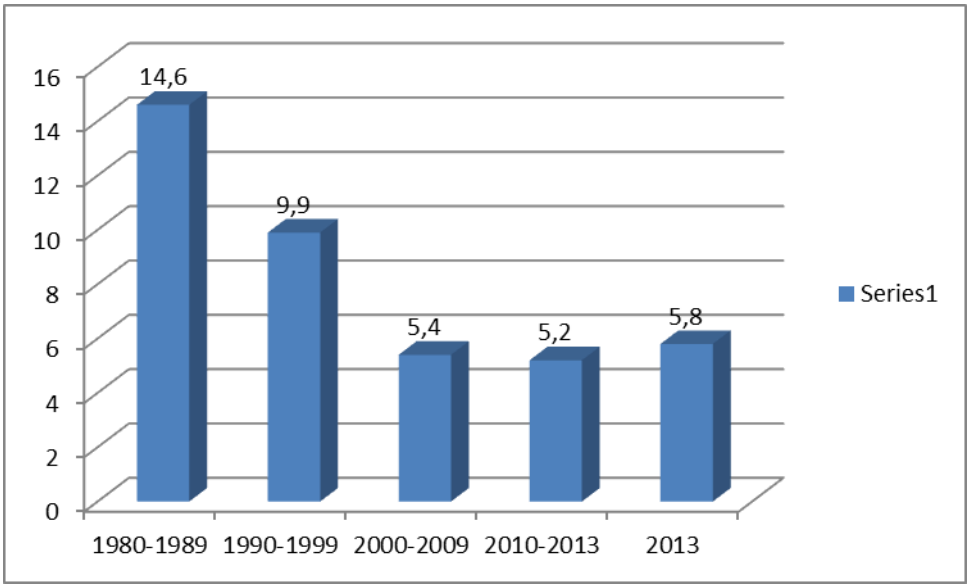

Figure 2.4: Inflation trends in South Africa from 1980 to 2013

Source: Stats SA (2014)

As mentioned earlier, inflation in South Africa is measured by the CPI, which is a current social and economic indicator that is designed to measure changes over time in the general level of prices of consumer goods and services that households acquire, use or pay for. This is achieved by determining the cost of purchasing a fixed basket of consumer goods and services of consistent quality and with similar characteristics, with the products in the basket being selected to be representative of households' expenditure during a specified year or other period. Such an index is called a fixed-basket price index (Stats SA, 2013). Furthermore, this index also aims to measure the effect of price changes on the cost of achieving a constant standard of living (in other words, a level of utility or welfare), which is known as the cost-of-living index.

Oosthuizen (2013) states that CPI data is central to at least three sets of decisions that have a direct impact on South African consumers, and especially those with low-income earnings. First, the inflation rate, both historical and expected, is a key variable influencing wage increases in South Africa's extensive collective bargaining system, estimated to have covered 20.3% of the employed population in 2004 (Godfrey, Maree & Theron, 2006). Second, the CPI is used to determine periodic adjustments to minimum wages in sectoral determinations, which covered an estimated 29.2% of employment in 2004 (Godfrey et al., 2006). Third, the CPI is an important

tool for determining the extent of the adjustments made to the nominal values of South Africa's various social grants, disbursed to 15.7 million grant beneficiaries out of South Africa's estimated population of 50 million people (Stats SA, 2012).

Roger (2009) highlights the familiarity of the public with the headline CPI, the place of the CPI in the establishment of inflation expectations and wage determination, and the fact that it is calculated by the statistics agency and is typically the best quality of the available price measures. Kavli and Kantor (2011) state that the South African CPI has been rebased and reweighted during the period 2003 to 2011.

Akinboade et al. (2002) indicate that some of the most often cited factors influencing inflation are connected with the exchange rate regime, or are monetary in nature and highlight the importance of the money supply and policies aimed at controlling money supply growth. They also refer to structural factors such as market imperfections and cost pressures (including those of import prices) as focal points of other models, whereas other models emphasise demand pressures (including the cost of government services and expenditures, the amount of revenue collected, debt and debt servicing, etc.). In analysing inflation and market uncertainty in South Africa, Burger (2014) identified market uncertainty, imported prices and the exchange rate as playing an important role in determining inflation dynamics in South Africa.

In the same vein, when studying South African inflation dynamics, Akinboade et al. (2002) found that among the determinants of inflation in South Africa, inflation expectations seemed to be positively correlated with current inflation. A positive correlation was also found between labour costs and domestic inflation. Furthermore, an increase in the nominal effective exchange rate was found to lower domestic inflation. It was also suggested that at the 10% level of significance, uncontrolled money supply increases will trigger inflation in the country. The coefficients of foreign prices and real output were found to be insignificant in the short run. In the long run, the authors indicate that a shock to real output could contribute significantly towards increasing domestic prices. It was also found that approximately 90% of the changes in unit labour costs translate into domestic price increases. Akinboade et al. (2002) conclude that inflation in South Africa is mostly structural in nature and that the monetary authorities have limited control over its main determinants. They further state that any reduction of inflation is likely to be particularly slow and costly in terms of output and employment if pursued exclusively

by interest rate manipulation and continuously counteracted by depreciation of the exchange rate and wage increases in excess of productivity growth.

Dhliwayo (2013) depicts the relationship between the CPI and GDP in South Africa from 2005Q1 to 2013Q1. It was found that high levels of inflation are associated with lower levels of economic growth. For the period between 2005Q1 and 2007Q1, the author suggests that the economy performed well, with GDP growth being higher at lower consumer inflation levels. However, with the boom of global commodities, the increase of local wages and lower levels of unemployment, inflation was pushed up by demand growth. At the same time, GDP growth slowed and then became negative, following the global financial crisis and related worldwide recession. He emphasises that the economy only stopped contracting from the recession with the fall of the CPI. Despite the fact that economic growth improved from 2011Q1 onwards, the rate of the CPI was relatively higher, coupled with higher levels of unemployment. Considering the fact that the rate of GDP growth should ideally exceed that of inflation, this has only been the case from around 2010Q3 to 2011Q1, marking the probable beginning of a stagflationary period for South Africa (Dhliwayo, 2013).

Furthermore, Dhliwayo (2013) identifies South African inflation as supply-side inflation, whereby increases in product cost due to higher input costs lead to higher inflation. He developed his argument by considering the impact of a hike in the price of petrol and electricity on South African inflation. Taking into account the 84 c/litre increase in the petrol price of July 2013, it was suggested that future inflation forecasts will appear to be austere. The author argues that such an increase has a ripple effect on other sectors of the economy, especially the transport, manufacturing and food sectors. As a result, Dhliwayo (2013) concludes that in response to the second-round inflationary effects, the price of most goods and services will increase. In addition, the author also highlights the fears of economist related to the impact of the electricity hike on consumers' disposable income, which results in decreasing demand and reduced economic growth.

According to Rangasamy (2010), food inflation is an important contributor to headline inflation in South Africa. Indeed, it was found that food inflation in the country has been more persistent than that of other commodities, and could therefore be an important source of underlying inflationary pressures on the economy.

2.6.2 Overview of food price increases in South Africa

Headline inflation in South Africa reached a peak of 6.4% in August 2013, before declining to 5.4% in December 2013 (Stats SA, 2015). It was observed that grocery items increased to three times their prices. For example, if the cost of bread, meat, milk, cheese, vegetables, sugar and cooking oil increased by 49% between 2008 and 2013, this means that the price of bread alone increased by 69% during the five-year period (City Press, 2013). South Africa has experienced two food price crises since deregulation in the mid-1990s. The first one was in 2002/2003 and the second in 2007/2008 (Kirsten, 2013). The 2002/03 crisis was mainly triggered by a sharp depreciation of the South Africa exchange rate, but was intensified by the shortages of staple food in the South African Development Community region. In 2007/08, trends in global commodity prices were leading factors in South African food price inflation (Kirsten, 2012). In comparison with many other countries, food prices increased less during the 2007/08 crisis in South Africa. In this regard, South Africa experienced among the lowest price increases, namely between 25 and 39% of the rise in world food prices. After the global food price scare, food inflation came down from a high of 16.1% in January 2009, and stayed below 8% for most of 2010 and 2011. Nonetheless, by the end of 2011, food inflation increased to 11.6% through higher prices for meat, oilseeds, sugar and vegetables, before coming down gradually in 2012 and 2013, and subsequently reaching its lowest point of 3.5% in December 2013 (Esterhuizen, 2014).

2.6.3 Trends in food inflation and headline inflation in South Africa

Figure 2.5 below, which depicts the trends in food and headline inflation in South Africa since 1971, shows, first, the existence of a strong correlation between movements in headline and food inflation, and second, that food inflation exceeded headline inflation, with peaks in food inflation being much steeper for most of the period since 1970 (Rangasamy, 2010).

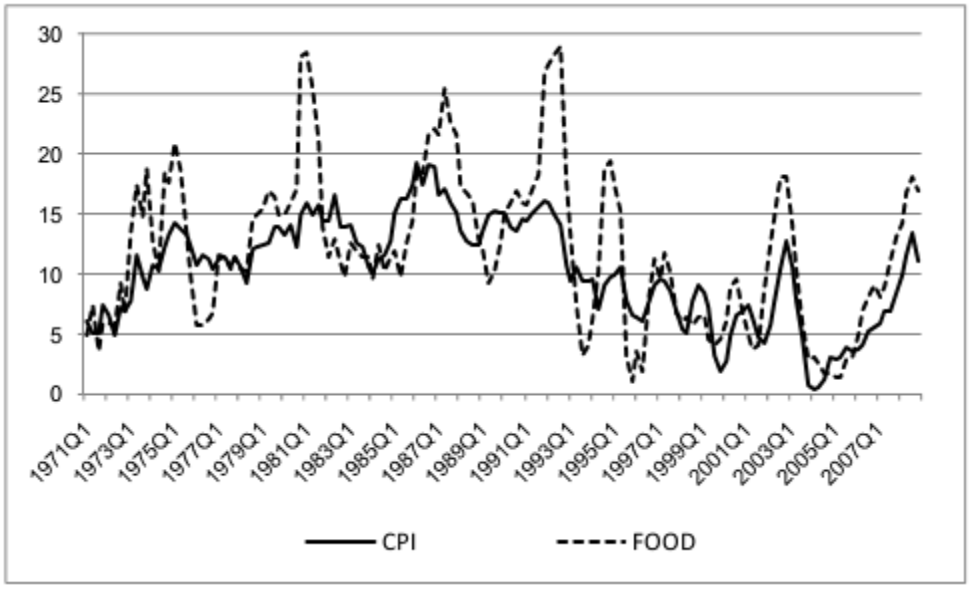

Figure 2.5: Inflation episodes and food inflation trends in South Africa

Source: Rangasamy (2010)

In view of the fact that food inflation is a component of headline inflation, its important contribution to headline inflation may suggest that food prices are an important source of inflationary pressures in South Africa. The weight and price increase of a product in the consumption basket influence the impact that this product has on headline inflation (Rangasamy, 2010).

The trend in the contribution of food inflation to headline inflation in South Africa suggests that during the 1980s, the contribution of food inflation to headline inflation was proportional to its weight in the CPI basket. This weight represents the consumer household expenditure during a specific period (NAMC, 2012). Over the last two decades, this contribution has shown a considerable increase (Rangasamy, 2010). Although it has been noted that the increasing inflation rate in South Africa is mostly the result of an increase in food price inflation, this was not always the case. There is evidence that between 1998 and 1999, when CPI food was growing at a relatively constant rate, the overall inflation rate was declining. Nevertheless, between the end of 1999 and the middle of 2000, and again from the middle of July 2001, there was a clear indication that the increase in CPI food had preceded an increase in the overall rate of inflation (NAMC, 2004).

Between 2002 and 2008, the contribution of food products to headline inflation increased its weight in the consumption basket by approximately 1.4% (Rangasamy, 2010). In 2012, the weight of the food category in the CPI was 14.27, while the weight of food and non-alcoholic beverages was 15.68. The average food and non-alcoholic beverages CPI for 2012 kept on increasing in comparison to previous years. It was recorded at an average of 127.4 index points, seven points higher than the 118.93 index points for 2011. The CPI rate for food and non-alcoholic beverages averaged 7.2% for 2012, showing that consumers paid 7.2% more for food and non-alcoholic beverages in 2012 than they paid in 2011 (NAMC, 2012). Comparing the food and non-alcoholic CPI to the headline CPI provides an indication of the impact of the food and non-alcoholic CPI on the headline CPI. During 2012, the CPI for food and non-alcoholic beverages was higher than the headline CPI rate. This was similar to 2011, when the CPI rate for food and non-alcoholic beverages exceeded the headline CPI rate. South Africa's official food price inflation rate (year on year) in December 2013 was 3.5%, whereas the headline inflation rate (CPI) was 5.4%. Table 2.1 below presents the annual average rate of headline and food inflation in South Africa from 2008 to 2013.

Table 2.1: The annual average rate of headline and food inflation in South Africa from 2008 to 2013

	2008	2009	2010	2011	2012	2013
Headline Inflation	10.04	7.1	4.3	5.0	5.6	5.8
Food inflation	13.85	9.4	0.8	7.3	7.4	5.9

Source: Stats SA (2014)

2.7 CHAPTER SUMMARY

The aim of this chapter was to discuss theoretical literature pertaining to purchase decision and inflation. First, it provided an explanation of the conceptual framework for purchase decisions, and then presented a detailed discussion of economic factors that influence personal vehicle purchasing. A particular emphasis was placed on the theory of inflation leading to food inflation, following by an explanation of the place of food inflation in headline inflation and then the impact of increase in food prices on consumer purchase decisions. Lastly, the South African realities regarding inflation and food inflation were reviewed.

In the next chapter, the research methodology used in the present study will be discussed

CHAPTER 3:
RESEARCH METHODOLOGY

3.1 INTRODUCTION

In the previous chapter, the theoretical literature pertaining to this study was presented. In that regard, theoretical aspects regarding purchase decision, passenger vehicle decision, inflation and food inflation were explored for a better understanding of this study.

In this chapter, the research methodology used for this study is discussed in order to highlight the difference in methodology between this present study and related literature. The chapter first presents the research design and then describes the data sources used for the study. The data-analysis techniques used to estimate the impact of food inflation on purchase of passenger vehicle in South Africa are also discussed in detail.

3.2 RESEARCH DESIGN

Van Wyk (2013) defines a research design as the overall plan for connecting the conceptual research problems to the pertinent (and achievable) empirical research. In other words, the research design articulates what data is required, what methods are going to be used to collect and analyse this data, and how all of this is going to answer the research question.

Social research needs a design or a structure before data collection or analysis can begin. The function of a research design is to ensure that the evidence obtained enables the researcher to answer the initial question as clearly as possible. Obtaining relevant evidence requires specifying the type of evidence needed to answer the research question, to test theory, to evaluate a programme or to accurately describe some phenomenon (NYU, 2015).

Yin (1989:29) posits that research design “deals with a logical problem and not a logistical problem”. In social research, the issues of sampling, method of data collection (for example questionnaires, observation and document analysis) and design of questions are all subsidiary to the issue of “What evidence do I need to collect?”

This study was an empirical study that employed a quantitative research design. The goal in this type of research is to determine the relationship between one variable (an independent variable)

and another (a dependent or outcome variable) within a population (Babbie, 2010). This study is described as quantitative due to the fact that it used hard data (Neuman, 2006) in the form of time series secondary data.

Furthermore, considering the fact that the objective of the study was to determine the relationship between food inflation and passenger vehicle purchases, the research is also classified as quantitative in light with Neuman's (2011) argument. In his argument, Neuman (2011:165) argued that "quantitative studies rely more on positivist principles and use a language of variables and hypothesis". The present study tested an hypothesis discussed in a later stage in this chapter.

3.3 DATA SOURCES

First, it was the purpose of this study to determine the relationship between food inflation and passenger vehicle unit purchases in South Africa. Second, the relationship between household income and passenger vehicle unit purchases was examined. Third, the study also sought to establish the presence of a causal relationship between food inflation and passenger vehicle sales. Lastly, the relationship between different variables in the purchase function was determined and analysed.

Pursuant to the objectives enunciated in the paragraph above, secondary data of a time series nature were used for this study. The principal sources of secondary data were as follows: first, data for the passenger vehicle quarterly sales units (VP) were obtained from NAAMSA, covering the period between January 2008 and August 2015. Second, the food inflation (FI) figures proxied by the food and non-alcoholic beverages index were obtained from Stats SA, for the same period. Third, disposable household income data were obtained from the SARB for the period under study. Fourth, passenger vehicle unit price (P) figures proxied by the Producer Price Index for manufacturer were obtained from the SARB. Fifth, interest rate (IR) figures proxied by the prime overdraft rates were obtained from the SARB. Lastly, fuel price (FP) figures proxied by the price of petrol per cubic meters were acquired from the South African Petroleum Association. All the sources of data stated herein are public data domains, duly audited. Therefore, there were no material issues in terms of data integrity or ethical infringements.

Other secondary data sources such as articles, scientific journals, books, press reports, websites, dissertations and theses were consulted, in order to conceptualise the key terms and explore a range of literature related to this study.

3.4 DATA-ANALYSIS TECHNIQUES

The data analysis for this study followed the same analytical approach as that used by Chisasa and Dlamini (2013) to enable a comparison to be made with the results of this study where necessary. However, this study added several tests to the list for a thorough understanding of the dynamics between the variables.

3.4.1 Descriptive statistics

Descriptive statistics were used to describe the basic features of the data in a study. They provide simple summaries about the sample and the measures. Used together with simple graphics analysis, they form the basis of virtually every quantitative analysis of data. Descriptive statistics virtually describe what the data presents. They are used to present quantitative descriptions in a manageable form. Each descriptive statistic reduces great quantities of data into a simpler summary (William, 2006). In order to facilitate data analysis, the data were reduced to selected descriptive summaries such as the mean, median, maximum, minimum and standard deviation.

3.4.2 Trend estimation

Trend estimation can be defined as a statistical technique to aid the interpretation of data. When a series of measurements of a process is treated as a time series, trend estimation can be used to make and justify statements about tendencies in the data, by relating the measurements to the times at which they occurred. The use of trend estimation facilitates the construction of a model that is independent of anything known about the nature of the process of an incompletely understood system (for example a physical, economic or other system). This model can then be used to describe the behaviour of the observed data (Cluebot, 2014).

First, the trend for each variable under investigation was analysed for the period under review. Second, the trend in passenger vehicle sales and household income for the period under review was compared and analysed to determine whether or not it was in tandem. Third, the trend in

food inflation was also studied and analysed in comparison with the sales of passenger vehicles for the period under study.

3.4.3 Correlation analysis

This statistical test determines the degree to which two variables are associated. The correlation coefficient is the measure of the degree to which two variables are related, and can range from 0 to +1 if positively correlated, and from 0 to -1 if negatively correlated. The lower-case r indicates the correlation coefficient (Caroll, 2014). Correlations can be descriptive and inferential at the same time. They can describe the data and can also infer relationships from samples to populations. The correlation test facilitated the determination of existing relationships between food inflation in South Africa and sales of passenger vehicles over the period under review. In the event that an existing relationship between the two variables was determined, the correlation test also assisted in determining the characteristics of that relationship. The correlation test enabled the determination of first, existing relationships between vehicle purchases and its predictors, and second, the relationship between predictors of vehicle purchases for the period under review.

3.4.4 Unit root test

The data were subjected to unit root tests using the Augmented Dickey-Fuller (ADF) Schwarz Info Criterion and the Phillips-Perron (PP) test. According to Chisasa (2015), models that contain potentially non-stationary variables can result in a spurious regression, yielding statistically significant relationships where there are none. Furthermore, the statistical significance obtained from standard regression techniques with non-stationary variables may be due to their trending over time, rather than a meaningful causal relationship between them.

The first motives behind the unit root test is that knowing the order of integration is crucial for setting up an econometric model and making inferences. The second motive is to investigate the properties prior to the construction of an econometric model. In this case, a unit root test is mainly a descriptive tool performed to classify series as stationary and non-stationary. Considering the fact that integrated variables lead to non-standard distributions and perhaps spurious regression results, the following is recommended: In case a data series appears to be non-stationary, assume as the maintained hypothesis that it is non-stationary and integrated. This hypothesis can be rejected if there is clear evidence for rejection.

The test will identify variables that might follow what is known as Brownian motion or a unit root process. If the series has a unit root, the underlying process is not stationary, and will consequently bias results. In the case where a unit root process is present, a first difference approach might be necessary in the estimation of the model.

To test stationarity an ADF as well as a PP unit root test is performed. The PP and ADF tests have a null hypothesis that the series does indeed have a unit root. For the ADF test, the general regression equation incorporates a constant and linear trend, while the t-statistic for whether a first-order autoregressive coefficient equals one (whether a process is I(1)) is computed.

3.4.5 Hypotheses

Following from the main objective of this study, the null and alternate hypotheses postulated are given below:

H_0: There is no supported relationship between food inflation and passenger vehicle purchases in South Africa.

H_1: There is a supported relationship between food inflation and passenger vehicle purchases in South Africa.

3.4.6 Simple regression: Ordinary least squares

The simple regression test was used to determine how changes in the predictor variables predict the level of change in the outcome variable (Caroll, 2014). This statistical test enabled the researcher to predict how changes in food inflation affect changes in the sales of passenger vehicles in South Africa. Therefore, the ordinary least squares (OLS) method was used to test the impact of food inflation on passenger vehicle purchases as well as identify the factors affecting passenger vehicle purchases in the long run.

3.4.7 Model estimation

Following on the main research objective, the functional form of the vehicle purchase decision is hereby presented.

Vehicle purchases (VP) = f{(Interest rates (IR); Food inflation (FI); Disposable income (I); Fuel price (FP); Vehicle price (P)}.

From the above vehicle purchase decision function, the econometric model was estimated to test the impact of food inflation on the decision to purchase vehicles using OLS. The specified model is shown below:

$$VP = \beta_0 + \beta_1 IR + \beta_2 FI + \beta_3 I + \beta_4 FP + \beta_5 P + \varepsilon_t \quad \text{.....[1]}$$

Where: $\beta_0 - \beta_5$ are coefficients of the variables in the specified model, and

ε_t is the error term.

The dependent and explanatory variables used in the above model are consequently defined.

3.4.7.1 Vehicle purchases

This variable includes passenger vehicle quarterly sales units (VP) obtained from NAAMSA, covering the period from January 2008 to August 2015.

3.4.7.2 Interest rates

Interest rate can be defined as the amount charged, expressed as a percentage of the principal, by a lender a borrower for the use of assets. The assets borrowed could include cash, consumer goods or large assets, such as a vehicle or building. Interest is essentially a rental or leasing charge to the borrower for use of the asset (Investopedia, 2015b). With regard to the present study, interest rate (IR) figures were proxied by the prime overdraft rates, which were obtained from the SARB. In South Africa, the prime lending rate is the average rate of interest charged on loans by major commercial banks to private individuals and companies (Trading Economics, 2015).

3.4.7.3 Food inflation

Food inflation is defined as a consistent rise in the price level of all agricultural food items. This rise in the price level is neither seasonal nor sudden; it keeps on increasing over a period of time (StudyMode, 2010). For this study, food inflation (FI) figures were proxied by the food and non-alcoholic beverages index, and were obtained from Stats SA, for the same period.

3.4.7.4 Disposable income

This variable is defined as the amount of money that households have available for spending and saving after income taxes have been accounted for. It is often monitored as one of the many key economic indicators used to gauge the overall state of the economy (Investopedia, 2015b). This data were obtained from the SARB for the period under study.

3.4.7.5 Fuel price

Fuel price (FP) figures were proxied by the price of petrol per cubic meters, and were acquired from the South African Petroleum Association.

3.4.7.6 Vehicle price

The passenger vehicle unit price (P) figures were proxied by the Producer Price Index for manufacturer, and were obtained from the SARB.

Although the influence of food inflation on vehicle purchases was the focal point of this study, several other relationships were tested in order to provide a comprehensive understanding of the factors that determine consumer decisions to purchase passenger vehicles. Notably, the study also tested the impact of price of vehicles on passenger vehicle unit purchases.

3.4.8 Ordinary least squares residual tests

Consistent with Gujarati and Porter's (2009:64–66) tests for normality, serial correlation and heteroscedasticity were carried out. Specific details of the tests are discussed below.

3.4.8.1 Normality test

One of the first diagnostic tests performed on the OLS model is a test for normality on the residuals. The robustness of the parameter estimates is dependent on the underlying assumption of normally distributed errors. Figure 4.4 in Chapter 4 displays the QQ plot for the residuals of the OLS test.

3.4.8.2 Serial correlation test

The DW d statistic was used to determine whether there is any first-order serial correlation in the error term of an OLS regression model. The null hypothesis of this test is $H_0: \rho = 0$, therefore it is important to see whether the test does not reject the null hypothesis of serial correlation.

3.4.8.3 Test for heteroscedasticity

In a final test to ensure robustness of parameter estimates, a test for heteroscedasticity is performed. If the error terms are found to not be homoscedastic, it can invalidate statistical tests of significance.

In order to test for heteroscedasticity, the Breusch–Pagan test is employed. The model uses an auxiliary regression, which encompasses using the predicted $\hat{Y}$ in order to fit the squared residuals:

$$\hat{\epsilon_i}^2 = \delta_0 + \delta_1 \hat{Y}_i$$

The goodness-of-fit statistic, R^2, is then used to derive a chi-squared statistic to test against the null of homoscedasticity.

3.4.9 Johansen cointegration test

The Johansen and Juselius (1990) provides a systems-based approach. The main advantage of the Johansen maximum likelihood (ML) method is that it enables one to determine the number of existing cointegrating (in other words, long-run) relationships among the variables in hand.

The Johansen ML vector autoregressive (VAR) method

According to (Uktu, n.d.), considering the existence of VAR modelling within the Johansen method (Johansen, 1988, 1991; Johansen & Juselius, 1990), the entire concept of cointegration becomes more complicated, not only regarding the concept but also the computation. In that

regard, the following is a simplified version. It was assumed that the vector of variables Z has the following representation:

$$Z_t = \sum_{i=1}^{m} A_i Z_{t-i} + E_t \tag{6}$$

where Z_t contains all n variables of the model and E_t is a vector of random errors. This model can also be represented in the form of

$$\Delta Z_t = \sum_{i=1}^{m-1} \Gamma_i Z_{t-i} + \Pi Z_{t-m} + E_t \tag{7}$$

where

$\Gamma_i = -I + A_1 + \ldots + A_i$ (I is a unit matrix)

$\Pi = -(I - A_1 - \ldots - A_m)$.

Matrix Π , being the main focus, can be represented in the following form:

$\Pi = \alpha.\beta$

where α and β are both n*x*r matrices.

Matrix β is called the *cointegrating matrix*, whereas matrix α is referred to as the *adjustment matrix* or the *feedback matrix*. The Johansen method provides not only the direct estimates of the cointegrating vectors, but also enables construction tests for the order (or rank) of cointegration, r. It is worth noting that, in a VAR model explaining N variables, there can be at most r = N-1 cointegrating vectors. It is generally agreed that the statistical properties of the Johansen procedure are generally better and the cointegration test is of higher power compared to the Engle–Granger test. However, it is important to mention that they are grounded within different econometric methodologies and therefore cannot be directly compared. In this regard, the Johansen method can be used for single-equation modelling as an auxiliary tool, testing the validity of the endo-exogenous variable division. This may also be used as a confirmation test of the single-equation model. Following Charemza and Deadman (1992), the researcher believes

that single-equation-based and systems-based methods should be seen as complementaries rather than substitutes. Assuming that the Johansen results suggest the existence of a unique cointegrating vector, if the estimated cointegrating coefficients have economically sensible signs and are roughly similar in size to those estimated by the Engle–Granger method, for example, this could be taken as some confirmation of the single-equation model to which the Engle–Granger method was applied.

Despite its theoretical advantages and superiority, the Johansen estimating procedure is subject to some shortcomings in practice. First, given the small sample size, the method cannot be accepted as an appropriate one, as the point estimates obtained for cointegrating vector, β, may not be particularly meaningful. Second, some additional problems occur if there is not a unique cointegrating vector. The problem of multiple long-run relationship is presumably best seen as an identification problem (Granger, 1986), and can be resolved in, essentially, two ways: either rejecting all but one such cointegrating vectors as economically meaningless, or, if the model is consistent with the underlying economic theory, it should consist of not one but two or more single equations. In this respect, Phillips and Loretan (1991) favour the use of the equation-by-equation approach of the single-equation error-correction model, as such a possibility is not available in complete systems methods such as the Johansen approach

3.4.10 Vector error correction model

The effect of food inflation on consumers purchase behaviour can be perceived over the short and long term. Considering the important place of food in headline inflation in South Africa, an appropriate analytical technique taking into account the dynamics of the short and long-run relationship between food inflation and vehicle purchases was required**.** VECM was found to be more appropriate in that regard.

The vector error correction model (VECM) was first used to present the long- and short-run structural relationship between passenger vehicle sales and food inflation, and then between passenger vehicle sales and other pre-cited independent variables.

In interpreting a VECM model, the coefficients of the model cannot be directly interpreted as in a linear model. The variables in the model form a system and therefore it is important to use the model to better understand the dynamics between the variables, rather than direct relationships.

The VECM model can be specified as:

$$\Delta X_t = \mu + \Phi D_t + \Pi X_{t-p} + \Gamma_{p-1} \Delta X_{t-p+1} + \cdots + \Gamma_1 \Delta X_{t-1} + \varepsilon_t, \quad t = 1, \ldots, T$$

where

$$\Gamma_i = \Pi_1 + \cdots + \Pi_i - I, \quad i = 1, \ldots, p-1$$

dictates the long- and short-run dynamics. Therefore, $\Pi = \alpha\beta'$, where Π dictates the number of cointegrating relationships, α is the speed of adjustment parameters and β is the cointegrating vectors.

In this study, the dynamic relationship between food inflation and vehicle purchases was the main focus. This relationship can therefore be seen as (excluding the external regressors):

$$\begin{bmatrix} \Delta x_t \\ \Delta y_t \end{bmatrix} = \begin{bmatrix} \alpha_1 \\ \alpha_2 \end{bmatrix} [1 - \beta] . \begin{bmatrix} x_{t-1} \\ y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{1,t} \\ \varepsilon_{2,t} \end{bmatrix}$$

3.4.10.1 Discussion of lag length used

The maximum likelihood technique is often used in the literature when choosing an optimal lag length. This technique attempts to estimate the parameters of a model, denoted generically by β, by maximising the likelihood function. The likelihood function, denoted L(β), is nothing else than the product of the probability density functions evaluated at the observed data values. Considering the observed data, the maximum likelihood estimation attempts to find values for the parameters, β, that maximise L(β) (JMP Statistical Discovery, 2015).

Rather than maximise the likelihood function L(β), it is more suitable to work with the negative of the natural logarithm of the likelihood function, -Log L(β). The problem of maximising L(β) is reformulated as a minimisation problem, where one seeks to minimise -LogLikelihood = -Log L(β). Therefore, smaller values of -LogLikelihood (or -2LogLikelihood) indicate better model fits (JMP Statistical Discovery, 2015).

With minimising the log likelihood to estimate the parameters. It is important to mention that the value of -LogLikelihood can be used to choose between models and to conduct custom hypothesis tests that compare models' fit.

Selection of the correct length was done by this method. Preference was directed to the model that minimises the log likelihood. Although one can argue for the other criteria such as the Akaike information criterion (AIC) or the Schwarz information criterion (SIC) , it is important to note that they may sometimes have contradicting results (JMP Statistical Discovery, 2015).

Lags measure metric:

2 Loglik -291.411

AIC 23.2156

SIC 24.27147

3 Loglik -263.196

AIC 22.24581

SIC 23.50391

4 Loglik -245.006

AIC 22.00044

SIC 23.46309

3.4.11 Granger causality estimation model

A study by Rangasamy (2010) found that there is a strong correlation between movements in headline and food inflation in South Africa. Chifurira et al. (2014) found that there is a unidirectional causal relationship running from inflation to new vehicle sales in South Africa. By the law of transitivity, the existence of a causal relationship between food inflation and vehicle purchase units was assumed. The granger causality test was therefore estimated to be the appropriate test in that regard.

A pairwise Granger causality test was conducted to examine the transmission mechanism between food inflation and vehicle purchases and other predictor variables of vehicle purchases. Therefore, in the food inflation–vehicle purchase context, the Engle and Granger (1987) two-step procedure was applied, as specified in equations 2 and 3 below:

$$VP_t = a + \sum_{j=1}^{N} n_j FI_{t-j} + \sum_{j=1}^{N} y_j VP_{t-j} + \mu_t \quad \text{.....[2]}$$

$$FI_t = c + \sum_{j=1}^{N} \alpha_j VP_{t-j} + \sum_{j=1}^{N} \beta_j FI_{t-j} + \mu_t \quad \text{.....[3]}$$

Where: VP = Vehicle purchases

FI = Food inflation

t = time period (01/2008 – 08/2015).

The error terms μ are assumed to be uncorrelated.

The null hypotheses to be tested were:

$H_1 : n_j = 0$, j = 1, 2, 3.....N meaning that food inflation does not Granger-cause vehicle purchases (VP).

$H_2 : \alpha_j = 0$, j = 1, 2, 3.....N meaning that VP does not Granger-cause food inflation.

If the first hypothesis is rejected, it means that food inflation Granger-causes VP. Rejection of the second hypothesis would show that the causality runs from VP to food inflation. If none of the hypothesis is rejected, it would mean that food inflation does not Granger-cause VP and VP also does not Granger-cause food inflation, indicating that the two variables are independent of each other. If all the hypotheses are rejected, it means there is bi-directional causality between food inflation and VP. Pairwise Granger causality tests among factors influencing VP were also performed.

3.5 CHAPTER SUMMARY

This chapter presented the research design and statistical analysis techniques used for the secondary data. The data sources and the statistical techniques testing the hypothesis of the

study were described. Different statistical and econometric approaches and methods testing short- and long-run relationships as well as the causal relationship between food inflation and passenger vehicle purchases were adapted.

The next chapter will focus on testing the hypothesis and discuss empirical results of the present study.

CHAPTER 4: HYPOTHESIS TESTING AND EMPIRICAL RESULTS

4.1 INTRODUCTION

In the previous chapter the methodological approach used to estimate the impact of food inflation on passenger vehicle purchases was presented. The methodological approach used was sufficient to demonstrate the fence between this present study and related studies in the literature.

This chapter offers the testing of the hypothesis and discussion of the results of this study. The descriptive statistics, correlation analysis, trend analysis, unit root tests, simple regression test, cointegration test and Granger causality test are presented and discussed.

4.2 DESCRIPTIVE STATISTICS

The primary phase of data analysis includes the organising of data. In this regard, the data are reduced to one or two descriptive summaries, such as the mean, standard deviation or correlation, or by data visualisation through means of various graphical procedures in the likes of histograms, frequency distributions and scatter plots.

Chisasa (2015) posits that when analysing time series data, the interest is in what happens to the variables being observed over time, with the purpose of predicting the future behaviour of this variable. As such, to simplify analysis and interpretation, the author recommends that the data be organised in a table or graph. Ideally, after observing the trend of the variables, one establishes the strength of association by the use of the correlation. Table 4.1 gives a data description of the dataset in the form of descriptive statistics.

Table 4.1: Data description

	VP	FI	FP	I	IR	P
Mean	28893.04	7.73	580.76	456127.17	10.22	6.71
Median	28746.50	6.70	608.70	447219.00	9.21	6.65
Maximum	40265.00	18.10	826.30	622869.00	15.50	18.00
Minimum	16866.67	0.80	321.65	309151.00	8.50	-3.80
Standard Deviation	6711.87	4.71	149.47	88136.62	2.26	4.38

Source: Eviews 9

The descriptive statistics above show that vehicle sales increased from a minimum of 16 867 to a maximum of 40 265 between 2008 and the second quarter of 2015, with a mean of 28 893. Food inflation averaged 7.7% and was characterised by an increase from a minimum of 0.7% to a maximum of 18.1% for the period under review. The minimum and maximum for fuel price were respectively R322 and R826 per cubic litre, showing an increase for the period under investigation. Disposable household income grew from a low of R309 151 to a high of R622 869, with a mean of R456 127. In the same manner, the prime overdraft rate also recorded an increase from a minimum of 8.5% to a maximum of 15.5%, with a mean of 10%. New vehicle price proxied by Producer Price Index for manufacturer also recorded a considerable growth from a low of -3.8 to a high of 18, with a mean of 6.7 for the period under review. It is also important to mention that all variables showed variability (standard deviation) below the mean.

4.3 CORRELATION ANALYSIS

Table 4.2 below presents the results of the correlation analysis. Using the Pearson correlation test, the results show that vehicle purchases are insignificantly and negatively correlated with food inflation. Household disposable income is found to have a positive and significant relationship with vehicle purchases ($p<0.05$). Between Fuel price and vehicle purchases as well, the relationship was found to be positive and significant ($p<0.05$). Furthermore, new vehicle price portrays a positive relationship with vehicle purchases, albeit insignificant ($p>0.05$).

Interest rate was found to have a negative and significant relationship with vehicle purchases, indicating that as interest rates increase, the demand for and hence the purchase of passenger vehicles in South Africa decrease.

A relationship between (1) food inflation and interest rate, (2) food inflation and new passenger vehicle price, (3) interest rate and new passenger vehicle price, and (4) fuel price and household disposable income was found to be positive and significant, implying that, maintaining other factors constant, an increase in one variable accompanies an increase in the other. The relationship between food inflation and fuel price was observed to be positive and insignificant. Similar results were obtained for fuel price and new vehicle price. Further results of the correlation analysis revealed the presence of a negative relationship between both food inflation and new vehicle price with household disposable income. However, the relationship

was found to be insignificant. Finally, interest rates were observed to be negatively related to household disposable income and fuel price, and the relationship was significant.

Table 4.2: Correlation analysis

		Vehicle purchase units	Food inflation	Fuel price	Household disposable Income	Interest rate	New vehicle price
Vehicle purchase units	Pearson Correlation	1	-0.169	0.822**	0.725**	-0.520**	0.130
	Sig. (2-tailed)		0.371	0.000	0.000	0.003	0.495
	N	30	30	30	30	30	30
Food inflation	Pearson Correlation	-0.169	1	0.029	-0.354	0.792**	0.572**
	Sig. (2-tailed)	0.371		0.881	0.055	0.000	0.001
	N	30	30	30	30	30	30
Fuel price	Pearson Correlation	0.822**	0.029	1	0.714**	-0.382*	0.304
	Sig. (2-tailed)	0.000	0.881		0.000	0.037	0.103
	N	30	30	30	30	30	30
Household disposable income	Pearson Correlation	0.725**	-0.354	0.714**	1	-0.677**	-0.164
	Sig. (2-tailed)	0.000	0.055	0.000		0.000	0.387
	N	30	30	30	30	30	30
Interest rate	Pearson Correlation	-0.520**	0.792**	-0.382*	-0.677**	1	0.490**
	Sig. (2-tailed)	0.003	0.000	0.037	0.000		0.006
	N	30	30	30	30	30	30
New vehicle Price	Pearson Correlation	0.130	0.572**	0.304	-0.164	0.490**	1
	Sig. (2-tailed)	0.495	0.001	0.103	0.387	0.006	
	N	30	30	30	30	30	30

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Stata 13.1

4.4 TREND ANALYSIS

In Figure 4.1 below, the variables food inflation, fuel price, household disposable income, interest rate, new vehicle price and vehicle purchase units are presented graphically and their different trends analysed (see figures 4.1a–f)

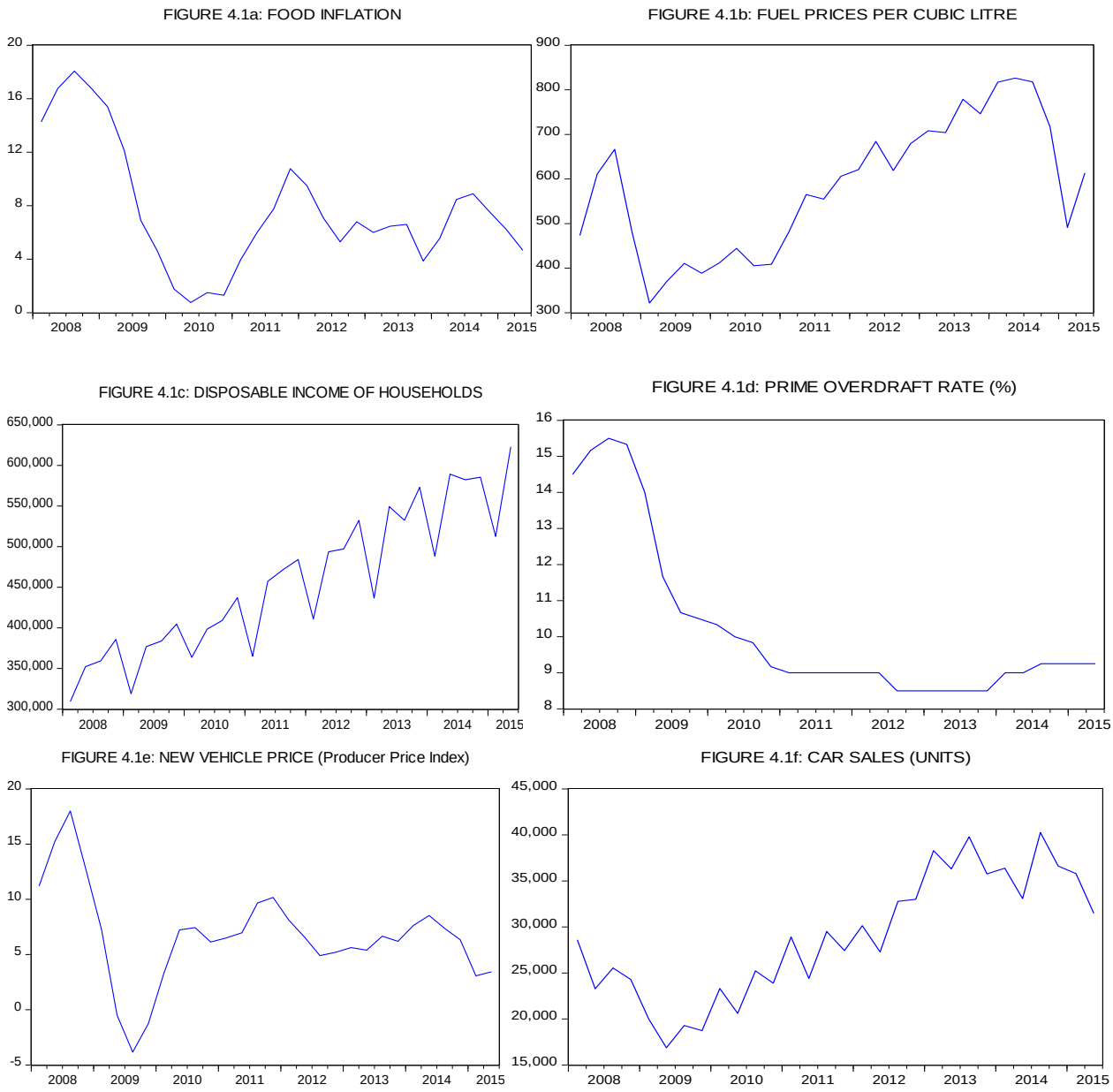

Figure 4.1: Trends of variables

Source: Eviews 9

Food inflation experienced a decline that translates to a drop from 18.1% in the third quarter of 2008 to 0.8% in June 2010. However, it trended upwards and closed the second quarter of 2015 at 4.7%. Figure 4.1a is illustrative. The downward trend in food inflation can be explained by the strong exchange rate while the upward trend can be linked to both the weaker exchange rate and the escalation of the drought in the country.

Figure 4.1b shows that the fuel price slid to a low of just over R300 per cubic litre in the six months to mid-2008. From then on, the price rose exponentially to a peak of just over R822 per cubic litre in 2014. However, by mid-2015 the price had plummeted to just under R500 per cubic litre. The increase in the fuel price could be linked to the increase in the global crude oil prices. The petrol retail price in South Africa is mostly affected by the international element, or basic fuel price (BFP). Furthermore, the weakness of the rand over the US dollar is also probably one of the elements explaining the upward trend in fuel price, considering that crude oil is traded in US currency. The downward trend in fuel price is largely attributed to the recent reduction in the global crude price.

Household disposable income trended upwards from 2008 to 2015, albeit with some volatility. Figure 4.1c is illustrative. The increase in income could be linked to the annual cost of living adjustments awarded to workers, given that South Africa has very strong labour unions. However, what is surprising is that this trend is not in accord with the trend in food inflation, which has generally averaged 7% as from 2011 (see Figure 4.1a).

Prime overdraft rate trended downwards for the period under review, from a high of 15.2 in the second quarter of 2008, hitting a low of 5.5% in November 2010 (Figure 4.1d). The rate was set at 9.25% in the second quarter of 2015. This trend is in line with the food inflation rate (Figure 4.1a). The increase and drop in the prime overdraft rate can be attributed to the fluctuation of inflation over the period under study. This can be further explained by the fact that the weak rand plays a role in higher food prices, which in return pushes up inflation.

The prices of vehicles nose-dived during the 2008/9 period (Figure 4.1e). This shock may be attributed to the effects of the global financial recession, although, by and large, South Africa survived the effects of the recession. Since then the market has stabilised into 2015.

Vehicle purchase units experienced a downwards trend from 2008 to 2009 before starting an upwards journey (see Figure 4.1f). According to the *Mail & Guardian* (2012), the drop in interest rates had stimulated the increase of new vehicle purchases by up to 10.5% year on year, resulting in 42 617 vehicles purchased in April 2012. The trend for vehicles purchased reached its peak in the third quarter of 2014, with 40 265 units being purchased. The year ended with 31 473 passenger vehicles sold in the second quarter of 2015. A strong rand and the increase in households' disposable income could be responsible for the upward trend in passenger

vehicle purchases. The downward trend in passenger vehicle purchases can be attributed to the political and economic turmoil within the country.

4.4.1 Trends of passenger vehicle sales and disposable income of households

Figure 4.2 shows a downwards trend for both variables from 2008 to 2009 before starting to rise. From the visual, it can be said that the two variables seem to fluctuate in tandem. It can be argued that on average and holding other factors constant, South African households will consider purchasing a passenger vehicle if their disposable incomes increase.

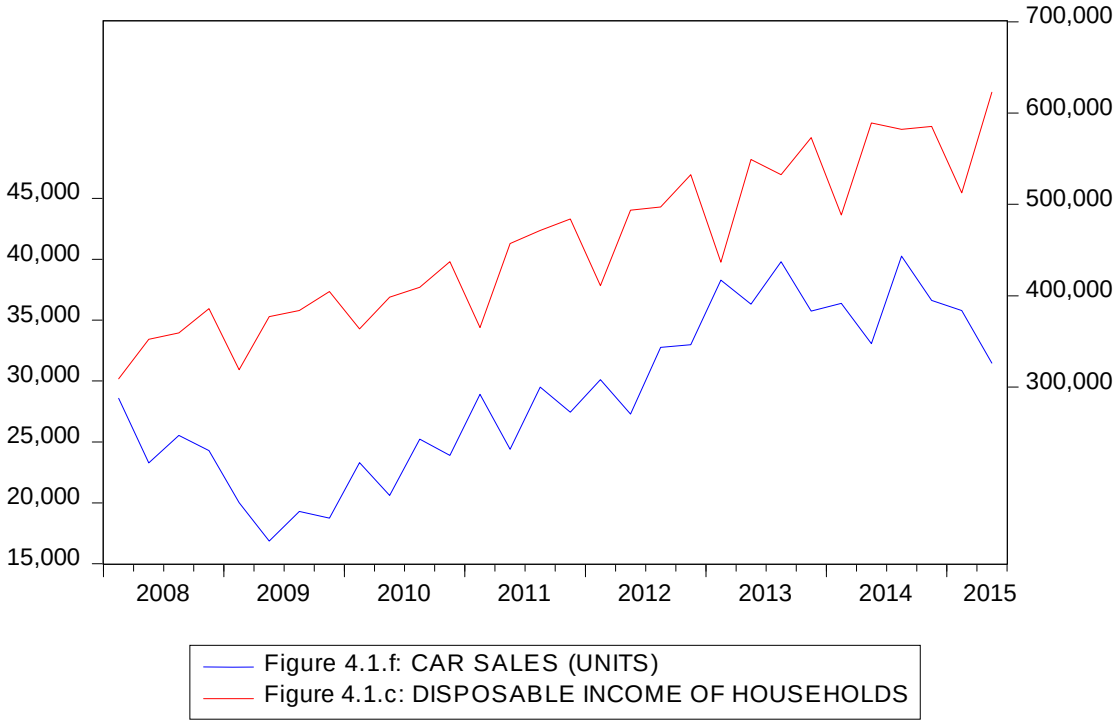

Figure 4.2: Trend of passenger vehicle sales and disposable income of households

Source: Eviews 9

4.4.2 Trends of passenger vehicle sales and food inflation

From the visual of Figure 4.3 below, an intriguing trend is evident. Roughly since 2008, the relationship between food inflation and car sales appeared to be inverse. While food inflation trended downwards, a priori, vehicle sales trended upwards, suggesting that households had more disposable incomes that could be channelled towards vehicle purchases. This trend

stabilised from around the middle of the year 2011. Since then, food inflation and car sales have moved in tandem, implying that food prices do not inhibit households from purchasing vehicles.

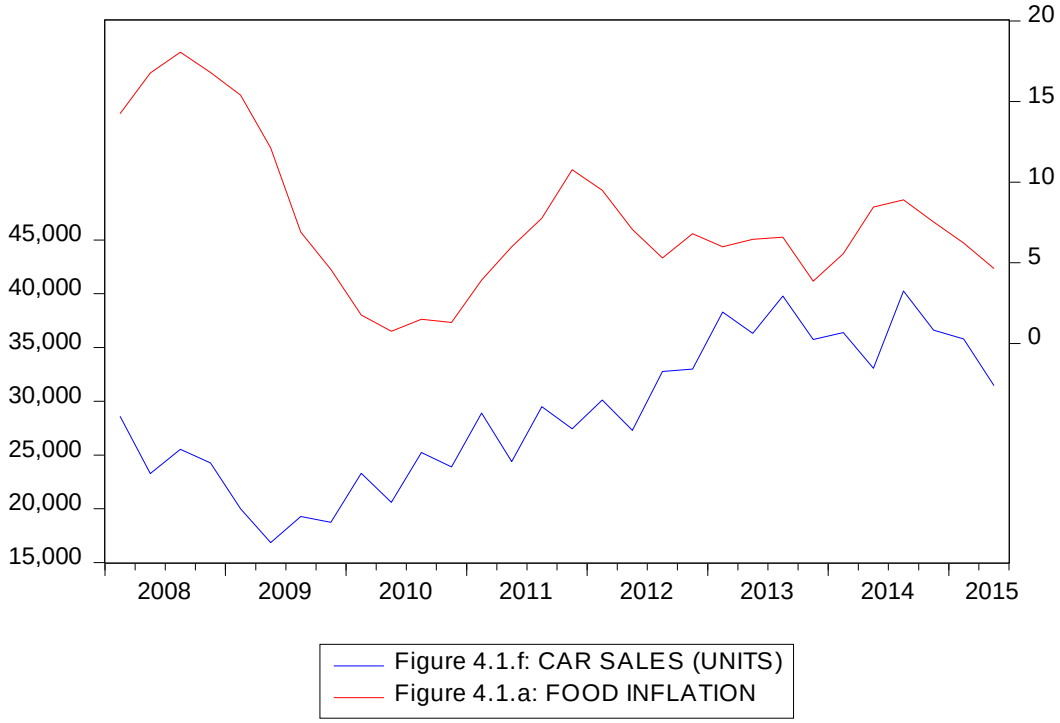

Figure 4.3: Trend of passenger vehicle sales and food inflation

Source: Eviews 9

4.5 UNIT ROOT TESTS

The results of the unit root tests are presented in Table 4.3 below. For most of the variable series, both the ADF and PP tests failed to reject the null hypothesis of the presence of a unit root. In levels, all variables except FI, VP and I were integrated of order one or I(1). After taking the first difference, all variables became stationary or integrated of order zero or I(0).

It can therefore be seen from the tests that the two tests do tend to disagree on the stationarity of each variable. As PP is non-parametric in nature, it was the preferred method for the unit root test. Household disposable income and new vehicle prices are the only variables confirmed by the test to be stationary. For the rest of the variables, the p-values at a 10% level of significance value suggest that the null of a unit root cannot be rejected. This insight had to be taken into account during the analysis and the non-stationary variables were included as first differenced variable. It is also important to note that for vehicle prices (P), the index had negative numbers,

and taking the log differenced to impose stationarity could not be performed. The variable was therefore left in its absolute form. The unit root tests paved the way for further analysis results, which are presented in the ensuing sections.

Table 4.3: Unit root test results

Variable	Augmented Dickey–Fuller				Phillips–Perron			
	Level with intercept (p-value)	Order of integration	1st difference with intercept	Order of integration	Level with intercept	Order of integration	1st difference with intercept	Order of integration
VP	-0.4042	I(1)	-3.2380**	I(0)	-3.4873*	I(0)	-	I(0)
FI	-4.1272**	I(0)	-	I(0)	-1.7599	I(1)	-4.6474***	I(0)
FP	-0.7692	I(1)	-4.1203**	I(0)	-2.1128	I(1)	-14.9974***	I(0)
I	-2.1593	I(1)	-5.0084***	I(0)	-9.1401***	I(0)	-	I(0)
IR	-1.5560	I(1)	-5.0084***	I(0)	-1.0389	I(1)	-3.6638***	I(0)
P	-2.2120	I(1)	-	-	-2.3049	I(1)	-	-

Note: ***, ** and * denote significance at 1, 5 and 10% levels, respectively (Source: R Statistics)

4.6 ORDINARY LEAST SQUARES REGRESSION

After correcting the data for stationarity by taking the first difference, a transformed equation was estimated using the OLS model. The re-estimated model follows the mathematical form:

$$\log(\mathrm{VP}) = \beta_0 + \beta_1 \Delta\log(\mathrm{FI}) + \beta_2 \Delta\log(\mathrm{FP}) + \beta_3 \log(\mathrm{I}) + \beta_4 \mathrm{IR} + \beta_5 P \text{ .....[1]}$$

Where $log(VP)$ is the change in vehicle purchases modelled as a change in the independent variables. For household income, the log was used for easier inference, $log(I)$. Variables FI and FP were differenced to transform the series to induce stationarity.

The results in Table 4.4 indicate that household disposable income and vehicle prices influence vehicle purchases positively at the 1% and 5% levels of significance respectively. A 1% increase in household income will result in a 1.1% increase in vehicle purchases. Similarly, a 1% increase in vehicle prices yields a 0.01% increase in vehicle purchases, all things being equal. The coefficients for food inflation, fuel prices and interest rates were observed to be positive and insignificant.

Table 4.4: Model 1 results

	Estimate	Std. error	t-value	Pr(>|t|)	
(Intercept)	-4.7620	1.6441	-2.8963	0.0081	*
$\Delta\log(\mathrm{FI})$	0.0318	0.0459	0.6921	0.4958	
$\Delta\log(\mathrm{FP})$	0.1375	0.1198	1.1475	0.2630	
$\log(\mathrm{I})$	1.1484	0.1244	9.2335	0.0000	***
IR	0.5337	0.5897	0.9050	0.3749	
P	0.0127	0.0059	2.1593	0.0415	**
F-statistic	35.48	P-value	0.000		
R-squared	0.8841	DW statistic	1.2891		
Adjusted R-squared	0.8603				

Note: *, ** and *** denote 1%, 5% and 10% significance levels, respectively.

Source: R statistics

The model does produce a relatively good fit of the data by explaining 86% of the variation in vehicle prices with the current included variables (adjusted R-squared = 0.8603). However, the low Durbin–Watson (DW) statistic of 1.2891 suggests the presence of serial autocorrelation in the data series, paving the way for the relevant normality and diagnostic tests.

4.6.1 Diagnostics: Ordinary least squares

4.6.1.1 Normality test

From a visual perspective, the residuals seem normal despite three outliers, but a more formal, Jarque–Bera test for normality had to be performed to statistically confirm this. A Jarque–Bera test takes into account the underlying behaviour of the third and fourth moments. If the kurtosis or skewness displays any excess behaviour, the data will be rejected as being normal. Figure 4.4 below displays the QQ plot for the residuals of the OLS test.

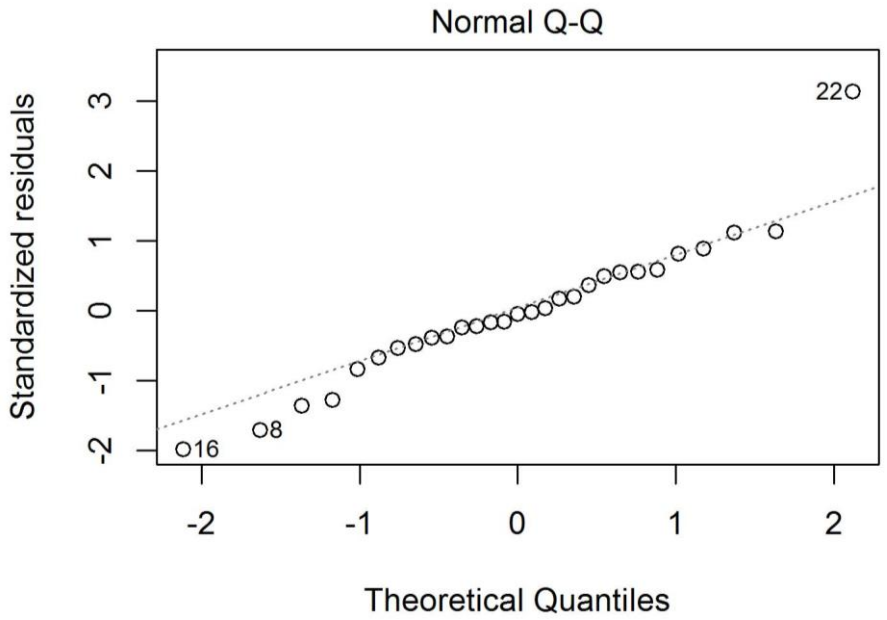

Figure 4.4: QQ plot

Source: R statistics

Figure 4.5 displays the histogram of Model 1's residuals. The results of the Jarque–Bera test on the residuals resulted in a p-value = 0.001413. The respective p-value indicates that the null hypothesis is rejected and the residuals can as such not be considered to follow a normal distribution.

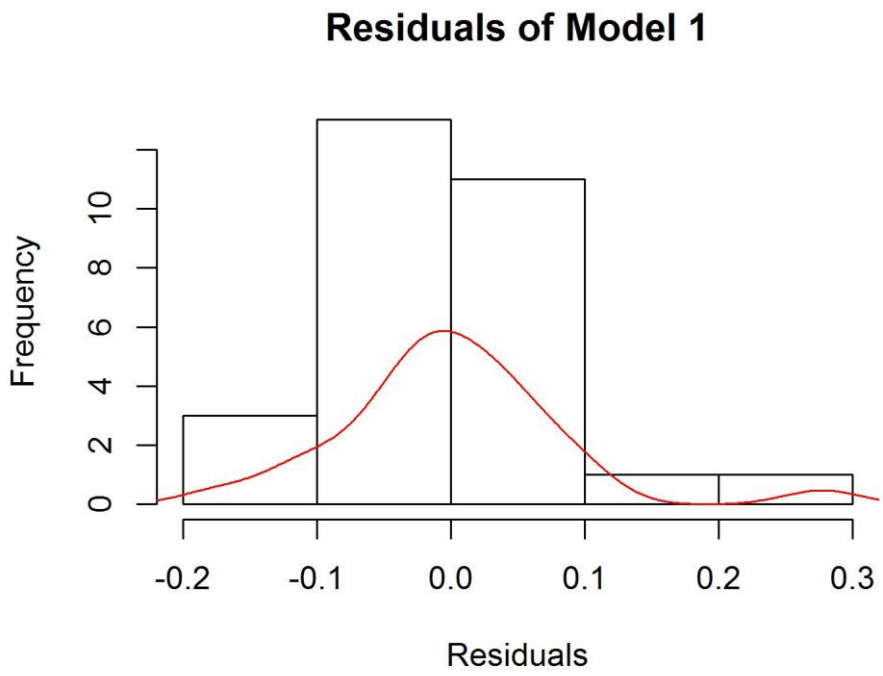

Figure 4.5: Histogram of Model 1's residuals

Source: R statistics

Although the Jarque–Bera test rejected normality, it is most likely due to three outliers in the data biasing the test outcome. This was confirmed when these three observations were removed and the test was run again. A p-value = 0.8824, when the three outliers are removed, does not reject normality (Figure 4.6). This could indicate a misspecification within the model. To address this, diagnostic tests were continued by looking at whether serial correlation might be biasing the results.

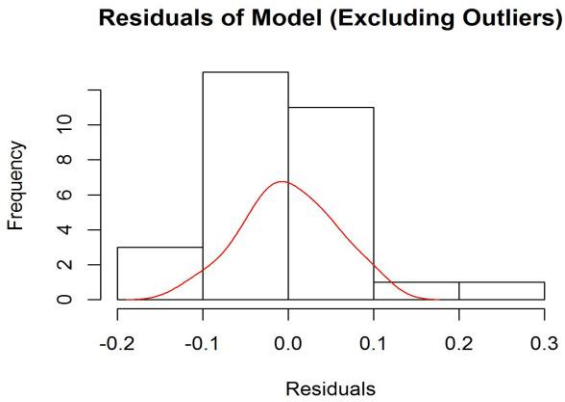

Figure 4.6: Histogram of model's residual (excluding outliers)

Source: R statistics

4.6.1.2 Serial correlation test

The DW test was performed and a statistic of 1.3414 and a respective p-value = 0.8824 indicated that the null hypothesis was rejected. The test revealed that there might be a serial correlation remaining in the residuals of the model and that autocorrelation was indeed not equal to 0. Unlike the DW statistic for AR(1) errors, the Lagrange Multiplier (LM) test may be used to test for higher-order autoregressive moving average errors.

The Breusch–Godfrey serial correlation LM test addresses the same misspecification diagnostic as the DW test by testing for autocorrelation in the errors. The difference in the so-called LM test is that it can test for higher order autocorrelation, where DW only tests for first-order serial correlation. In the LM test the null hypothesis slightly differs, where the null is stated as having no serial correlation up to order *p*, $H_0: \{\rho_i = 0 \text{ for all } i\}$.

The LM statistic = 3.1546 and p-value of 0.0.07571 with degrees of freedom = 1 indicate a misspecification and indeed serial correlation remains in the residuals. In order to accommodate the serial correlation in the residuals, an AR(1) term was added to a second specification of the model and re-estimated as Model 2.Table 4.5 below, presents the OLS results for Model 2 .

4.7 ORDINARY LEAST SQUARES REGRESSION: MODEL 2

The formulation of the model now changes to:

$$\log(\text{VP}) = \beta_0 + \beta_1 \Delta\log(\text{FI}) + \beta_2 \Delta\log(\text{FP}) + \beta_3 \log(\text{I}) + \beta_4 \text{IR} + \beta_5 P + \beta_6 \log(VP_{t-1}) \ldots.[2]$$

Table 4.5: Model 2 results

	Estimate	Std. error	t-value	Pr(>|t|)	
(Intercept)	-4.0609	1.4725	-2.7579	0.0115	***
$\Delta\log(\text{FI})$	0.0345	0.0405	0.8520	0.4034	
$\Delta\log(\text{FP})$	0.1051	0.1064	0.9880	0.3339	
$\log(\text{I})$	0.8742	0.1482	5.8974	0.0000	***
IR	0.4391	0.5213	0.8423	0.4087	
P	0.0080	0.0055	1.4615	0.1580	^
Log(VP_{t-1})	0.2825	0.1027	2.7500	0.0117	***
F-statistic	39.27	P-value	0.000		
R-squared	0.9137	DW statistic	1.8519		
Adjusted R-squared	0.8913				

Source: R statistics

Model 2's specification with the AR(1) term, in Table 4.5 above, has a better fit than Model 1's restricted specification, with a respective goodness-of-fit measure of 0.8913. The lagged vehicle purchases variable is highly significant along with household income at 1%. Although the coefficients of food inflation, fuel price, interest rates and vehicle price are positive, they are not significant (p>0.05). The DW statistic of 1.8519 suggests that there is no serial autocorrelation.

The Jarque–Bera test of normality was not rejected with a p-value = 0.8912 (see Figure 4.7) for residual density function. This indicates that the residuals can be assumed to be normally distributed.

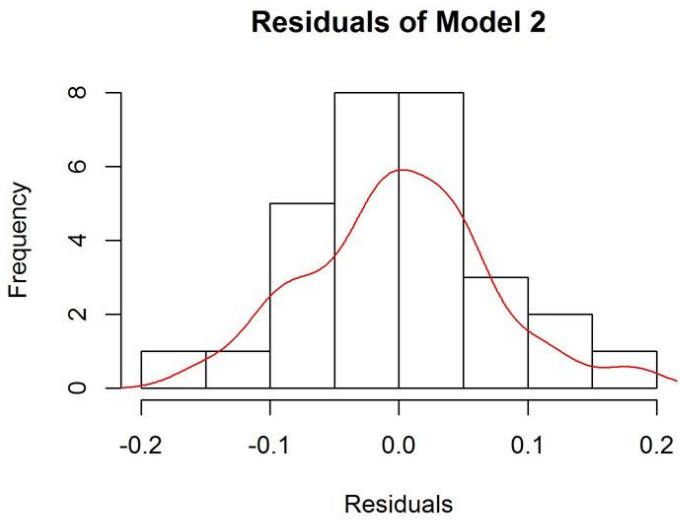

Figure 4.7: Histogram of Model 2's residuals

Source: R statistics

The model was re-tested for autocorrelation using the LM test. No serial correlation was observed (p-value = 0.6776). This confirms that the OLS model was correctly specified with unbiased parameters (also known as BLUE) with which inference can be made. After the second specification of the regression model, the results suggest that household disposable income and vehicle purchases for the previous period are good estimators of vehicle purchases. Food inflation cannot be said to have any significant effect on vehicle purchases.

A fit of the model can be seen in Figure 4.8, where the red line represents the fitted values.

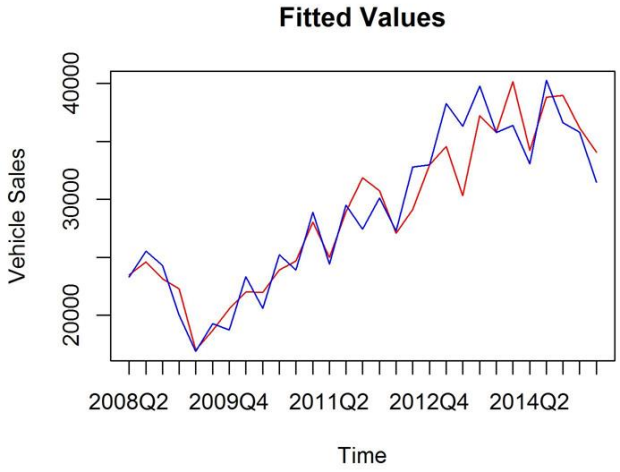

Figure 4.8: Model 2's fitted Values

Source: R statistics

4.7.1 Test for heteroscedasticity

The results obtained provided a highly statistical argument against heteroscedasticity with a p-value = 0.9065. The test indicated that the residuals of the linear model are indeed homoscedastic.

4.8 JOHANSEN COINTEGRATION TEST

The Johansen test is a procedure that tests whether several I(1) processes might be integrated. The Johansen test is preferred over the Engle–Granger test, as it allows for more than one cointegrating relationship. The Johansen test has two types of tests of cointegration. The first is the 'trace' test, which has the null hypothesis that the number of cointegrating vectors are not of full rank and therefore: $r^* = r < k$ with an alternative of $r = k$. The second is the max eigenvalue approach, which tests where the alternative is specified as $r = r^* + 1$.

The test results in Table 4.6 reveal that there is indeed at least one cointegrating vector and that a VECM approach will be appropriate.

Table 4.6: Johansen cointegration test results

Lags interval: 1 to 2

Data trend:	None	None	Linear	Linear	Quadratic
Test type	No intercept No trend	Intercept No trend	Intercept No trend	Intercept Trend	Intercept Trend
Trace	5	4	4	5	6
Max eig.	3	4	4	5	4

Source: Eviews 9

4.9 VECTOR ERROR CORRECTION MODEL

The Johansen and Juselius test performed above confirmed that in the long run, food inflation and vehicle purchases are cointegrated (see Appendix 3). The cointegrating equation represents how deviations from the long-run relationship affect the dependent variable in the next period. Food inflation is estimated to have a negative long-run relationship with vehicle purchases. However, a t-statistic of 1.57517 gives enough confidence to reject that the long-run relationship is of statistical significance. The long-run relationship is dominated by the effect of vehicle purchase in the previous period. The model, in estimating the dynamics of changes in vehicle purchase, has an adjusted R-squared of 0.398199, indicating that approximately 40% of the variance in the dependent variable can be explained by the regressors.

Given that the long-run relationship seems to be solely dependent on past values of the dependent series, a closer study into the short-run dynamics is required. The α parameter in the VECM formulation is representative of the short-run deviations of the long run. This error correction parameter has a t-statistic of -1.77942, which makes it significant at a 10% level, but not the 5% level, and should be further investigated.

As mentioned before, the evaluation of the parameter's significance occurs on the basis of joint tests on all of the lags of the variables in the equation. These joint tests (F-tests) in essence look at whether the inclusion of the lagged variables improve the model in relation to when the lags are all set to zero. These tests were first proposed by Granger and are often referred to as Granger causality tests.

4.10 GRANGER CAUSALITY TEST RESULT

To explore the possibility of a transmission mechanism between vehicle purchases and food inflation, a causality test was performed. The Engle–Granger two-step procedure was applied, as

mentioned in the methodology section (Chapter 3) of this study. In the context of the Granger causality test, if the null hypothesis is rejected, it can be said that a variable, X, Granger-causes Y. To put it in another light, it can be said that if the null hypothesis is rejected, X is a good predictor of Y. Table 4.7 below presents the Granger causality test results.

Table 4.7: Granger causality test results

VEC Granger causality/Block exogeneity Wald tests

Sample: 2008Q1 2015Q2

Dependent variable: D(VP)

Excluded	Chi-sq.	df	Prob.
D(FI)	1.448641	2	0.4847
All	1.448641	2	0.4847

Dependent variable: D(FI)

Excluded	Chi-sq.	df	Prob.
D(VP)	1.107052	2	0.5749
All	1.107052	2	0.5749

Source: Eviews 9

A chi-squared statistic of 1.448641 for lagged values of food inflation indicates that the parameters of these lagged values are almost zero and have no explanatory power in vehicle purchase decisions by consumers. As the variable does not reject the null hypothesis, it can be said that there is no short-run causal effect running from the independent variables to the dependent variables. This unsubstantiated unidirectional casual flow was also rejected when it was examined whether vehicle purchases have any explanatory power in predicting food inflation. In a better light, the Granger causality test result means that food inflation does not Granger-cause vehicle purchases and vehicle purchases also do not Granger-cause food inflation, indicating that the two variables are independent of each other. These tests corroborate the results found in the OLS regression, where food inflation was not a significant predictor of vehicle purchases.

4.11 CHAPTER SUMMARY

This chapter presented the results of the study using secondary data, covering the period from the first quarter of 2008 to the second quarter of 2015 following an econometric model approach. The chapter presented a data description of the dataset in the form of descriptive statistics and the correlations of the variables used in the analysis, showcased the trends of variables and presented the unit root tests and the OLS regression. The Johansen cointegration test and VECM as well as the Granger causality test results were also presented.

CHAPTER 5:
DISCUSSION OF RESULTS, CONCLUSION AND RECOMMENDATIONS

5.1 INTRODUCTION

Food inflation in South Africa has been viewed as an important source of underlying inflationary pressures in the economy due to its persistence beyond that of other commodities (Rangasamy, 2010). Although several studies found food to be one of the factors that influence purchase decisions (Cheng et al., 1997; Makatouni, 2002; Munchanda et al., 1999; Pieterse, 2009; Rimal et al., 2005), there still appears to be an absence of research that directly links food inflation to consumers' decisions, especially when financing the purchase of new passenger vehicles in South Africa. In that regard, the purpose of this study was to empirically explore the influence of food inflation on passenger vehicle purchases in South Africa. In order to achieve this, the relationship between passenger vehicle purchases and the increase in the prices of food products in South Africa was tested. In addition, the relationship between household disposable income and passenger vehicle purchases was tested and trends in price increases of food products, passenger vehicle sales and household disposable income were identified.

Motivated by the study by Chisasa and Dlamini (2013), which argues that economic factors do not play a significant role with regard to passenger vehicle purchase decisions in South Africa, this present study argued that there is no supported relationship between food inflation and passenger vehicle purchases in South Africa. To test the postulated hypothesis, secondary data were used.

In this final chapter, the correlation results between variables and the results of the various tests performed are discussed. The contribution of the study as well as its limitation is presented, followed by the conclusion of the study and recommendations and suggestions for further research.

5.2 DISCUSSION OF RESULTS

5.2.1 Relationship between passenger vehicle purchases and food inflation

As per its primary objective, the focus of this study was to determine the relationship between the purchase of passenger vehicles and the increase in the prices of food products in South Africa. Using the Pearson correlation test, it was found that there is a negative but insignificant relationship between vehicle purchases and food inflation in South Africa. This could be explained by the fact that vehicles are most likely purchased by high living standards measures (LSM) groups

within a socio-economic group. Food inflation will have no significant effect on their decisions to purchase durable goods such as passenger vehicles.

However, the negative relationship, although insignificant, between food inflation and passenger vehicle purchases indicates that an increase in food inflation will result in a reduction in the unit of passenger vehicle purchase. This inverse relationship can be attributed to the fact that as the currency purchasing power diminishes, consumers will spend money, first on the most immediate needs, such as food and then luxuries such as cars. Furthermore, driven by the aim of maintaining the inflation target range, the SARB often responds to a serious rise in inflation by raising the repo rate. At this stage, the repo rate will lead to a rise in the cost of vehicle finance and a reduction in the units of passenger vehicle purchased.

The finding of the present research is in line with that of Chisasa and Dlamini (2013), which suggests that economic factors do not play a significant role in passenger vehicle purchase decisions. Psychosocial factors are rather considered as having a significant influence on consumer passenger vehicle purchase decisions in South Africa.

5.2.2 Relationship between household income and passenger vehicle purchases

Among the secondary objectives of this study was to determine the relationship between household income and passenger vehicle purchases. The results of the Pearson correlation test found that there is a positive and significant relationship between vehicle purchase unit and disposable household income in South Africa. This finding is in contrast with that of Chisasa and Dlamini (2013), who found in their empirical study a positive but insignificant relationship between car sales and household disposable income in South Africa. This view is not far from that of Zide (2012), who found that income elasticity of demand for new passenger vehicles appears to be inelastic, proving that changes in real disposable income have no influence on the demand for cars. Therefore, the author concluded that consumers will always demand cars irrespective of whether their income increases or decreases.

Consistent with the results of the present study, Shende (2014) found disposable income to be the main driver for car purchases in all segments of the India industry, such as small and hatchback, sedan, SUVs and MUVs, and luxury cars. Similarly, Feng et al. (2011) state that recent studies revealed that there is a positive relationship between income levels and vehicle purchase decisions by individuals. Similar observations were made by Nagai et al. (2013), who indicated that two- and four-wheeled vehicle ownership in Thailand depends largely on the income levels of individuals. This view was also supported by Banerjee et al. (2010), who found household income as the main determinant of the number and size of cars bought by households in Surat, India. Furthermore, Prieto and Caemmerer (2013), exploring the factors that influence car-purchasing decisions in

major car markets in France, found that income has a positive impact on the decision to buy a new car from higher segments and a negative impact on the decision to buy a used car from lower segments.

5.2.3 Trends in price increases of food products, passenger vehicle sales and household income in South Africa

5.2.3.1 Trend in passenger vehicle sales in South Africa

The new passenger vehicle sales slowed down in 2009, with 258 129 units being sold following the 2008 global meltdown, in comparison with the average of 416 335 units sold per year over the four previous years (OICA, 2014). However, new passenger vehicle sales recovered by 5.67% by December 2011 year on year, compared to the same period in the previous year, and reached 450 440 units sold in 2013 (OICA, 2014). The trend for vehicles purchased reached its peak in the third quarter of 2014, with 40 265 units being purchased. The year ended with 31 473 passenger vehicles sold in the second quarter of 2015. The upward trend in the passenger vehicle units purchased can be explained by a strong rand encouraging exportations and an increase in the disposable income of households. The drop in the number of passenger vehicle units purchased can be associated with the domestic political and economic turmoil leading to consumer reluctance to purchase durable goods such as passenger vehicles.

5.2.3.2 Trend in food price products in South Africa

In comparison with many other countries, food prices increased less during the 2007/08 crisis in South Africa. In this regard, South Africa experienced among the lowest price increases, namely between 25 and 39% of the rise in world food prices. After the global food price scare, food inflation came down from a high of 16.1% in January 2009, and stayed below 8% for most of 2010 and 2011. Nonetheless, by the end of 2011, food inflation increased to 11.6% through higher prices for meat, oilseeds, sugar and vegetables, before coming down gradually in 2012 and 2013, and subsequently reaching its lowest point of 3.5% in December 2013 (Esterhuizen, 2014). The downward trend in food inflation can be explained by the strength of the rand, stopping South African consumers to be significantly affected by the sharp rise in global commodity prices. In the same light, the upward trend in food inflation is owing to the weaker exchange rate and the intensification of the drought in the country.

5.2.3.3 Trend in household income in South Africa

Household disposable income trended upwards from 2008 to 2015, albeit with some volatility. Figure 4.1c is illustrative. The increase in income could be linked to the annual cost of living

adjustments awarded to workers, given that South Africa has very strong labour unions. However, what is surprising is that this trend is not in accord with the trend in food inflation, which has generally averaged 7% as from 2011 (see Figure 4.1a).

5.2.4 Relationship between passenger vehicle purchases and fuel price

The relationship between passenger vehicle purchases and fuel price was found to be positive and significant. This opinion is contrary to the one of Chisasa and Dlamini (2013), who found a positive but insignificant relationship between car sales and fuel price in South Africa. Flowing in the same direction, Duncan (1980) presents evidence that a change in gasoline prices would not affect total car sales, but only the distribution between large and small automobiles. Pieterse (2009) presents a similar view, stating that almost two-thirds (58.7%) of the 194 valid cases considered in his study shared the opinion that the fuel price was not the main impediment to consumers' decision to apply or not apply for motor finance in South Africa.

Contrary views were presented by Banerjee et al. (2010), who observed that consumers are sensitive to fuel cost and that new vehicles are preferred over used vehicles. In the same regard, Menon and Raj (2012) found that approximately one-third of car owners in India had diesel vehicles, due to the price differences between gasoline and diesel, thereby presenting the significant impact of fuel price on car purchases in India.

5.2.5 Relationship between passenger vehicle purchases and interest rate

The result of this study showed a negative and significant relationship between vehicle purchase units and interest rate, implying that consumers will take the interest rate into consideration in new vehicle purchases. This defies the view of Chisasa and Dlamini (2013), who argue that interest rate has no role to play in the decision-making process to purchase a passenger car in South Africa, implying therefore that by and large, regardless of whether the interest rate is high or low, South African consumers will apply for credit to purchase a passenger vehicle. This argument challenges the economic theory, which contends that when interest rates are high, the demand for credit is low because of the high cost of borrowing. In this regard, when interest rates are high, the demand for goods and services is likely to slow down or remain static *ceteris paribus*.

In line with the result of the present study, Smusin and Makayeva (2009) confirm that car sales are quite sensitive to credit interest fluctuations. This view corroborates that of Pieterse (2009), who established that the prime interest rate is one of the factors that influence the number of motor finance loans granted in South Africa. Another similar argument is the one of Cokayne (2007), who reports that the six consecutive prime rate increases since 2005 had a dramatic negative impact on

South African new vehicles sales. Corroborating the view, Muhammad et al. (2012) suggest that spikes in interest rates have a negative impact on car sales.

5.2.6 Relationship between passenger vehicle purchases and new vehicle price

The result from the present study showed that there is a positive but insignificant relationship between vehicle purchase units and new vehicle price. This defies the view of Pieterse (2009), who found that of the total 194 valid cases considered in his research, almost two-thirds (62.4%) of the respondents (passenger vehicle consumers) shared the opinion that motor vehicle retail prices were the main impediment to consumers' decision to apply or not apply for motor finance.

5.2.7 Relationship between different predictors of passenger vehicle purchases

The result of the Pearson correlation test showed a positive and significant relationship between (1) food inflation and interest rate, (2) food inflation and new vehicle price, (3) interest rate and new vehicle price, and (4) fuel price and household disposable income. A positive but insignificant relationship was found between (1) food inflation and fuel price and (2) fuel price and new vehicle price. A negative and significant relationship was found between (1) household disposable income and interest rate and (2) fuel price and household disposable income. However, a negative but insignificant relationship was found between (1) food inflation and household disposable income and (2) household disposable income and new vehicle price in South Africa for the period under review.

5.3 ORDINARY LEAST SQUARES ESTIMATES OF THE PASSENGER VEHICLE PURCHASE FUNCTION

As the main objective of the study was to determine the relationship between food inflation and vehicle purchases in South Africa, the OLS test was applied to test this relationship. The results of the regression analysis show that the relationship between these two variables is positive. However, the relationship is insignificant. Food prices have an indirect impact on headline inflation through their effects on inflationary expectations, wages and prices of other components in the consumer price index (CPI) (Rangasamy, 2010). It is suggested that if consumers expect inflation to go up in the future, they will tend to buy now, causing aggregate demand to increase. This could explain why food inflation could be a positive although insignificant predictor of vehicle purchases in South Africa.

Household disposable income and vehicle prices were observed to have a positive and significant relationship, with vehicle purchases at the 1% and 5% degree of significance level, respectively.

Chisasa and Dlamini (2013), researching the relationship between the interest rate and passenger vehicle purchase decisions in South Africa, performed an OLS estimate of the vehicle purchase function and found economic factors explaining passenger vehicle purchase decisions to be weakly positive but insignificant. The authors therefore suggest that psychosocial factors influence vehicle purchase decisions.

Similar to the above, the present research confirms that indeed most economic factors do not play a significant role when it comes to predicting passenger vehicle purchases in South Africa. However, the present study found household disposable income and vehicle purchases of the previous period to be a highly significant predictor of passenger vehicle purchases. Furthermore, vehicle price index was also considered a significant determinant of vehicle purchases at the 15% level and should likely be included in any analysis.

5.4 COINTEGRATION TEST

The results of the Johansen cointegration test showed that there was at least one cointegrating vector, suggesting that vehicle purchases, food inflation, fuel price, interest rate, household disposable income and new vehicle price are cointegrated in the long run, hence a long-run equilibrium exists between the variables.

Similarly, Chifurira et al. (2014) found the existence of a long-run cointegration between car sales and inflation in South Africa. However, in contrast to the present study, the authors only considered inflation as a predictor of car sales, while this study considered five economic predictors of vehicle purchases, including food inflation, which is considered an important source of underlying inflationary pressures in the South African economy.

5.5 VECTOR ERROR CORRECTION MODEL

The VECM results showed a negative but insignificant long-run relationship between food inflation and vehicle purchases and no relationship between food inflation and vehicle purchases in the short run. The results of these tests substantiate the idea that vehicles are most likely purchased by high living standards measures (LSM) groups within a socio-economic group. Food inflation will affect the lower-income groups more due to the fact that it encapsulates a relatively larger proportion of their disposable income.

However, during economic booms, recessions and recovery periods, there is a change in the consumers' purchasing behaviour. For example, they maybe more likely to purchase a passenger vehicle during an expansion period, rather than during a recession. It is expected that during a recession, the relative importance of food would escalate leading to a higher proportion of their

food expenditure. With the severe hike in food products purchased generally during a recession, consumers might choose to save money by either buying used passenger vehicles instead of new ones, or postponing the purchase of their passenger vehicle to a better period. The upward trend of food inflation during the period under study, mixed with the political and economic turmoil in the country, could have portrayed a false sense of recession to consumers and affected their purchase decision. In support, Kumo (2015) posited that from the first quarter of 2002 to the third quarter of 2013, the country experienced economic downturns. This could count as a possible reason behind the negative relationship, although insignificant, between food inflation and passenger vehicle purchases in South Africa.

Household disposable income and the effect of vehicle purchases for the previous period have been shown to be dominant predictors in the long run with regard to vehicle purchase behaviour.

The effect of vehicle purchases for the previous period as main predictor of vehicle purchase behaviour in the long run highlights the inelasticity in the vehicle demand economy of South Africa. The current economic infrastructure provides a low concentration of public transport within urban areas, with almost no infrastructure in rural areas. This strengthens the need for privately owned transportation to commute.

5.6 GRANGER CAUSALITY TEST

The result of the Granger causality test showed that there is no causal effect running from food inflation to vehicle purchases or a causal effect running from vehicle purchases to food inflation. The two variables were found to be independent from each other. Considering the fact that food inflation in South Africa was found to affect mostly the poor range of the population and having a smaller to negligible impact on the wealthiest consumers' annual income, as mentioned earlier in this study, this corroborates the view that an increase in the price of food products will not cause any impact on the purchase of passenger vehicles.

5.7 CONTRIBUTION OF THE STUDY

Several studies have been conducted on passenger vehicle purchase decisions in South Africa (Chisasa & Dlamini, 2013; Moodley, 2007; Pieterse, 2009). In these studies, interest rates, prices of cars, fuel prices and household income were identified as factors that influence vehicle purchase decisions in South Africa.

The present study adds to the literature by investigating the impact of food inflation on the purchase of passenger vehicle. Contributing to the literature, beyond the scope of the study by Chisasa and Dlamini (2013), the present study found that disposable income of households along

with vehicle purchases of the previous period are to be considered as main determinants of vehicle purchases in South Africa. In addition, it was revealed that the variable new vehicle price can also be considered a significant determinant of vehicle purchases at the 15% level and should likely be included in any analysis.

Going beyond the limited scope in the methodology of Chifurira et al. (2014), the present study revealed that the variables in the vehicle purchase function were cointegrated in the long run. The VECM showed a long-run relationship, albeit insignificant, between food inflation and vehicle purchases and no relationship between the two variables in the short run. The Granger causality test revealed that the two variables (food inflation and vehicle purchases) are independent from each other, meaning that no causal effect was found between the variables, regardless of the direction of the test.

5.8 LIMITATION OF THE STUDY

This study used secondary data and is therefore subjected to limitations associated with this type of data. Indeed, secondary data present the disadvantage of inappropriateness of the data and lack of control over data quality. This issue was considered of less pertinence with regard to the present study. In fact, the data used in this study were obtained from an authentic public domain and present the particularity of being primary sources of secondary data (for example census publications). This type of secondary data is that which are not taken into a process that augments, modifies, summarises, synthesises, updates, or in any way manipulates the data (Rabianski, 2006). Furthermore, considering the reliability of the sources of secondary data that were used, it was assumed that the data were collected, organised and distributed by properly specifying the particulars of the collection process, data-assembly procedures or any data synthesis that was used. It was also assumed that data quality and validity were taken into consideration. In addition, it is worth noting that although secondary data have been gathered by others for their own purposes, the data could be useful in the analysis of a wide range of marketing and consumer research (Svetlana, 2012). In the light of this, it is believed that the issues of inappropriateness of data and lack of control over data quality for this study are of less relevance.

5.9 CONCLUSION

Several studies have been conducted on passenger vehicle purchase decisions in South Africa (Chisasa & Dlamini, 2013; Moodley, 2007; Pieterse, 2009). In these studies, interest rates, prices of cars, fuel prices and household income were identified as factors that influence vehicle purchase decisions in South Africa. The present study contributed to the literature by investigating the impact of food inflation on the purchase of passenger vehicles. Considering the fact that food inflation in

South Africa is viewed as an important source of underlying inflationary pressures in the economy due to its persistence beyond that of other commodities (Rangasamy, 2010), this study appears to be of considerable value.

The results of this study were similar to that of other empirical studies. The study found that food inflation has a negative but insignificant relationship with vehicle purchases in the long run, but no relationships with it in the short run. The two variables were found to be independent from each other considering the fact that there were no causal relationships between them. This substantiates the idea that vehicles are most likely purchased by high LSM groups within a socio-economic group, for whom increases in food prices will have a small to negligible impact on their disposable income, and therefore will not alter their decision to purchase a passenger vehicle. However, food inflation will affect the lower-income groups more due to the fact that it encapsulates a relatively larger proportion of their disposable income.

The study revealed that although variables in the passenger vehicle purchase function are shown to be cointegrated in the long run, the majority of them appeared not to be significant predictors of vehicle purchases, thereby corroborating the view that economic factors do not play much of a role with regard to vehicle purchases, giving room to the view that psychosocial factors would rather be predictors of vehicle purchase decisions in South Africa. However, the study found household disposable income and vehicle purchases of the previous period to be significant determinants of passenger vehicle purchases in South Africa.

5.10 RECOMMENDATION AND SUGGESTIONS FOR FURTHER STUDY

This study revealed household disposable income to be one of the main determinants of vehicle purchases in South Africa. In this regard, it will be interesting to better understand the synergy between the two variables. One could explore how a change in household disposable income could affect vehicle purchases. Furthermore, it would be interesting to also identify the types of passenger vehicles South African consumers prefer to purchase considering their annual income range.

The findings of this study revealed that food inflation and passenger vehicle purchases are independent from each other. In that regard, the South African government should focus more on variables such as household disposable income and new vehicle price, rather than food inflation when it comes to passenger vehicle purchases. Government should continue to support policies that enhance vehicle manufacturing, considering the growth potential of this sector and its contribution to the country’s economy.

The results of this study revealed the effect of previous vehicle purchases on vehicle purchases. It is critical to better understand this phenomenon and also to identify the main psychosocial factors, in the case of South Africa, having an influence over the purchase of passenger vehicles.

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APPENDICES

Appendix 1: Frequencies: Descriptive statistics analysis

Frequencies

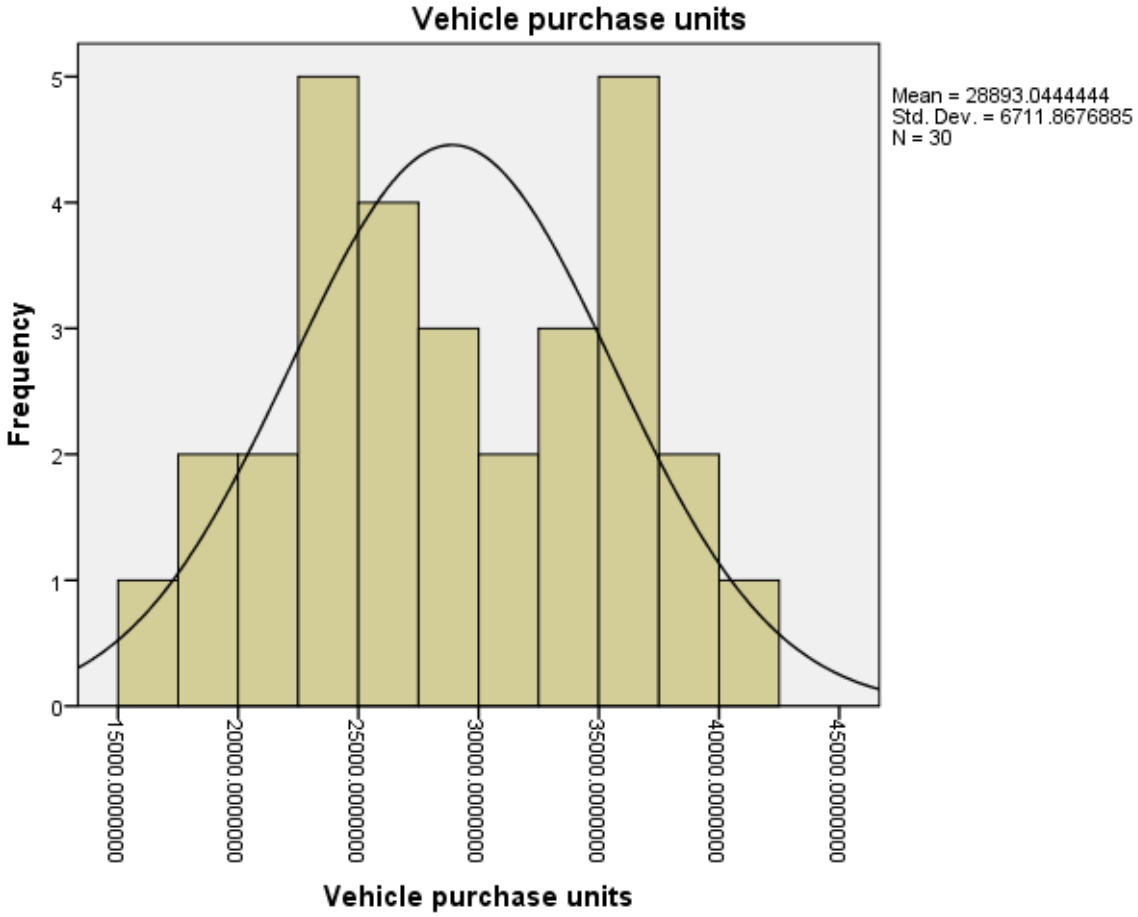
Statistics							
		Vehicle purchase units	Food inflation	Fuel price	Household disposable income		
N	Valid	30	30	30	30		
	Missing	0	0	0	0		
Mean		28893.044444443	7.733	580.7610	456127.17		
Std. error of mean		1225.4137786565	0.8596	27.29000	16091.472		
Median		28746.500000000	6.700	608.7000	447219.00		
Mode		16866.6666667[a]	3.9[a]	321.65[a]	309151[a]		
Std. deviation		6711.8676884778	4.7084	149.47351	88136.623		
Variance		45049167.868	22.169	22342.330	7768064334.006		
Skewness		0.007	0.776	0.026	0.202		
Std. error of skewness		0.427	0.427	0.427	0.427		
Kurtosis		-1.068	-0.030	-1.182	-1.052		
Std. error of kurtosis		0.833	0.833	0.833	0.833		
Range		23398.3333333	17.3	504.65	313718		
Minimum		16866.6666667	0.8	321.65	309151		
Maximum		40265.0000000	18.1	826.30	622869		
Percentiles	25	23743.833333350	4.675	436.1050	382074.25		
	50	28746.500000000	6.700	608.7000	447219.00		
	75	35764.083333350	9.825	705.1250	532443.25		

Statistics			
		Interest rate (Overdraft rate)	New vehicle price (proxied by ppi)
N	Valid	30	30
	Missing	0	0
Mean		10.2223	6.707
Std. error of mean		0.41276	0.7993
Median		9.2100	6.650
Mode		9.00	7.4
Std. deviation		2.26075	4.3780
Variance		5.111	19.167
Skewness		1.556	0.112
Std. error of skewness		0.427	0.427
Kurtosis		1.005	1.610
Std. error of kurtosis		0.833	0.833
Range		7.00	21.8
Minimum		8.50	-3.8
Maximum		15.50	18.0
Percentiles	25	9.0000	5.125
	50	9.2100	6.650
	75	10.5425	8.200

Source: Stata 13.1

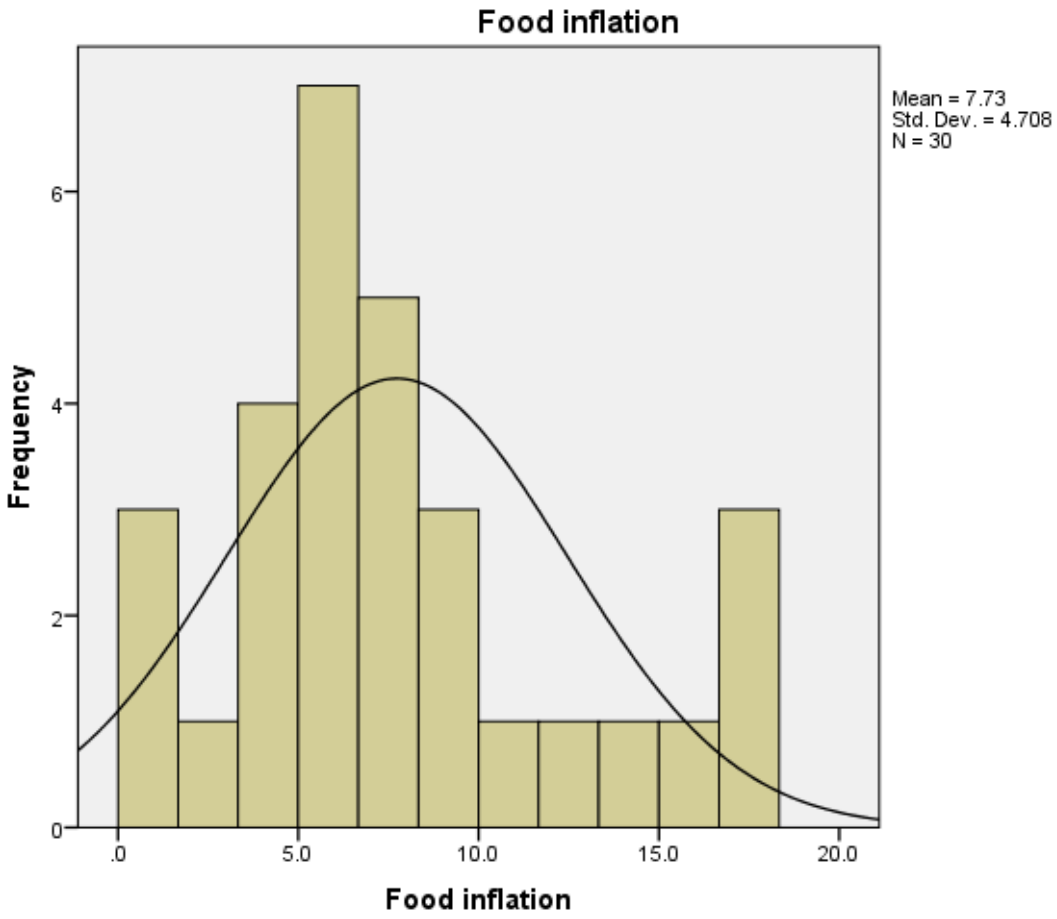
a. Multiple modes exist. The smallest value is shown

Appendix 2: Histogram

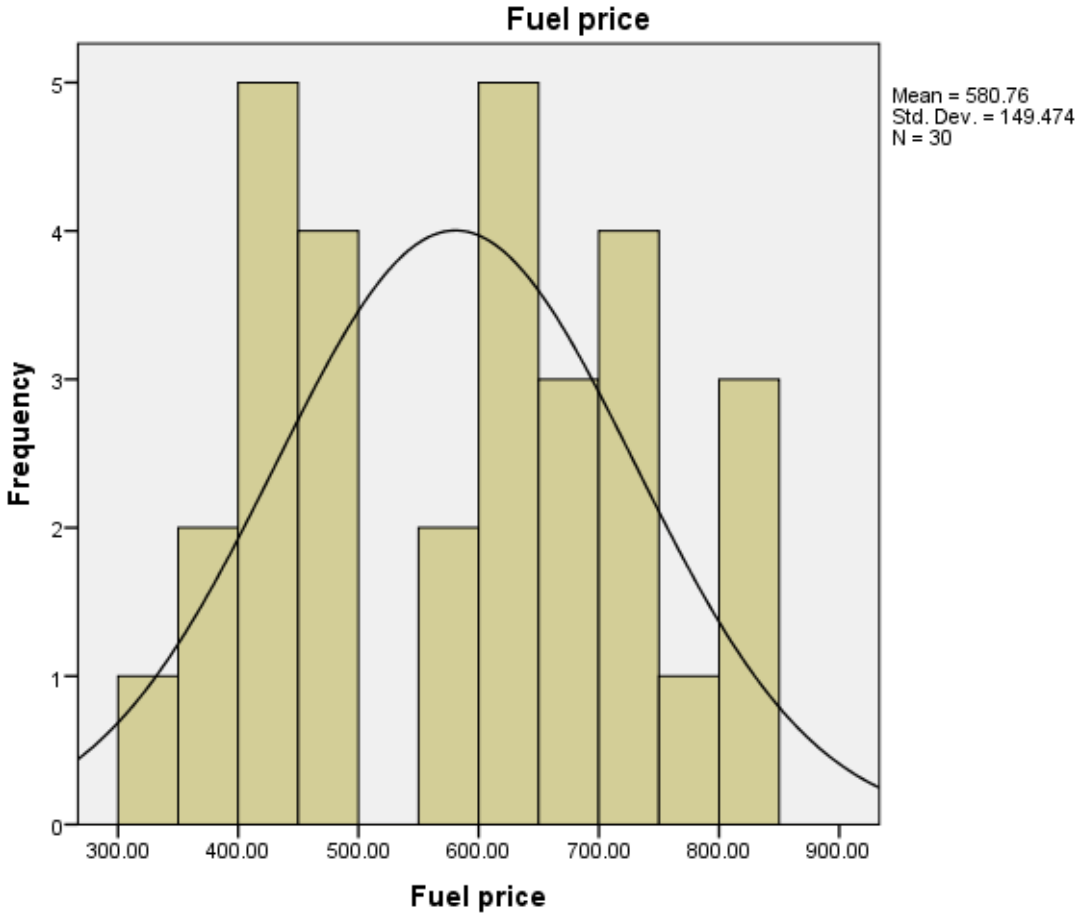


Source: Stata 13.1

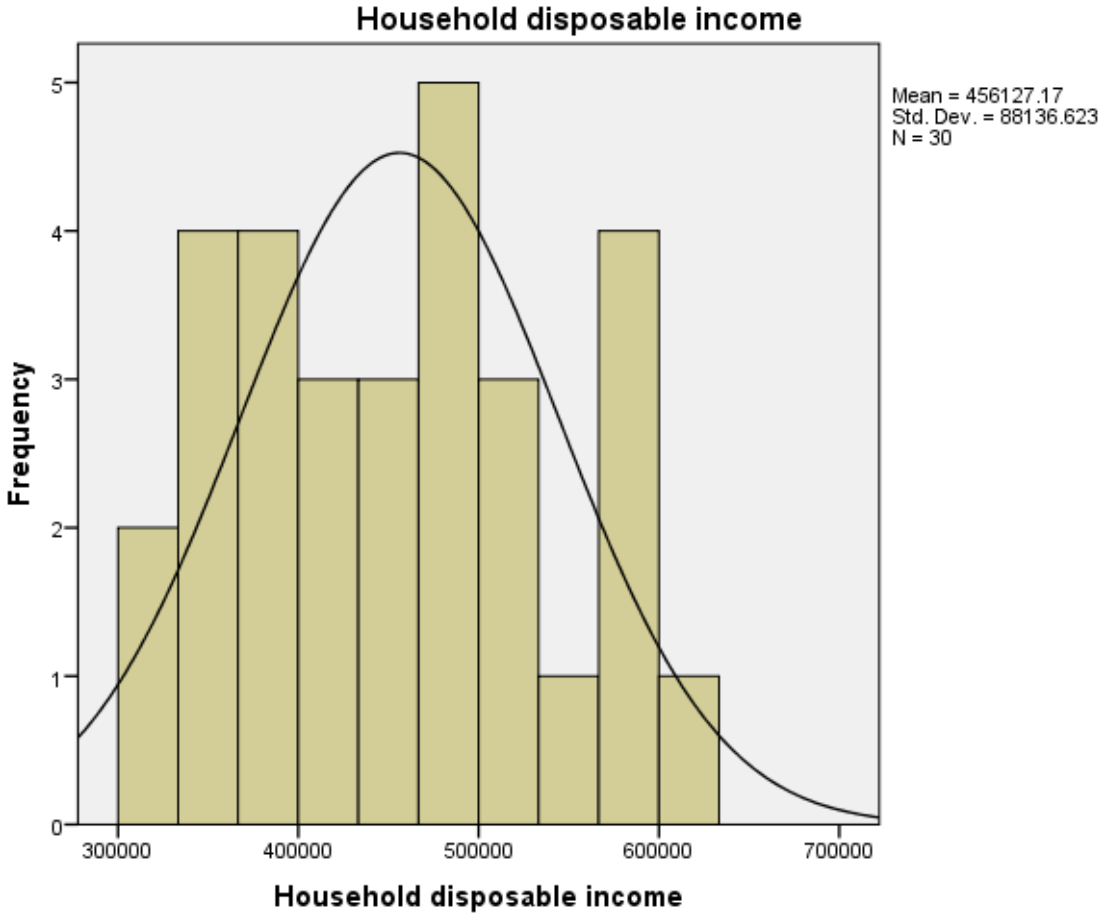
Appendix 3:Histogram; Descriptive statistics; Graph correlation; Vector error correction model output.



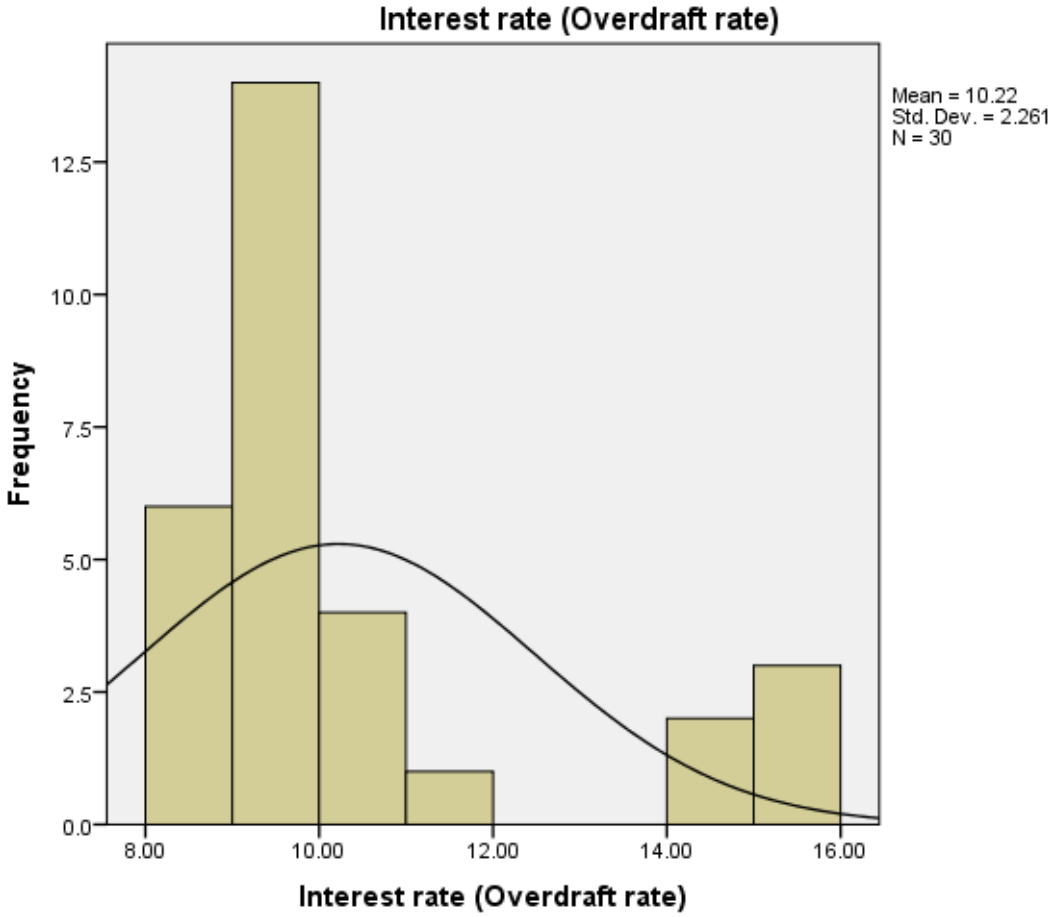
Source: Stata 13.1



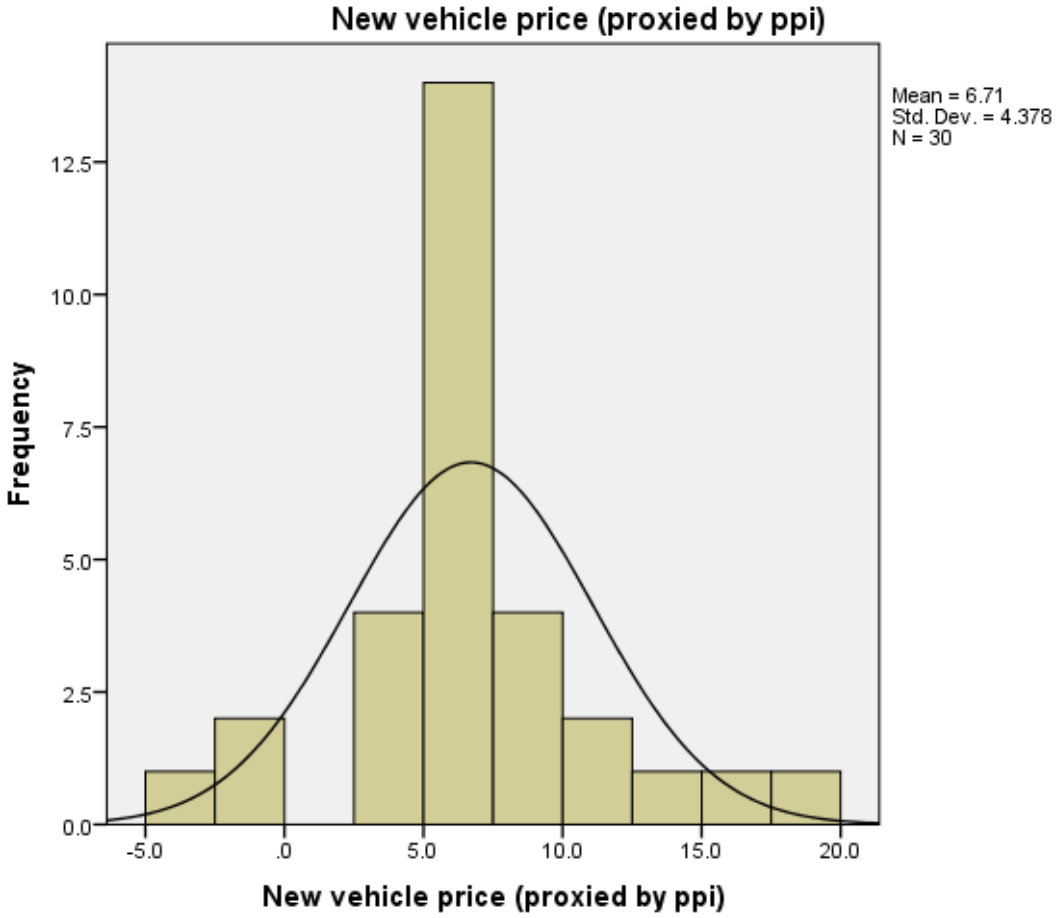
Source: Stata 13.1



Source: Stata 13.1



Source: Stata 13.1



Source: Stata 13.1

Descriptive statistics				
			Statistic	Std. error
Vehicle purchase units	Mean		28893.044444443	1225.4137786565
	95% confidence interval for mean	Lower bound	26386.791860458	
		Upper bound	31399.297028429	
	5% trimmed mean		28903.432098763	
	Median		28746.500000000	
	Variance		45049167.868	
	Std. deviation		6711.8676884778	
	Minimum		16866.6666667	
	Maximum		40265.0000000	
	Range		23398.3333333	
	Interquartile range		12020.2500000	
	Skewness		0.007	0.427
	Kurtosis		-1.068	0.833
Food inflation	Mean		7.733	0.8596
	95% confidence interval for mean	Lower bound	5.975	
		Upper bound	9.491	
	5% trimmed mean		7.557	
	Median		6.700	
	Variance		22.169	
	Std. deviation		4.7084	
	Minimum		0.8	
	Maximum		18.1	

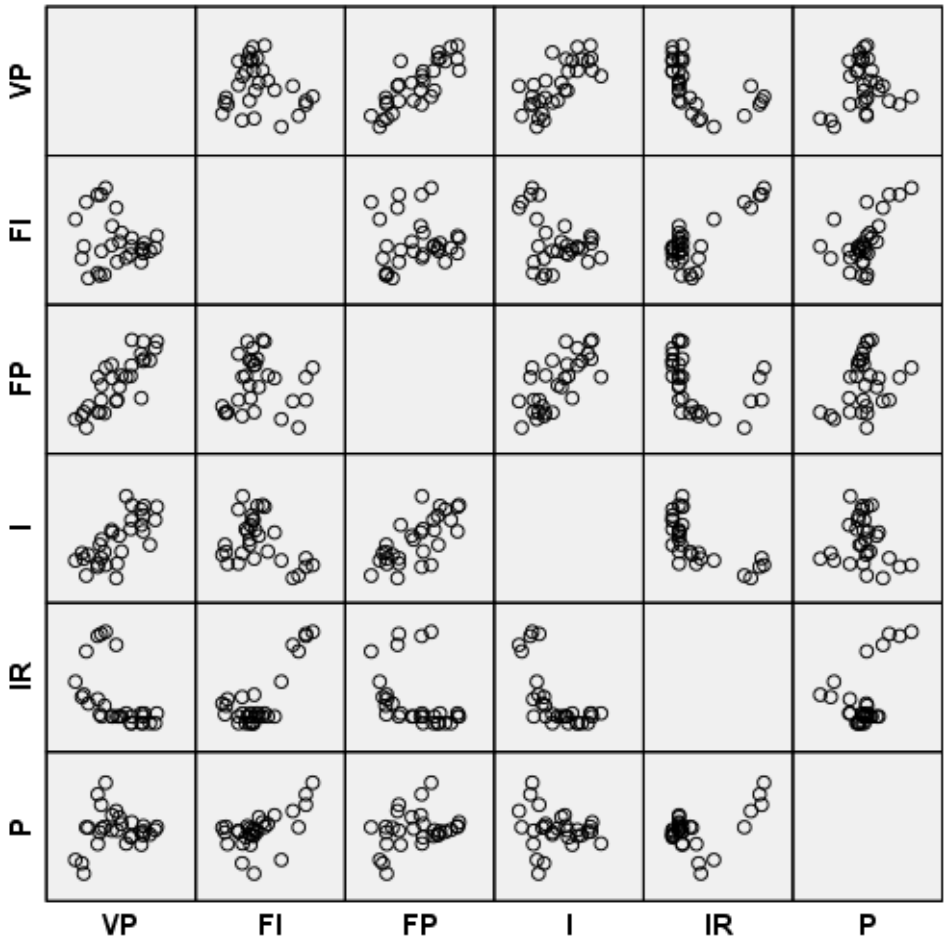
	Range		17.3	
	Interquartile range		5.1	
	Skewness		0.776	0.427
	Kurtosis		-0.030	0.833
Fuel price	Mean		580.7610	27.29000
	95% confidence interval for mean	Lower bound	524.9467	
		Upper bound	636.5753	
	5% trimmed mean		580.7694	
	Median		608.7000	
	Variance		22342.330	
	Std. deviation		149.47351	
	Minimum		321.65	
	Maximum		826.30	
	Range		504.65	
	Interquartile range		269.02	
	Skewness		0.026	0.427
	Kurtosis		-1.182	0.833
Household disposable income	Mean		456127.17	16091.472
	95% confidence interval for mean	Lower bound	423216.41	
		Upper bound	489037.92	
	5% trimmed mean		455468.70	
	Median		447219.00	
	Variance		7768064334.006	
	Std. deviation		88136.623	
	Minimum		309151	
	Maximum		622869	

	Range		313718	
	Interquartile range		150369	
	Skewness		0.202	0.427
	Kurtosis		-1.052	0.833
Interest rate (Overdraft rate)	Mean		10.2223	0.41276
	95% confidence interval for mean	Lower bound	9.3782	
		Upper bound	11.0665	
	5% trimmed mean		10.0280	
	Median		9.2100	
	Variance		5.111	
	Std. deviation		2.26075	
	Minimum		8.50	
	Maximum		15.50	
	Range		7.00	
	Interquartile range		1.54	
	Skewness		1.556	0.427
	Kurtosis		1.005	0.833
New vehicle price (proxied by ppi)	Mean		6.707	0.7993
	95% confidence interval for mean	Lower bound	5.072	
		Upper bound	8.341	
	5% trimmed mean		6.669	
	Median		6.650	
	Variance		19.167	
	Std. deviation		4.3780	
	Minimum		-3.8	
	Maximum		18.0	

	Range	21.8	
	Interquartile range	3.1	
	Skewness	0.112	0.427
	Kurtosis	1.610	0.833

Source: Stata 13.1

Graph correlation



Source: Stata 13.1

Vector error correction model output

Vector error correction estimates
Sample (adjusted): 2008Q4 2015Q2
Standard errors in ( ) & t-statistics in [ ]

Cointegrating eq.:	CointEq1	
VP(-1)	1.000000	
FI(-1)	197.1029	
	(278.679)	
	[0.70727]	
C	-30449.05	
Error Correction:	**D(VP)**	**D(FI)**
CointEq1	-0.885801	6.30E-05
	(0.21425)	(0.00016)
	[-4.13441]	[0.39778]
D(VP(-1))	0.287738	-0.000123
	(0.25698)	(0.00019)
	[1.11967]	[-0.64468]
D(VP(-2))	1.004455	-0.000149
	(0.28757)	(0.00021)
	[3.49292]	[-0.70237]
D(FI(-1))	295.7536	0.038323
	(302.798)	(0.22395)
	[0.97674]	[0.17113]
D(FI(-2))	140.7593	-0.188402
	(268.638)	(0.19868)
	[0.52397]	[-0.94826]
C	-41018.14	8.738258

	(15159.4)	(11.2117)
	[-2.70579]	[0.77939]
FP	26.01532	-0.003187
	(7.24858)	(0.00536)
	[3.58902]	[-0.59452]
I	0.034039	-5.30E-06
	(0.01690)	(1.2E-05)
	[2.01409]	[-0.42418]
IR	1219.319	-0.806898
	(670.806)	(0.49612)
	[1.81769]	[-1.62641]
P	-330.0596	0.514142
	(228.753)	(0.16918)
	[-1.44286]	[3.03896]

Source: Eviews 9