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The Relationship between Market Structure and CPI: A Study of the Food and Beverage, Housing and Transport Industries in Lebanon

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DECLARATION

I hereby declare that this thesis is entirely my own work and that it has not been submitted as an exercise for a degree at any other University.

Pia Joseph Abdo

ABSTRACT

Purpose – With inflation being the main concern of all economies, many theories have been developed to try to find its determinants. Different studies have been conducted in an attempt to understand the behavior of prices and the link between competition and prices; however, none have been conducted in Lebanon. Consequently, this paper studied the market structure of the leading Lebanese Industries for the period extending between 2002 and 2016. In addition, aiming to understand the behavior of prices, this paper studied the existence and type of the relationship between market structure and prices, by controlling for several variables such as market size, currency in circulation and the unemployment rate.

Design/methodology/approach – This paper conducts two separate approaches to understand the relationship between market structure and prices at the industry level and the overall level. First, the Pearson correlation test is conducted to detect possible linear relationships between market concentration and industry specific CPI first, and then, overall CPI. Second, where linear relationships exist, the multiple linear regression approach is used to detect the existence of causal relationships between the changes in market concentrations and the changes in CPIs.

Findings – The relationship between market concentration and prices is linear and not causal.

Research limitations – Due to the lack of available sources of data in Lebanon, the period understudy was short and restricted to the VAT department in the ministry of Finance. In addition, there was no available public micro and macroeconomic data, which also affected the results of the paper and prohibited the usage of several potential control variables.

Practical implications – The importance of a better competition law to organize the Lebanese markets and the need to increase the size of the existing firms are confirmed in this paper.

Originality/value – This paper is the first to study the relationship between competition and prices in Lebanon, and the first to evaluate the market structure in the Lebanese markets since 2003.

Keywords – Market concentration, industry-specific CPI, overall CPI, Pearson correlation test, multiple linear regression.

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Chapter 1: Introduction

1.1 General Background about the Topic

Market structure is viewed by economists as the number and relative size of firms in an industry. Market structures vary from pure competition to monopolistic competition, oligopoly, and finally monopoly. "Competition is the absence of market concentration in the hands of the few, and hence the absence of power, or so-called "monopoly-power", over price determination in particular" (Gaspard, 2003, p.8). Gaspard adds that monopolistic and oligopolistic aspects are apparent in high concentration markets which thus might lead to increases in prices. Bannock et al. (1992) in Wood (1999) define market power as "the degree to which a firm exercises influence over price and output of a market."

From this perspective, "unless there is perfect competition, prices contain a markup component reflecting the ability for a firm to set a price above marginal costs" (Gullstrand et al., 2014). According to Martinez and Reboredo (2009), changes in prices due to mark-up variations are affected by variations in the market concentration and in laws. Market concentration refers to the degree to which a main proportion of the total production of the market is focused among a small number of producers or sellers.

From a different angle, the main goal of several central banks all over the world is to control variations in the overall price level, according to O'sullivan (2005). Welfare is what all economies optimally thrive for. In addition, as widely known, inflation could be one of the issues hindering welfare. Before proceeding, it is worth mentioning that almost all developing economies suffer from increases in prices. Specifically, the majority of Lebanese citizens suffer from increases in prices but only a few are able to see what is behind this increase in the value of our supermarket trolley. Thus, by calculating and evaluating the degree of concentration and studying its relationship with CPI or inflation, some major remedies to price increases could be developed. These remedies might help developing economies in general and Lebanon, specifically, make one step further towards development, growth or any other improvement in social welfare.

1.2 Need for the Study

According to a report conducted by the Consultation and Research Institute (CRI) on competition in the Lebanese economy, around 58% of Lebanese markets witnessed high concentration (Gaspard, 2003). Specifically, the highest degrees of concentration were witnessed in manufacturing and wholesale trade compared to other activities. Although this report is not recent, it represents an important element in the narrow literature tackling competition in Lebanon.

Furthermore, based on the data provided by the Central Administration of Statistics in Lebanon and according to the updated weights (2004 weights), 57.9% of the expenditure divisions included in the Lebanese Consumer Price Index (CPI) represented housing, water, electricity, gas and other fuels (25.7%), food and non-alcoholic beverages (19.9%) and transportation (12.3%). In addition, according to the most recent weights (2012 weights), the above mentioned divisions have become more valuable in the measurement of the CPI since they now represent 62.2% of the expenditure divisions, with housing, water, electricity, gas and other fuels (28.5%), food and non-alcoholic beverages (20.6%) and transportation (13.1%). It is necessary to mention that two of the above divisions are included in the manufacturing and wholesale trade industries which witnessed the highest degrees of concentration in the Gaspard (2003).

It then becomes apparent that further and updated study on the current status or structure of Lebanese markets, mainly the ones that include the main items of the Lebanese CPI, is very crucial. This study becomes more significant with the diminishing purchasing power that Lebanese citizens have witnessed for the past several years, according to Blooomberg statistics and the Central Administration of Statistics in Lebanon. "In recent years, food and energy prices have soared boosting inflation rates to highest levels" (Jad, 2013, p.1) as stated in a report conducted at the Lebanese Central Bank by the Statistics and Economics Research Department in 2013. Mainly speaking, by attempting to find a relationship between the concentration degree and price changes, this study could be used to modify some regulations in the competition law of Lebanon and perhaps offer some modifications to the barriers to entry.

Thus, If CPI is affected by the degree of concentration, and if, a high degree of concentration or a lack of competition preys our Lebanese markets, then action should be done to attack all barriers

or causes that are forcing the Lebanese industries to be less competitive and hindering the welfare of Lebanese citizens.

1.3 Purpose of the Study

As mentioned in the previous section, in the 2003 report conducted by the Consultation and Research Institute, the majority of the Lebanese industries witnessed high concentrations. This paper attempts to evaluate the market concentration of different markets throughout several years, and then, investigate the relationship between the market structure and CPI. According to the 2012 updated weights in Lebanon, the consumer basket of goods used to measure CPI is divided into 12 divisions which are constituted of: housing, water, electricity, gas and other fuels (28.5%); food and non-alcoholic beverages (20.6%); transportation (13.1%); health (7.8%); education (5.9%); clothing and footwear (5.4%); communication (4.6%); miscellaneous goods and services (4%); furnishing, household equipment and routine household maintenance (3.7%); restaurants and hotels (2.6%); recreations and culture (2.3%); alcoholic beverages, tobacco and narcotics (1.6%).

For data availability purposes and in order to be more specific and focused, this paper attempts to assess the market structure of the markets representing the 3 divisions with the highest weights in the consumer basket of goods used to measure CPI (i.e. housing, water, electricity, gas and other fuels; food and non-alcoholic beverages; and transportation). In addition, it investigates the relationship between the market structure and price levels, and their variations. This is done by investigating the degree of concentration in the above mentioned markets in Lebanon and the behavior of CPI through focusing on these major points:

- Assessing the market structure of the markets representing housing, water, electricity, gas and other fuels; food and non-alcoholic beverages; and transportation in Lebanon. The most recent study, if not the only one, that evaluated the market structure in general and specifically, measured the degree of concentration was in 2003. That assessment of market structure cannot be applied or generalized to this year because many firms would have entered and exited the industries throughout these several years, which highlights the importance of an assessment of the market structure after 2003.

- Investigating the existence and type of relationship between the price level and the market structure. Although many studies have attempted to investigate this relationship, results are different and sometimes even opposing. This emphasizes the importance and relevance of a study to be done in the case of Lebanon that shall hopefully ensure a basic ground for the emergence of new regulations or at least some modifications to barriers to entry or competition laws.

- Investigating the effect of a change in the market structure on changes in prices, and the nature of this effect. Inflation surely has many factors. However, being a major issue of concern to all economies, as it might be one of the basic factors that hinder social welfare, increases or at least emphasizes the importance of studying how price changes are affected by market structure. If modifications on the existing laws that organize competition in Lebanon are to be made or if new regulations are to be set, then, they should emerge from the effect of market structure on prices, knowing that social welfare is the end goal.

1.4 Brief overview of all Chapters

This research paper comprises five main chapters. The first one includes a brief introduction to the topic understudy and some main definitions that must be agreed on in order to continue the reading of the paper. In addition, the importance, relevance and originality of this study are shown in this chapter by mentioning the need and purpose of this research paper. The second chapter starts with a conceptual framework that links the secondary topics like market power, competition, social welfare and price variations, to the main topics understudy, market concentrations, CPI levels and the changes in CPI. In addition to that, this chapter includes detailed empirical evidence on the available literature on the degree of concentration and price levels. The third chapter includes the methodology of this paper where the strategies, sources of data, data collection process and statistical approaches are explained. The fourth chapter comprises the findings of the paper including first the descriptive statistics and then the inferential statistics where the results of the correlation tests and the regression

approach were stated and explained. Finally, the fifth chapter concludes the paper by stating the final comments on the topic understudy that resulted from the findings of this research with a clarification on the limitations faced, possible implications and suggested recommendations.

Chapter 2: Review of Literature

2.1 Conceptual Framework

In the following section, the main findings concerning the relationship between prices and market structure and as a result, what links market concentration to consumer welfare, are summarized. In addition, this section tackles the different indices researchers have used in order to measure market concentration.

Several authors have conducted studies with the purpose of investigating the relationship between market structure and prices. As "inflation has been popularized as the number one public enemy" (Gisser and Johnson, 1979, p. 1377), attempts to discover what actually affects and causes price changes have widely spread. Furthermore, increases in prices highlight the existence of market power (Cutts and Kirsten, 2006) and "market shares are typically a necessary condition for market power" (Cameron, Glick and Mangum, 2012, p.721), which thus leads to the importance and relevance of these studies in what concerns consumer welfare. According to Newmark (2004), the importance of price-concentration studies lies in their ability to support the widely spread belief that consumers are "harmed" when high market concentration is found among sellers.

Market concentration is perceived as a direct indicator of market power. "Market concentration is a structural characteristic that usually refers to the sales share of the largest one, three or five, or any small number of sellers in a specific product market" (Gaspard, 2003, p. 21). Although the four-firm concentration ratio index (CR4), which represents the sales share of the four largest firms, is the most commonly used in the literature CR1, CR3, and CR5 indices are also used. These ratios represent the market share of the one, three and five largest firms in the industry, respectively. Generally speaking, an industry that has 40% of its total output in the hands of the four largest firms is considered to be competitive. An industry with a concentration ratio above that is considered oligopolistic or monopolistic.

Another common index is the Herfindahl-Hirschman Index (HHI), which is also used in evaluating concentration by summing the squares of market shares of all participants in the market

understudy. According to the Merger Guidelines by the US Department of Justice (DOJ), a market with an HHI below 1000 is considered fragmented or not concentrated, where the HHI could even be at zero, or too close to zero, in a strongly fragmented market. On the opposite, an HHI of 10,000 (100^2) indicates that one sole firm controls the market (monopoly). Precisely, an HHI above 1800 indicates a high concentration in that market, and any market with an HHI between 1000 and 1800 is considered "moderately concentrated". Ciapanna and Rondinelli (2014) compared national HHI, which considers the country as a whole, to local HHI, which measures local competition by considering a restricted set of stores, and considered national HHI less powerful than local HHI in measuring actual competition when considering the assumption that competition exists among all the stores in a country. Researchers used the HHI in most of the price-concentration studies conducted. According to Yu and Connor (2002), most of the empirical studies concerned with market power use the HHI as a proxy for market structure since it was the most powerful among all other measures of concentration in proving significant positive relationships.

The Merger Guidelines represented market power by the Lerner index and defined it as the "ability profitably to maintain prices above competitive levels for a significant period of time" (Glick and Campbell, 2007, p. 231). However, they believed that applying one set of thresholds on all markets either overestimates market power or underestimates it depending on the market understudy.

Several hypotheses and models have been conducted in an attempt to understand and analyze whether the behaviors of concentration and prices are related and whether concentration affects prices, and if so, what impact concentration has on prices. The start was with the Cournot model which developed a linear relationship between prices and the reciprocal of the number of sellers (Wiggins and Maness, 2004). Precisely, this model reveals that as any firm's production increases, all other firms will be affected in proportion to their market shares. However, this model does not apply when product differentiation exists (Schmalensee, 1980), which has led to the attempt of other economists to build different models and develop other hypotheses. An important hypothesis in the literature tackling the price-concentration relationship is the ordinary school which relies on specific cooperative models which believe that higher prices are the direct result of more concentrated markets. Another important school was that of Demsetz (1973) known as the Chicago hypothesis or the cost/efficiency hypothesis "which postulates that concentrated markets can

experience economies of scale, lower costs, and higher profits" (Kinsey, 1998, p.8-9) and thus lead to lower consumer prices and therefore contradict the previously studied hypotheses where higher concentration leads to higher prices. In addition, other economists who did not deny the positive relationship between concentration and prices however, link it to the better services which are offered in more concentrated markets and thus would lead to higher prices, which is due to consumers' demand for services as suggested by Anderson (1990) (Kinsey, 1998).

Furthermore, although the majority of economists believed that market concentration hinders welfare and investigated relationships to prove this belief, other economists, found relationships that prove the opposite. Chen (2003) assessed the countervailing-power hypothesis which implies that when one side of a market possesses economic power, it creates a countervailing power on the other side, which will thus ensure a rebalance in the market and a neutralization of market power. This hypothesis proves how the existence of power within one firm helps in the creation of power within all the other firms that deal with it whether they are suppliers or buyers, because of the "reward" they receive through the portion of market power they gain too. Chen (2003) added to this hypothesis the development of a negative relationship between countervailing power and retail prices for consumers, leading to the belief that market power improves welfare instead of hindering it.

2.2 Empirical Evidence[1]

Cross-sectional studies on the relationship between concentration and price have evolved since Stigler's pioneer work in 1964 who made the first attempt of investigating market concentration and prices by studying the price reductions at different market structures. According to the several studies that were conducted in this aspect, concentration was shown to be associated with both increasing and decreasing prices, depending on the industry and trading level understudy. However, in almost all the industries, a significant positive relationship between concentration and prices was the result, except for banking and media advertising industries where many studies have failed to prove either a significant relationship or a positive one (Yu and Connor, 2002). In addition, in the literature tackling the studies that were investigating concentration and prices at

[1] Table 2.1 in the appendix summarizes all this chapter.

the wholesale level, lower prices was the impact of increased concentration in the majority, due to what is called the "countervailing power", discussed in the previous section. The following literature is divided to different sections. The first section includes the literature dealing with the retail grocery and food industries since they denote items that are most continuously purchased by consumers, and thus have the most effect on consumer welfare. The second section includes studies done on diversified retail industries. The third section tackles a few of the studies that were done on the wholesale level. Fourth, literature on the case of Lebanon is tackled in the last section.

2.2.1 Retail Grocery and Food Industries

Several studies were conducted in the grocery industries testing the relationship between market concentration and prices. These studies differ in the price and concentration indexes, control variables, time period, sample size and data collection methods. However, all those studies, except two, have similar results, where a positive and statistically significant relationship between concentration and prices was proven.

The first of the two studies that failed to find a significant positive relationship between concentration and prices in the grocery industries is the Kaufman and Handy (1989) study. The authors used a random sample of product prices and stores in New York City, not holding constant product quality and brand differentiation which was subject to criticism in other studies (Kinsey, 1998). This study revealed a significant negative correlation between concentration and prices. Geithman and Marion (1993) in Kinsey (1998) assert that the result is unusual and criticized the authors for using New York City as the sample. However, Kaufman and Handy (1993) revealed their belief in the random sampling for the collection of price indexes for such areas of study.

The second study which revealed surprising results among the other similar studies is Newmark (1990), which is one of the most famous studies that were conducted on concentration and prices in grocery industries. He investigated the total price for a basket of 35 frequently purchased grocery items in 14 cities across the US and 13 other cities in Florida, which reflected grocery prices in those 27 chosen cities. A simple Ordinary Least Squares (OLS) regression model was conducted, where prices were the dependent variables and seller concentration, represented by the CR4 index, and effective buyer income were taken as explanatory variables. In addition, three control variables were included in the model, market size, store size and market growth. The results of the regression

were different from the majority of other price-concentration studies. There was a negative, however, insignificant relationship between concentration and prices, which was consistent with the use of any of the three control variables. This case applied to the significant positive relationship between income and prices. In order to eliminate any bias to the 13 cities located in Florida, the study was reexamined by eliminating the Florida cities and the insignificant relationship between concentration and prices remained.

Furthermore, Yu and Connor (2002) examined grocery prices by reexamining Newmark (1990). The authors of this study retested the relationship between concentration and prices by offering modifications to the Newmark study. First, instead of using the CR4 index including grocery stores and supermarkets, as Newmark's study, they suggested the separation of those two by using the supermarket CR4 index, and CR4 and HHI indices from the *1987 Census of Retail Trade.* Second, instead of using the effective buyers income as an explanatory variable, they used the average household income and the frequently used per capita disposable income from the *County and City Data Book.* Third, they used a different pricing index as the dependent variable. Finally, they used a bigger sample and more random one. Regression was conducted taking price as the dependent variable and concentration and income as explanatory ones. The study was able to prove a positive significant relationship between concentration and prices after the application of the modifications to Newmark's study.

Cotterill (1986) investigated the relationship between market structure and prices in the Vermont retail grocery industry by using and comparing different measures of concentration, HHI, CR4 and CR1 indices. The regression analysis was applied, where the dependent variable was an aggregate price index of the prices of 121 selected goods in 18 supermarkets in August 1981. Different regression models were constructed where differences in the use of market structure measures and in the control variables were accounted for. In a first model, he uses the HHI index as a proxy for market structure and different control variables including, a binary variable identifying independent supermarkets, store size, sales per square foot as a proxy for capacity utilization, warehouse distance, population growth and per capita income. In another model, the sales per square foot variable was removed because of its multicollinearity with the square feet measure, and the supermarket's market share was used as a measure of market structure. In other models, data on groceries instead of supermarkets were used and grocery market share and grocery CR4

index were used to represent market structure. Irrespective of the model being used, all the models explained 60% or above of the variation in price, however the models using the supermarkets were more powerful. In addition, market concentration, represented by HHI, CR4 index, CR1 index or market share was significantly positively affecting prices. The effect was more significant with HHI than with any of the other measures of concentration and the CR1 index had a more significant impact on prices than the CR4 index.

Dunne and Roberts (1992) studied the relationship between plant concentration and prices by using reduced-form regression models of a plant's production level and output prices when operating in an oligopolistic market. Data was collected from 681 bread manufacturing plants in the U.S in 1977 that focus on the two main categories (bread and rolls) of the eight categories in the bread industry and which are responsible for 88% of the total production of bread and 84% of the total production of rolls. The average output price of bread (or rolls) represented the dependent variable and concentration, denoted by the number of competitors, represented one of the explanatory variables along with different control variables. The control variables included in the model are the plant's costs, particularly, capital stock and the cost of inputs, the production costs of the competitors and the demand conditions. The results of this study showed that only the plant's costs were significant in determining the level of output prices. Thus, there was no significant relationship between the market concentration and the output prices.

Franklin and Cotterill (1993) studied the relationship between concentration and prices by investigating 332 Metropolitan Statistical Areas (MSAs). They differentiated between grocery stores and supermarkets. HHI and concentration ratios were used for the calculation of market concentrations. Trends of concentration were examined and proven to be highly increasing in the 1980s especially for smaller markets. Results proved that market concentration and prices are significantly positively correlated.

Lopez, Azzam and Liron-Espana (2002) studied the effect of changes in industrial concentration on price by separating oligopoly power and cost efficiency through the investigation of 32 food manufacturing industries in the US in the period extending from 1972 to 1992. HHI and concentration ratios were used as measures of industry concentrations. They derived an estimating model of five equations: a pricing equation, three input demand equations and an output demand

equation where three stage least squares estimates of the set of nonlinear equations were obtained (non-linear 3SLS). As a result of both, oligopoly power and cost-efficiency effects, industry concentration and output prices had a significant negative relationship in only 9.4% of the industries understudy, where increases in concentration led to decreases in prices. On the other hand, in 68.7% of the industries understudy, increases in concentration caused increases in output prices revealing a significant positive causal relationship between concentration and prices, and in 21.9% of the industries no significant relationship was revealed. It is worth mentioning that the industries where more concentration caused decreases in prices deal with fat and oil manufacturing where strong economies of size and product homogeneity are found.

Sharkey T. and Stiegert K. (2006) examined the link between seller concentration and changes in the retail food prices, in addition to the effect of supercenters on food prices. The study included annual data from 1992 to 2003 for 23 demographic metropolitan areas in the US of America, thus summing up to 253 observations. A simple regression model was formulated where the annual percentage point change in the Consumer Price Index (CPI)-Food at Home price index denoted the dependent variable and market structure or concentration, represented by the relative market shares, HHI and the CR4 index, denoted the explanatory variables. In addition, control variables such as population, income, labor costs, electricity costs and rent costs were included in the model. The results proved a significant positive relationship between market concentration, in terms of change in HHI, and food price changes, proving that an increase in the concentration within a certain market, increases food prices.

Ciapanna and Rondinelli (2011) investigated the relationship between market concentration and price changes in the grocery retail sector based on a group of five main categories of goods (food and non-alcoholic beverages; alcoholic beverages, tobacco and narcotics; clothing and footwear; furnishings, household equipment and routine household maintenance; miscellaneous goods) in six Euro-area countries including Finland, Spain, Italy, Portugal, Austria and Germany. 240 series were included with annual data from 2003 till 2010. HHI indices were constructed for 2010 only at two levels, national (the whole country) and regional (specific region not whole country) and on three trading groups, the buying group, the parent company group, and store group. A regression analysis was conducted through different models taking the change in price as the dependent variable, and HHI at each level and each trading group as explanatory variables taken separately

for multicollinearity reasons. The explanatory variables interacted with product dummies for the 5 different categories understudy, along with other dummies included in the model, specifically, country fixed effects and year dummies. In addition, two control variables were considered in the model too, the regional density and a measure of the evolution of labor costs. The regression results were robust when HHI at different levels and different trading groups were used. The concentration level appeared to have a significant positive effect on price changes in the food and non-alcoholic beverages section; the alcoholic beverages, tobacco and narcotics section and the miscellaneous goods section. However, the concentration level appeared to have a significant negative effect on price changes in the clothing and footwear sector and the furnishings, household equipment and routine household maintenance sector.

Hovhannisyan and Bozict (2016) empirically investigated the effect of retail concentration on retail dairy product prices in the US. The data used included monthly prices for 11 dairy products in 20 US retail markets in the period 2008-2011. A simple cross-section regression analysis was conducted by taking prices (in logarithm) as the dependent variable and the concentration index as the explanatory variable. Control variables such as population and income were taken as well. In addition, robust testing was done via three different models by taking three different concentration proxies, the number of retail stores, revenue-based HHI and space-based HHI. Results were the same in the three models, where an increase in market concentration significantly positively affected prices, thus revealing a negative causal relationship between competition and prices.

2.2.2 Diversified Retail Industries

Marvel (1978) studied the determinants of the level of retail gasoline prices in 22 major cities in the US, by taking into consideration market concentration as one of the determinants. Monthly data was derived for 10 Standard Metropolitan Statistical Areas (SMSAs) and quarterly data for 13 others from the U.S. Bureau of Labor Statistics (BLS) surveys of the gasoline market developed for the calculation of the CPI for the period extending from January 1964 to June 1971. The method used was the regression method where gasoline retail prices at two sets of stations, low price stations and high price stations, represented the dependent variables, respectively. The cost of transporting petroleum products (transport costs), average state motor fuel excise tax rates (or state and local sales taxes) and market concentration, denoted by the HHI, represented the explanatory

variables. In addition to that, control variables for probable size-related differences such as land and labor costs were summarized by a population variable. Results showed that the market concentration had a more powerful and significant impact on prices in the low price regressions than in the high price regressions, empowering the observation that competition is more common in the high price stations than in the low price ones. In summary, a positive significant relationship between market concentration and prices was proven, where increases in concentration of gas stations caused increases in the retail gasoline prices.

Borenstein (1989) investigated the effect of concentration in the airline industry on prices. He used the regression analysis with three different dependent variables: the 20^{th} percentile, 50^{th} percentile, and the 80^{th} percentile fee paid on each of 5428 routes (origin to destination) to each of the nine leading local airlines in the third quarter of 1987. The explanatory variables included in the study were market structure, denoted by HHI (calculated form the share of carriers) and the airline's share of the passengers, variables that affect production costs represented by the nonstop mileage and variables that affect cost and service quality, such as the average load factor, the average size of aircrafts on flight, the average frequency of flights, the circuity of travel, the average number of on-plane stops made by passengers and the average number of change-of-plane made by passengers. Other explanatory variables were linked to the scarcity rents from operations at one of the overcrowded airports, including the weighted average of the cost per seat mile. Results proved that an airline's dominance, i.e. share of the passengers, highly determines its ability to raise the price. As a conclusion, the increase in the airline industry concentration was a main cause for the increase in the prices.

In a different type of industry and analysis, Berger and Hannan (1989) investigated the relationship between market concentration and prices in the banking industry by extracting quarterly data on the interest rate for ten quarters paid on different categories of retail deposits at 470 banks in 195 local banking markets. The rates that were obtained are: the Money Market Deposit Account rate, the Super-Now rate, and the 3, 6, 12 and 30 month Certificate of Deposit. A regression analysis was conducted by estimating reduced-form price equations taking the prices as the dependent variable and market concentration as the explanatory variable along with different control variables. Market concentration was represented by CR3 and HHI. Market conditions and cost factors were represented by the control variables chosen for the analysis such as the growth rate of

deposits in the bank's market, the number of bank branches divided by total banks, local per capita income and local bank wage rate. Results revealed a negative significant relationship with price. However, it is worth mentioning that the prices used in this study are paid *to* consumers rather than *by* consumers as prices usually are in other studies, thus, these results do not contradict the hypothesis that market concentration results in higher prices paid by consumers, or in other words, less favorable prices to consumers.

Newmark (1998) studied the U.S. cement industry by taking into consideration transportation costs. He used data on prices and seller concentration, precisely calculated the CR4 index, from the shipments that were done in 1964 in all the states in the US, except Hawaii where data on concentration was unavailable. Then by using different regression models, he was able to reach the following conclusions. First, he regressed price on the CR4 index without adding any other explanatory variables, and the result was a significant positive relationship between prices and concentration. In another model, he added two control variables, the reciprocal of average plant capacity (as a proxy for transportation costs) and family income, where all coefficients were shown to be significant. In another attempt he added population density and population as control variables, where the effect of concentration on price almost reached zero. Thus, according to Newmark (1998) the positive association between cement prices and seller concentration was not caused by concentration, however could be partially explained through the changes in transportation costs that were represented by average plant capacity.

Wiggins and Maness (2004) studied the relationship between concentration and prices in the pharmaceutical industry, mainly in the anti-infectives market. They used annual data on total spending and the quantity of prescriptions sold, yielding annual prices per prescription, for each seller of each of 98 compounds in anti-infectives in the period extending from 1984 to 1990. A regression analysis was first conducted to test the relationship between prices and the number of sellers, denoting market concentration. The results of this analysis showed a significant negative effect of the number of sellers on prices. Then, in another regression model the authors used HHI as a proxy for market concentration, where a significant positive relationship between HHI and prices was revealed. Thus, both models concluded that industry concentration has a significant positive impact on prices.

Furthermore, Lee and Jablonowski (2010) investigated the effect of increasing market concentration in the drilling rig market on prices. Three main regions were used in their study: the Gulf of Mexico, North Sea and West Africa, and two divisions of global drilling rig market were investigated, jackups and semisubmersibles. A regression analysis was conducted for each division taking average prices in every region as the dependent variable and the global HHI as the independent variable along with the utilization rate and the total cost index (labor index and steel index) as control variables for price changes due to supply. Monthly data was taken from 1990 to 2005. Results proved that increased concentration in the jackups market caused increases in prices; however, this result was weaker in the semisubmersibles market, although some positive effect was found.

Apergis and Monastiriotis (2013) investigated the structure of the Greek manufacturing industries and empirically studied the effect of industry concentration on prices by estimating three different versions of the Cournot model. The study included monthly data for years 2000 till 2011 involving seven industrial classifications. HHI indexes were used as proxies for concentration and the Instrumental Variable (IV) least squares method was applied. The results were similar for the three models, where the decrease in concentration was leading to decreases in prices, thus a significant positive causal relationship between concentration and prices was empirically proven.

From a different perspective, recent literature on concentration and CPI precisely is not very wide. Most recent studies investigate concentration and price levels in specific industries and do not focus on the overall price level in the country. Such studies go back to the late 1970s where Gisser and Johnson (1979) investigated the effects of increasing concentration ratios on the CPI in the US for a period of 10 years. A model comprising two goods was derived, one of the goods produced in a perfectly competitive market and another in an oligopolistic market. The assumption of Cournot was used, thus taking into consideration the number of identical firms as a proxy for concentration, and other assumptions of factor response and demand elasticities were also considered. In addition, the stock of money in circulation and velocity were taken as control variables. By estimating the created model, the result that was found can be summarized as follows: only when the oligopolistic market becomes completely monopolized there will be significant increases in the CPI. Thus, this led to the conclusion that only dramatic changes in the industry concentrations have an effect on the overall average price level.

2.2.3 Concentration on the Wholesale Level

In another study, Matsui (1992) focused on wholesaler concentration and its effect on wholesale price. He studied the Japanese wholesale markets in 49 cities and 12000 stores for the prices of 134 specifications of 38 items including national brands for a period of 1 month. The Generalized Least Squares method was used where HHIs were part of the independent variables of the estimated model. HHI indices were extracted from the number of workers instead of the amount of sales. The author included in the model dummies for the total number of wholesale stores for each product category, area dummy variables and a series of item dummy. Results proved a significant positive relationship between market concentration and prices where prices increase as the structure of the wholesale market becomes more oligopolistic. In addition, results showed that the sensitivity of the price to the degree of concentration of suppliers increases as the size of the retailer increases, due to their ability of obtaining advantageous purchase prices by dealing in a greater number of brands for the same category.

Ciapanna and Rondinelli (2014) studied the retail and wholesale market structures and consumer prices in the Euro area. They investigated the empirical relationship between product market competition and prices in the grocery sector by constructing HHI at two different levels, which lead to two different results and conclusions. Their analysis included nine Euro countries and 13 categories of goods using the Nielsen structural data for 2010. The first group was the buying group level where wholesale prices were considered, and the second group was the parent company level, where final consumer prices are set. In their study, they built a regression model by taking the average log price levels as the dependent variable, and the buying group HHI and parent companies HHI as explanatory variables. In addition, regional population density, per capita GDP and regional unemployment rates were taken as control variables. The results reached were different between both groups. For the parent company groups, a significant positive causal relationship was proven between the retail prices and HHI, inferring that an increase in competition will cause a decrease in the retail prices. However, for the buying groups, there was a significant negative causal relationship between the prices and the HHI, or in other words, a positive relationship between competition and prices, revealing the enhancement of welfare due to the countervailing power buying groups possess.

2.2.4 The Case of Lebanon

Although several hypotheses have proven the link between market concentration and prices in an attempt to investigate the determinants of price and the reasons behind inflation, only one study has been conducted to evaluate the degree of concentration in Lebanon. This study under the title "Competition in the Lebanese Economy" was conducted in 2003 by the Consultation and Research Institute (CRI) with Dr. Toufic Gaspard at the request of the Ministry of Economy and Trade. The primary goal of the study was the assessment of competition in the Lebanese economy serving as a ground for the Competition Law. Gaspard stated that 90 % of all the firms in Lebanon had a maximum of 10 workers which implies the importance of an increase in the size of the already existing firms in an attempt to benefit from economies of scale thus ensuring better profits. According to Gapsard, this highlights the need for an increase in concentration rather than increase in competition. Thus, the above statements inferred the value of an evaluation of the market structure of the main activities in the Lebanese economy before drafting the Competition Law and represented the main objective behind the analysis. For these reasons, the study mainly focused on the analysis of the market concentration and barriers to entry in the main industries of the economy precisely, agriculture, industry and services. Data from the Value Added Tax (VAT) department at the Ministry of Finance for the year 2002 was the main source of data in the study. In addition, data was collected from recent official surveys on the national accounts for 1994 and 1995, household living conditions in 1997, manpower resources in 1997 and on industry in 1998 and 1999. The CRI used the sales of the firms in order to calculate the degree of concentration in the markets, sales being the only available data in Lebanon due to the accessibility to the VAT data. The CR1, CR3 and CR5 indices were found by taking the 40% threshold adopted in the US for the 4-firm concentration ratio as a reference level for the CR1 and CR3 indices and raised the threshold to 60% for the CR5 index. Results showed that around 36% of the Lebanese markets in 2002 had a CR1 index equal or greater than 40%, meaning that one firm is highly dominating the market. In addition, around 58% of the Lebanese markets showed a CR3 index of at least 40%, also indicating a high concentration in those markets. Finally, by raising the threshold to 60%, 52% of the Lebanese markets had a CR5 index greater than or equal to 60%. Precisely, high concentration markets were mostly found in the manufacturing industry, mainly in markets such as: soft drinks, mineral waters, hygienic paper and diapers, pesticides and other agro-chemical products, soap, detergents and house cleaning products, cement, lime and plaster, articles of concrete, cement and

plaster, treatment and coating of metals, general mechanical engineering, insulated wire and cable and repair of electrical elevators. Another industry that witnessed high concentration markets was the wholesale trade industry including markets of liquid fuel, live birds and other animals, solid, liquid, gaseous fuels and related products, liquid fuels and mineral oils and liquid gas in bottles. A third industry witnessing high concentrations was the services industry mainly in markets of renting of electronic equipment (computers) and sewage and refuse disposal, sanitation and similar activities. As a conclusion, almost 50% of the Lebanese markets in Lebanon, representing a minimum of 40% of the total market turnover, can be considered as monopolistic or oligopolistic, due to the high concentration levels they witnessed. "High concentration implies monopolistic and oligopolistic behavior, with the expectation of collusion among enterprises, and other restrictive practices that lead to prices being greater, and investment lower, than they would be under conditions that are more competitive" (Gaspard, 2003, p. 31).

2.3 Conclusion

This research initiates from the 2003 Lebanese report that investigated the degree of concentration in the Lebanese markets during 2002 and attempts to replicate the study by computing the degrees of concentration through different concentration ratio indices, however with some removals and additions. Precisely, only 3 industries are selected for the investigation, namely, food and beverage, housing and the transport industries. As additions to the above mentioned report, an investigation is done for 54 time periods instead of one. Furthermore, as in many other researches, an investigation on the existence and type of relationship between concentration and prices is conducted. Subsequently, similar to only a few articles in the literature, this research attempts to link CPI to industry concentration and generate suggested models that shall clarify the existence and types of relationships between concentration and price levels, by taking into consideration the most used concentration ratio index (CR4) and other macroeconomic and microeconomic control variables. Thus, such a study will be important in order to evaluate the level of competition in the leading Lebanese industries and perhaps, find the roots of the high price levels. As a result, it may provide another ground for the most probable conclusion and well-known belief, that increases in

concentration could be the cause of higher prices, or in other words, prices are increased as an effect of a decrease in competition.

Chapter 3: Procedures and Methodology

3.1 Introduction

This study primarily attempts to explain the price levels in Lebanon and their variation in terms of market structure. For this purpose, an evaluation of the market structure in the food and beverage, housing and transportation industries was found feasible because they represent the main categories of the consumer basket of goods in Lebanon and thus have a high contribution in the measurement of the CPI levels (i.e. 62.2%) increasing their representativeness of the overall price level in Lebanon. In addition to that, the study attempts to investigate the relationship between the market concentrations of each of the three main industries with the CPI corresponding to each of those three categories.

The sections that follow explain the methodology adopted to fulfill the purpose of the study. The population and sampling approach are discussed in the second section. Sections three and four describe the research strategy and methodology. Section five provides a detailed explanation of each of the variables understudy, while section six designates the suggested models. The analysis framework is described in the seventh section, clarifying the purpose and need of all the tests that will be conducted. Finally, section eight concludes the chapter.

3.2 Population and Sampling Approach

All single product markets and establishments operating from 2002 till 2016 in the food and beverages, housing and transportation industries in Lebanon would denote the total population understudy. Their specific number varies through the different time periods, and is shown in table 3.1 in the appendix as collected through the compilation of data from the Value Added Tax (VAT) report available at the Ministry of Finance.

Census sampling would be ideal in such studies because as much as the number of establishments covered increases, the more the accuracy of the measure, so that would be ideal if the whole population is considered. However, stratified random sampling is used in this study because census

sampling would be inapplicable in the case of Lebanon for different reasons as reported in the 2003 report already mentioned in chapter one (Gaspard, 2003). One of the reasons would be the exclusion of the establishments that are not subject to VAT reporting and thus are out of scope of VAT. Another reason for some omissions is the failure of some VAT-eligible establishments in submitting to the Ministry of Finance the needed information for the corresponding years. Fifty four observations for each of the selected markets are found since quarterly data was retrieved for each of the years from 2003 till 2015, in addition to the last quarter of 2002 and the first quarter of 2016. The selection of the years is justified in the methodological section below.

3.3 Research Strategy

The research strategy used in the study is archival data where secondary data will be retrieved from the VAT reports provided by the Ministry of Finance, which represent the primary source of information for the analysis of concentration in Lebanon through the calculation of concentration ratios. Although sales are the most known variables in concentration measures, other factors like employment, output or capital could also be used. However, with the possibility of retrieving data from the above mentioned source, sales are the only available data in the case of Lebanon. In addition, the Consultation of Applied Statistics institution (CAS) represents another source of information for CPI. Furthermore, the Central Bank of Lebanon is a third source for the data concerning the money in circulation and the Federal Reserve Economic Research Division represented the source for the unemployment rate.

3.4 Research Methodology

The secondary data is analyzed and used in conducting statistical tests which represents the content analysis methodology. This method ensures the explanation of the bulk of data retrieved. It is applied by choosing an appropriate sample, breaking it down to smaller components if needed, conducting descriptive statistics and analyzing data and relationships through inferential statistics.

The most important issue in measuring concentration is being able to specify the boundaries of the product markets, which is usually applied through the "substitution possibilities on the demand

side" (Gaspard, 2003, p.21). In other words, by defining substitutes through their cross-elasticities which is supposed to be "high" enough to denote them as substitutes and thus represent them in one particular market. However, methodologically speaking, this approach is somehow difficult and not feasible[2], thus evaluation through common sense is crucial (Gaspard, 2003). In addition, the report conducted in 2003 implements the grouping used by the Ministry of Finance which uses the International Standard Industrial Classification (ISIC) for defining market boundaries. Hence, this study too adopts the classification used by the ministry at the present time.

Linear and causal relationships are the purpose of this study, where coefficients of correlation, determinants and their weights are targeted. This purpose, in addition to having metric variables and time series data of a random (stratified) sample, validates the use of regression analysis using the OLS regression method. The choice of the 54 observations mentioned in the above section, is justified by the need of time series data to perform the regressions needed for the study. As mentioned above, this study attempts to detect associations and consequently test the existence of causal relationships between the degree of concentration in the food and beverages, housing and transportation industries and their corresponding CPI levels. The VAT department was founded at the beginning of 2002, thus the only available reported accurate data at the data collection stage of this study start at the fourth quarter of 2002 and end at the first quarter of 2016. Thus, in order to ensure consistency, data concerning all the variables understudy were retrieved quarterly starting from the fourth quarter of 2002 until the end of data collection for this paper at 2016.

3.5 Variables and Suggested Hypotheses

In an attempt to fulfill the previously mentioned purposes of this paper several variables will be used for the different hypotheses and assumptions that will be tested. In the following two sections there is a detailed explanation of each of the variables understudy, the calculation of the concentration ratio indices, the dependent and explanatory variables including the control variables, for each model and the corresponding research questions and suggested hypotheses.

[2] This requires an estimation of each cross-elasticity of each two products separately, which makes it impossible given the data and time constraint for this paper. However, this could provide an interesting topic for further research.

3.5.1 Concentration ratio indices

Concentration ratios are used to measure the degree of concentration in a specific industry or market. In this paper, 4 concentration ratio indices were calculated from the sales data for each of the three selected industries in 54 periods starting from the 4th quarter of 2002 till the 1st quarter of 2016. Each concentration ratio was computed based on its significance. The calculation of the concentration ratios is essential for the description of the market structure in the industries understudy while attempting to answer the first two research questions: What was the market structure of the food and beverages, housing and transportation industries in Lebanon in each of the selected periods? Have those industries become more or less concentrated since 2002 till 2016?

Concentration ratio-one (CR1)

This index denotes the sales share of the firm with the highest sales value in each quarter. It is calculated by dividing the sales of the top 1 firm by the total sales of all the firms operating in the same industry in the same selected period.

Concentration ratio-three (CR3)

This index denotes the sales share of the three firms with the highest sales value in each quarter. It is calculated by dividing the sum of the sales of the top 3 firms by the total sales of all the firms operating in the same industry in the same selected period.

Concentration ratio-four (CR4)

This index denotes the sales share of the four firms with the highest sales value in each quarter. It is calculated by dividing the sum of the sales of the top 4 firms by the total sales of all the firms operating in the same industry in the same selected period.

Concentration ratio-five (CR5)

This index denotes the sales share of the five firms with the highest sales value in each quarter. It is calculated by dividing the sum of the sales of the top 5 firms by the total sales of all the firms operating in the same industry in the same selected period.

3.5.2 Consumer Price Indices (CPIs)

According to the Central Administration of Statistics, around 50,000 prices are collected monthly in order to obtain the significant CPI measure. In addition, based on a special survey that was done in 2007, selected retail outlets were chosen to be included in the price collection process, which sum up to around 2000 retail outlets. As previously mentioned, data on CPI was retrieved from the CAS, however they were available based on three different base periods and different corresponding weights, and thus they had to be adjusted based on the unified selected base period December 2013 and weights had to be adjusted to represent a consistent weight for each item.

The CPI basket is divided into 12 divisions according to "The Classification of Individual Consumption by Purpose" as published by the UN , however, only three selected items are investigated in this paper, which actually possess the three highest weights among the 12 other items, representing around 63% of the expenditure divisions (according to the most recent update of the weights), with housing, water, electricity, gas and other fuels (around 29%), food and beverages (around 21%) and transportation (around 13%).

CPI- Food and Beverage

This item includes the prices of selected foods and beverages that are actually acquired by households based on detailed information about the buying habits of households, highlighting the most purchased varieties and brands. In 1997, the weight of this category was 34.6 % of the CPI, decreased to 22 % in 2007 and reached 22.2 % since 2014.

CPI- Housing

This item includes the prices of selected products related to activities including actual rents for housing (private furnished and unfurnished rent), the regular maintenance and repair of the dwelling, water supply and miscellaneous services for the dwelling, in addition to, electricity, gas and other fuels. According to the CAS, which denotes the main source of data on CPI in this paper, based on a sample of 1200 residences distributed in different regions in Lebanon, rental data are

collected twice a year. In 1997, the weight of this item was 8.8 % of the CPI, increased to 25.7% in 2007 and became 28.5% since 2014.

CPI- Transport

This item includes the prices of selected products based on activities including the purchase of vehicles (new cars and second hand cars), the operation of personal transport equipment (including spare parts, fuels, car maintenance and repairs, etc....) and transport services. In 1997, the weight of this item was 11.3 % of the CPI, increased to 12.3% in 2007 and reached 13.1% since 2014.

Is there a relationship between market concentration of each of the above mentioned industries and its corresponding industry-specific CPI? Is there a relationship between the market concentrations of the three industries with the overall CPI?

According to most of the literature and to the models linking the increase in concentration to higher prices and inflation, higher CPI levels are expected to be witnessed with lower levels of competition. In an attempt to answer the above research questions and investigate the existence of the expected positive linear associations between any of the concentration ratio indices and industry-specific CPI and the overall CPI, the following six hypotheses are developed:

H1: As the degree of concentration in the food and beverage industry increases, the CPI-food and beverage increases.

H2: As the degree of concentration in the housing industry increases, the CPI- housing increases.

H3: As the degree of concentration in the transport industry increases, the CPI- transport increases.

H4: There is a positive relation between one (or more) concentration ratio index (indices) in the food and beverage industry and the overall CPI.

H5: There is a positive relation between one (or more) concentration ratio index (indices) in the housing industry and the overall CPI.

H6: There is a positive relation between one (or more) concentration ratio index (indices) in the transport industry and the overall CPI.

3.6 Generated Suggested Models

In addition to the detection of linear associations between market concentration and industry-specific CPIs or overall CPI, this study attempts to generate models describing the kind of relationships existing between them as will be discussed in this section through the multiple linear regression method. However, it is worth mentioning that the models that will be tested are the ones including the variables that show encouraging results in the correlation tests, although all the models will be mentioned in this section. This paper will use two commonly used software packages, specifically the Statistical Package for the Social Sciences (SPSS) and e-views, to run the statistical tests and assess the determinants of the price levels in Lebanon.

3.6.1 Industry-Specific Models (Models 1 to 3)

Subsequently, the first three generated models will have the industry-specific CPI as the dependent variable and market concentration in the corresponding industry as an independent variable, along with the most used macroeconomics control variable in the literature and an industry specific control variable, as shown in the functional form:

$$\mathbf{CPIi = \beta 0 + \beta 1\ CONi + \beta 2\ MRKi + \beta 3\ MONEY + \varepsilon}$$

Market concentration (denoted as CONi proxied by CR4 since it is the most used in the literature among other concentration ratio indices): measures the degree of competition in the corresponding industry understudy.

Market size (denoted as MRK, proxied by the number of firms): measures the number of firms operating in the corresponding industry understudy in each quarter.

Money in circulation (denoted as MONEY, proxied by the money in circulation published data from the central bank): measures the amount of money available in the economy for consumption.

Error term (denoted as ε): measures the error term of the model.

This model summarizes the first three models understudy by taking each industry by itself with its concentration ratio index and corresponding CPI.

Similar to what most of the literature signifies, as the degree of concentration increases, market power of the dominating firms increases, thus increasing their ability to affect prices and subsequently increase them. From an opposite perspective, as the number of firms operating in the same industry increases, prices tend to decrease because market share and power are distributed among a larger number of firms. Finally, as money in circulation increases, people are able to buy more and subsequently demand more products, which most probably causes higher prices.

Thus, increases in market concentration and money in circulation are expected to increase the industry-specific CPI, whereas increases in market size are expected to decrease price thus, the expected signs of the estimated coefficients are: $\beta 1 > 0$, $\beta 2 < 0$, $\beta 3 > 0$.

The above model can be translated to the following 3 hypotheses[3]:

H7: An increase in the concentration ratio index in the food and beverage industry increases the CPI- food and beverage.

H8: An increase in the concentration ratio index in the housing industry increases the CPI- housing.

H9: An increase in the concentration ratio index in the transport industry increases the CPI- transport.

[3] In case the results of the unit root test that will be explained later reveal a need for differenced variables, then the model will have the functional form: $D(CPIi) = \beta 0 + \beta 1\ D(CONi) + \beta 2\ D(MRKi) + \beta 3\ D(MONEY) + \varepsilon$ and these hypotheses will be: An increase in the **change** in the concentration ratio index increases the **change** in the industry specific CPI in each of the 3 industries.

3.6.2 Models 4 to 6

The next three generated models have the overall CPI as the dependent variable and a selected concentration ratio index for each corresponding industry as an independent variable, along with the most used macroeconomics control variables in the literature, as shown in the functional form:

$$\textbf{CPI overall} = \beta 0 + \beta 1\ \text{CONi} + \beta 2\ \text{MONEY} + \beta 3\ \text{UNEMPLOYMENT} + \varepsilon$$

Market concentration (denoted as CONi as mentioned for the previous model.

Money in circulation (denoted as MONEY as mentioned for the previous model.

Unemployment rate (denoted as UNEMPLOYMENT, proxied by the unemployment rate published by the central bank): measures the number of people in the labor force who are unable to find a job in Lebanon in each quarter.

Error term (denoted as ε): measures the error term of the model.

This model summarizes the next three models understudy by taking each industry by itself with its concentration ratio index and the overall CPI.

As the increase in industry concentration is expected to increase the industry-specific CPI, it is also expected to increase the overall CPI due to the increase in the market power of the dominating firms. Again, as money in circulation increases, people are able to buy more and subsequently demand more products, which most probably causes higher average prices. Oppositely, as unemployment increases, demand decreases and thus the overall level of prices is supposed to decrease.

In summary, all the explanatory variables are expected to increase the overall CPI, except for unemployment, thus, the expected signs of the estimated coefficients are: $\beta 1 > 0$, $\beta 2 > 0$, $\beta 3 < 0$.

The above model can be translated to the following 3 hypotheses[4]:

H10: An increase in the concentration ratio index in the food and beverage industry increases the overall CPI.

H11: An increase in the concentration ratio index in the housing industry increases the overall CPI.

H12: An increase in the concentration ratio index in the transport industry increases the overall CPI.

3.7 Analysis Framework

This study investigates quantitative data that are metric in nature. Therefore, descriptive statistics will be first conducted to describe the past behavior of variables. The descriptive statistics applicable with metric scales are the mean for central tendency and the standard deviation for dispersions. In addition, skewness and kurtosis are measured for each variable for a better description of the variables.

Next, a preliminary statistical analysis is conducted where the coefficients of correlation between all the industry-specific concentration ratio indicators and each of the industry-specific CPI and overall CPI are computed in order to detect any possible linear associations between the concentration ratios and CPI. This shall trigger (or not) the attempt to detect possible causal

[4] In case the results of the unit root test that will be explained later reveal a need for differenced variables, then the model will have the functional form:

D(CPI overall) = $\beta 0 + \beta 1$ D(CONi)+ $\beta 2$ D(MONEY)+ $\beta 3$ D(UNEMPLOYMENT) + ε and these hypotheses will be: An increase in the **change** in the concentration ratio index in each of the 3 industries separately increases the **change** in the overall CPI.

relationships in each model since linear regression primarily requires a linear relationship between the dependent and independent variables. For that reason, as previously mentioned only the models where linear associations are significant will be further investigated. As a next step, a unit root test is conducted to check if the variables that shall be used in regression are stationary and thus run the regressions in levels. If the variables are non-stationary, then a regression in first difference shall be the solution.

Finally, an econometric analysis or inferential statistics is conducted to describe the behaviors of the variables and test the existence and types of relationships found among those proving to have strong linear associations among them in the preliminary statistical analysis previously explained. As mentioned above, parametric tests are conducted, specifically the multiple linear regression analysis, in an attempt to detect possible causal relationships between industry concentration and CPI. Furthermore, the assumptions for linear regression are tested in order to validate the use and results of the selected parametric inferential test explained above. First, multicollinearity is tested by calculating the correlations found among the explanatory variables to ensure that the explanatory variables themselves are not highly correlated. Second, homoscedasticity of the residuals, which denotes that the variance of errors is consistent across the explanatory variables, is tested using the white test, in addition to the Jarque-Berra test which will be applied on the residuals too to verify the normality of each model. In case the two assumptions of homoscedasticity and normality are not verified, the Newey-West estimator will be used to retest the significance of the variables understudy while correcting for non-normality and heteroskedasticity. Finally, autocorrelation is tested using the Durbin Watson test ensuring that the dependent variable itself is not related to its value at different time periods and that the residuals are independent.

3.8 Conclusion

This chapter represented the different methodologies, strategies and approaches adopted for the purpose of fulfilling the required research. It began with a clarification of the purpose of the study. Next, the population denoting all the firms operating in the food and beverage, housing and transportation industries was stated. In addition, the reason for the use of a stratified random

sample based on the data available at the VAT department at the Ministry of Finance was further clarified. Thus, based on the secondary data source, archival data was stated as the research strategy used in this study. Later, each of the variables understudy was explained in detail with clarifications on the purpose of use, data collection and source of each. As a result, the regression models under study were explained in detail with the expected outcomes of each. Finally, the main assumptions to validate the use of linear regression and the descriptive and inferential statistics that is conducted were indicated.

Chapter 4: Findings

4.1 Introduction

Being one of the major concerns of all economies, the price level has been a topic of investigation for decades. Several variables have been associated to the increases and decreases in price levels, one of which is the level of competition. By favoring social welfare, economies must strive to find what causes the increases in prices and thus try to fight it, since it is known as the worst public enemy to consumers. However, Lebanon is not showing continuous efforts and interest to evaluate its degrees of competition and the causes of the high price levels it could be struggling from and its unexplained changes.

While taking into consideration the insufficient empirical studies that investigate the relationship between competition and the price level in Lebanon, this chapter examines this relationship. In order to reach its aim, this thesis first evaluates the degree of concentration in three main industries in Lebanon for the period extending from 2002 till 2016. For these purposes, this paper relies on the SPSS and e-views. Data analysis primarily focuses on two broad types of statistics, the descriptive statistics, where the past behavior of the variables is described, and the inferential statistics. As stated in previous chapters, this thesis uses secondary data from several sources, which shall be described in the descriptive statistics. Furthermore, two major inferential statistics tests are conducted, the correlation and the multiple linear regression.

This chapter is organized as such. The next section reveals the evaluation of the degree of concentration in the three industries and describes the change in competition throughout the period understudy. Section three exposes the descriptive statistics of the variables understudy. Section four states the results of the tested correlations. The results of the unit root tests conducted on the variables that will be used in the regression analysis are revealed in section five. In the sixth section, the application and results of the multiple linear regression approach are stated with the verification of its assumptions. Finally, section seven concludes the whole chapter.

4.2 Evaluation of the Level of Competition

Regarding competition, as previously explained in the methodology chapter, four concentration ratios are calculated and a threshold of 40% is applied to evaluate the resulting degrees and thus consider a market as oligopolistic. For that purpose, this thesis computed the concentration ratio one, three, four and five indices for each of the three main industries understudy for the period extending from the 4th quarter of 2002 till the 1st quarter of 2016. The tables showing the detailed numerical results are found in tables 4.26 to 4.29 in the appendix. However, the following graph reveals the trend and behavior of the concentration ratio four index for the three industries. For further details, figures 4.19 to 4.21 in the appendix show the graphs of the other three indices.

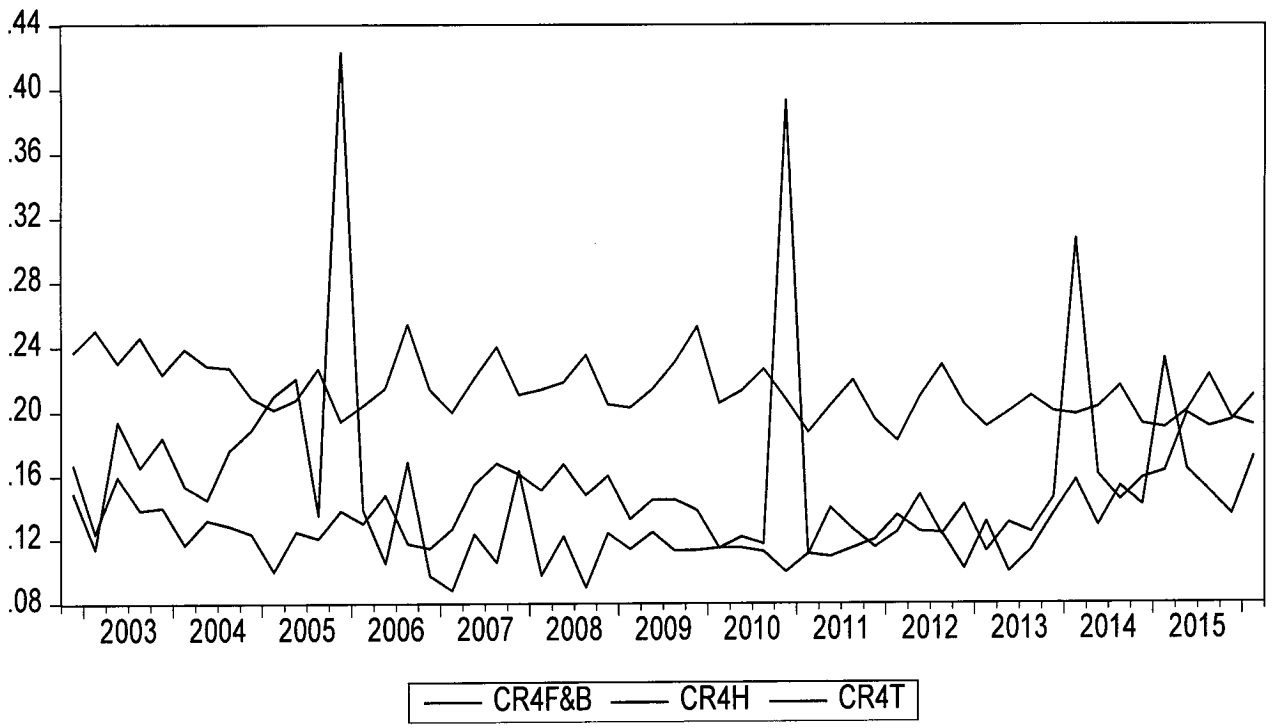


Figure 4.1: Concentration ratio four index, source: e-views

4.2.1 The Market Structure in the Food and Beverage Industry

As shown in the above figure and in table 4.28 in the appendix, the concentration ratio four index (CR4) in the food and beverage industry ranges from the lowest degree being around 18.2% in the 1st quarter of 2012 with 785 firms operating in this industry at that period to the highest degree being 25.4% in the 3rd quarter of 2006 with 537 operating firms. By taking into consideration the threshold of 40%, the food and beverage industry in Lebanon has not been oligopolistic for any quarter of the period understudy. However, moving from about 290 firms in 2002 to 902 firms in 2016, and keeping almost the same concentration ratio four index, which in other words means that only 4 firms out of the total number of firms operating in the industry possess between 18 and 25% of the whole market sales, which could not be considered low. Thus, the food and beverages industry in Lebanon is dominated by relatively high degrees of concentration, however, not as high as to be considered oligopolistic. Competition in the food and beverages industry is fair.

Furthermore, according to table 4.28 in the appendix, in the last quarter of 2002 the CR4 index of the food and beverage industry measured 23.65% with 290 operating firms and at the 1st quarter of 2016, the CR4 index was 19.11 % with 902 operating firms. As noticed, the number of firms has largely increased and yet there is a slight decrease in the concentration ratio. Thus, as a matter of fact, the food and beverage industry has become less concentrated, or in other words, more competitive from 2002 till 2016. Figure 1 shows a slight decreasing trend in the blue curve representing the food and beverages industry.

4.2.2 The Market Structure in the Housing Industry

The degree of concentration in the housing industry ranged from the lowest degree being around 8.76% in the 1st quarter of 2007 with 1234 firms operating in this industry at that period to the highest degree being 42.3% in the last quarter of 2005 with 1062 operating firms, as exposed in the above figure and in table 4.28 in the appendix. Thus, by taking into consideration the threshold of 40%, the housing industry in Lebanon was considered oligopolistic only in the 4th quarter of 2005, where it was the least competitive throughout the whole period. At other quarters in the period understudy, the degree of concentration in the housing industry was always less than 20% except for the 1st quarter of 2015, where the CR4 index measured 23.27% but yet, the industry

could not be considered not competitive. As revealed in the above figure, the graph representing the housing industry is below that representing the food and beverage industry (except for the 2 exceptions), thus the housing industry is more competitive than that of the food and beverage.

In addition to that, according to table 4.28 in the appendix, in the last quarter of 2002 the CR4 index of the housing industry was 14.89% with 590 operating firms and at the 1st quarter of 2016, the CR4 index was 17.17 % with 2429 operating firms. As noticed, the number of firms has also largely increased and the degree of concentration has slightly increased. Thus, as a matter of fact, it is quite harder to evaluate whether competition has decreased or increased, and taking into consideration the slight difference in the values computed, the housing industry in Lebanon cannot be considered more concentrated at the beginning of 2016 compared to the end of 2002.

4.2.3 The Market Structure in the Transport Industry

As revealed in the above figure and in table 4.28 in the appendix, the degree of concentration in the transport industry ranged from the lowest degree being around 9.94% in the 1st quarter of 2005 with 1914 firms operating at that period to the highest degree of 39.32% in the last quarter of 2010 with 3777 operating firms. Thus, by taking into consideration the threshold of 40%, the transport industry in Lebanon was not oligopolistic throughout the whole period understudy. Only two quarters witnessed more concentration than the obvious trend of CR4 for this industry and could be considered the periods that witnessed least competitiveness in the transport industry which are, the previously mentioned highest level of CR4 during the last quarter of 2010 and during the 1st quarter of 2014 where the CR4 index measured 30.7%. From the above figure we can conclude that the graph representing the transport industry is almost at the same level of that of the housing industry but below that representing the food and beverage industry (except for the 2 exceptions), thus the transport industry too is more competitive than the industry of food and beverage.

Moreover, according to table 4.28 in the appendix, in the last quarter of 2002 the CR4 index of the transport industry was 16.69% with 855 operating firms and at the 1st quarter of 2016, the CR4 index was 20.99 % with 4544 operating firms. As noticed, in this industry too, the number of firms has extremely increased and the degree of concentration has increased too. Thus, we can conclude that the transport industry has become a little more concentrated, less competitive from 2002 till

2016. Figure 1 shows a slight increasing trend in the green curve representing the transport industry, especially in the last couple of years, thus confirming what was just stated.

In summary, all three industries are not dominated by high degrees of concentration and cannot be considered oligopolistic and the behavior of competition differs among them throughout the period understudy. However, although not completely oligopolistic, they cannot be considered very competitive, and the food and beverage is the least competitive among the three.

4.3 Descriptive Statistics

Descriptive statistics is used to describe the past behavior of the variables and mainly focuses on a better understanding of the data in order to make a correct choice concerning the inferential statistics that shall be carried out. This is done basically through two statistical tests, the central tendency, which is measured using the mean in our case and dispersion that is measured using the standard deviation. In addition, skewness and kurtosis are measured for a better understanding of the data. E-views is selected for this section, since it demonstrates in a clear way the above mentioned statistics in 1 single table with the graph of each variable[5] understudy. Furthermore, it conducts the Jarque-Bera significance test and demonstrates it in the same table, which shall be used in this section to describe whether the variable is normally distributed or not, and later in section five, as a tool for the verification of normality, one of the assumptions of regression.

[5] The descriptive statistics for the CR1, CR3 and CR5 indices in each industry are found in figures 4.22 to 4.30 in the appendix.

4.3.1 CPI-food and beverage

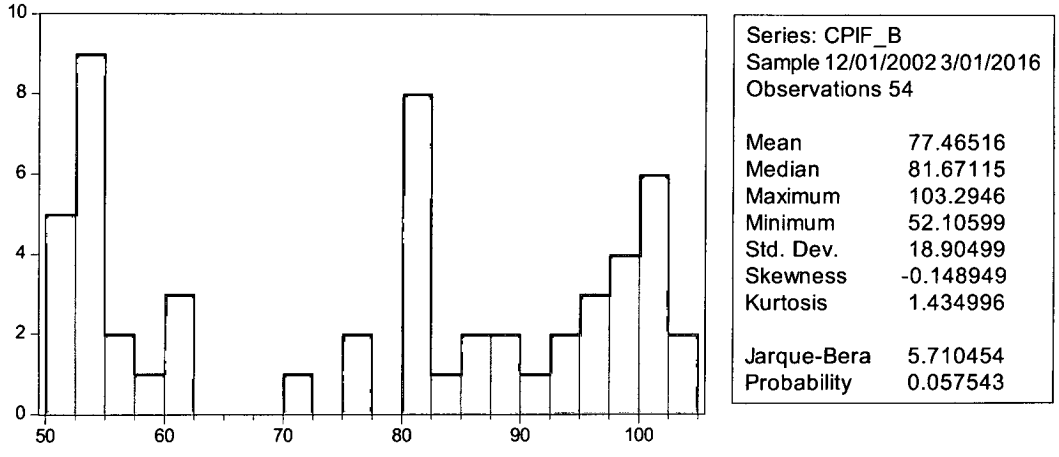


Figure 4.2: Histogram CPI (F&B), source: e-views

The Jarque-Bera (J.B.) test assumes normality in its null hypothesis, thus any probability of less than 0.05 rejects normality at the 5% significance level and a probability of 0.01 and below rejects normality at the 0.01 significance level. The probability of Jarque-Bera for $CPI_{F\&B}$ is around 0.058 implying that this variable is normally distributed at the 0.05 significance level.

4.3.2 CPI-housing

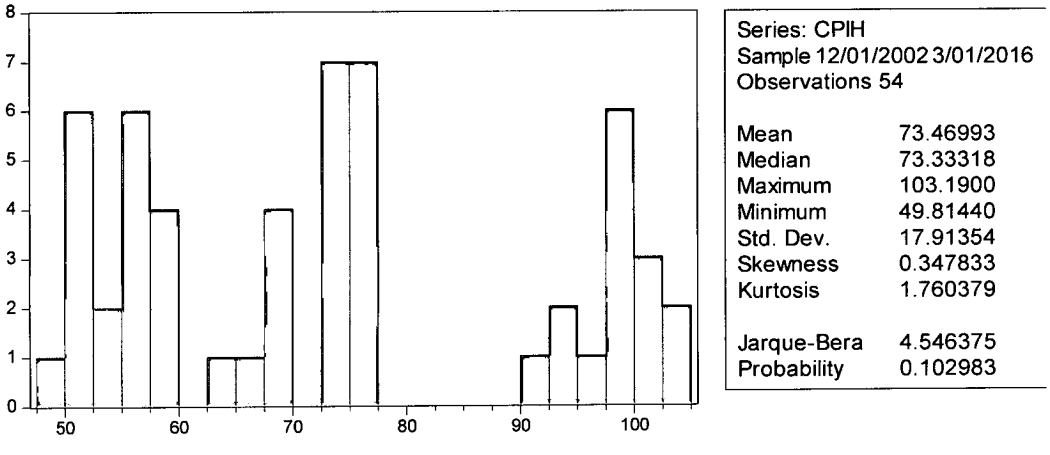


Figure 4.3: Histogram CPI (housing), source: e-views

The probability of J.B. for $CPI_{housing}$ is around 0.1 implying that this variable is normally distributed at the 5% significance level.

4.3.3 CPI-transport

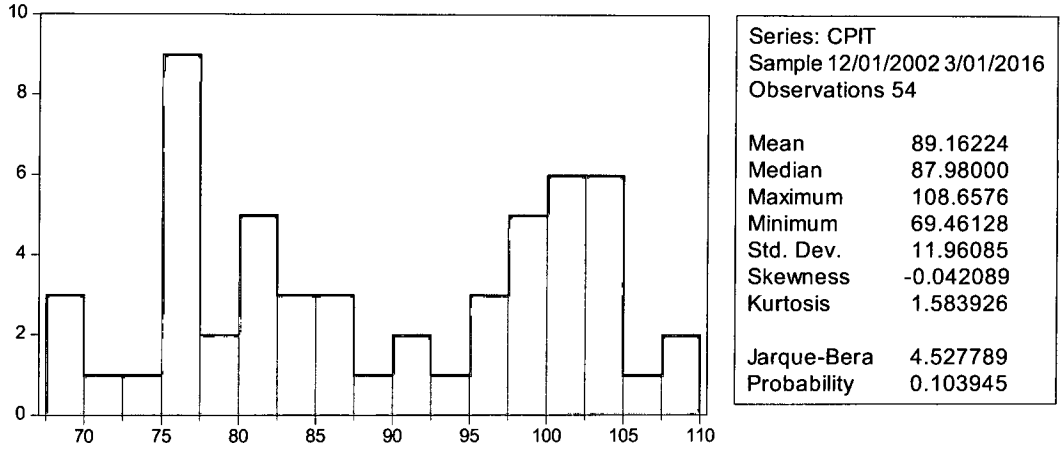


Figure 4.4: Histogram CPI (transport), source: e-views

The probability of J.B. for $CPI_{transport}$ is around 0.1 implying that this variable is normally distributed at the 5% significance level.

4.3.4 Overall CPI

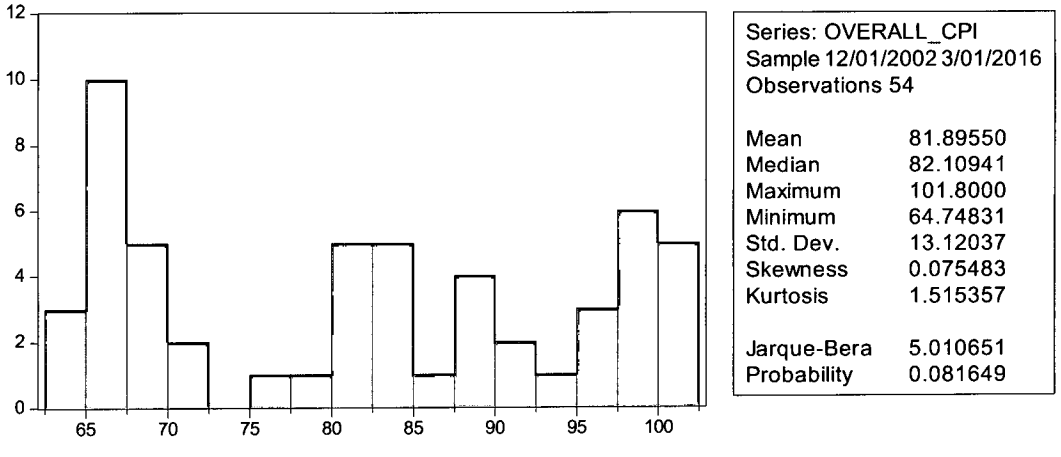


Figure 4.5: Histogram overall CPI, source: e-views

The probability of J.B. infers that it is normally distributed at the 5% significance level.

4.3.5 Concentration Ratio Four Index for the Food and Beverage Industry

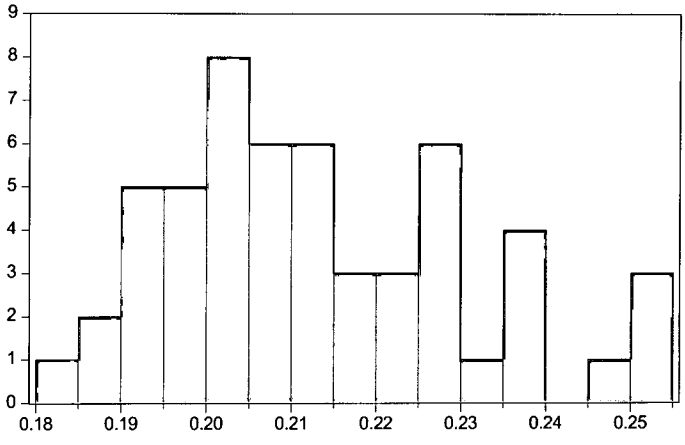


Figure 4.6: Histogram CR4 (F&B), source: e-views

The probability of J.B. for the CR4 index in the food and beverage industry is around 0.24 implying that this variable is normally distributed at the 5% significance level.

4.3.6 Concentration Ratio Four Index for the Housing Industry

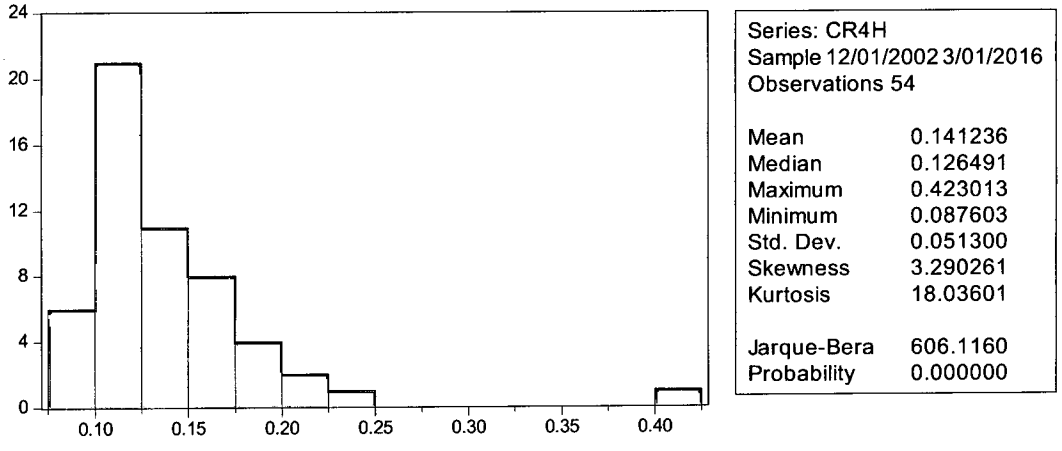


Figure 4.7: Histogram CR4 (housing), source: e-views

The probability of J.B. for the CR4 index in the housing industry is below 0.01 which rejects normality at the 0.01 significance level.

4.3.7 Concentration Ratio Four Index for the Transport Industry

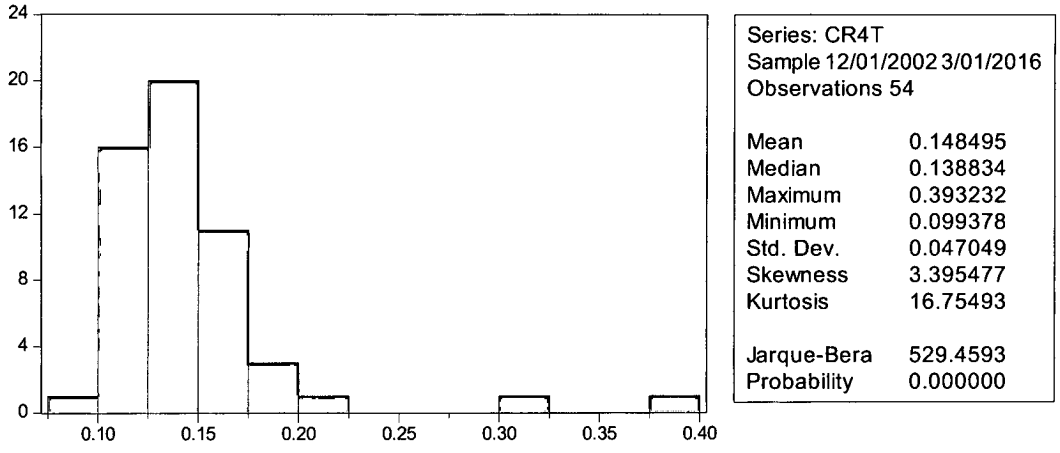


Figure 4.8: Histogram CR4 (transport), source: e-views

The probability of J.B. for the CR4 index in the transport industry is below 0.01 which rejects normality at the 1% significance level.

4.3.8 Market Size in the Food and Beverage Industry

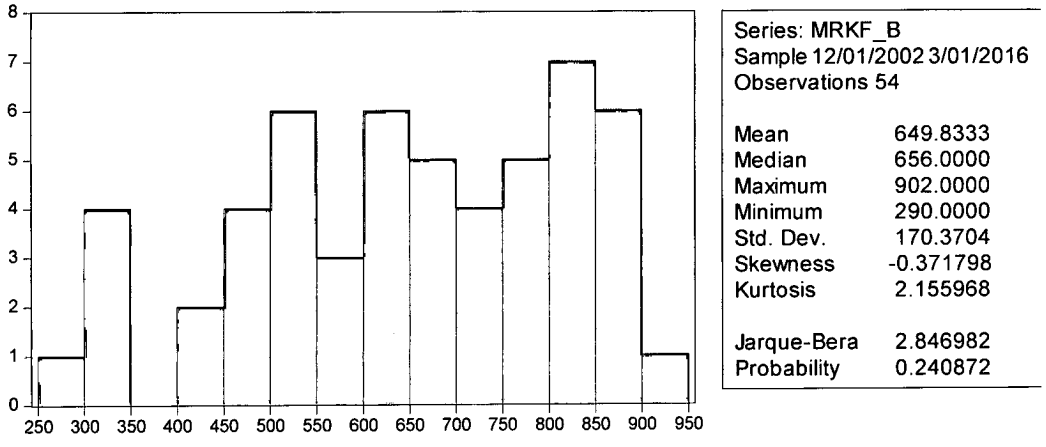
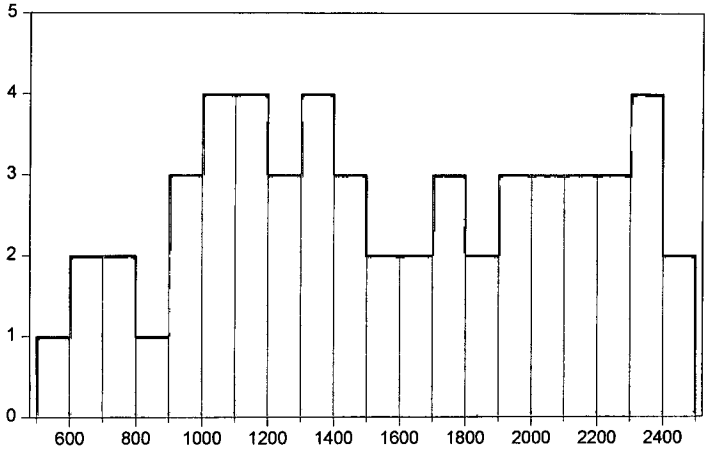


Figure 4.9: Histogram market size (F&B), source: e-views

The probability of J.B. for the market size in the food and beverage industry is around 0.24 implying that this variable is normally distributed at the 5% significance level.

4.3.9 Market Size in the Housing Industry

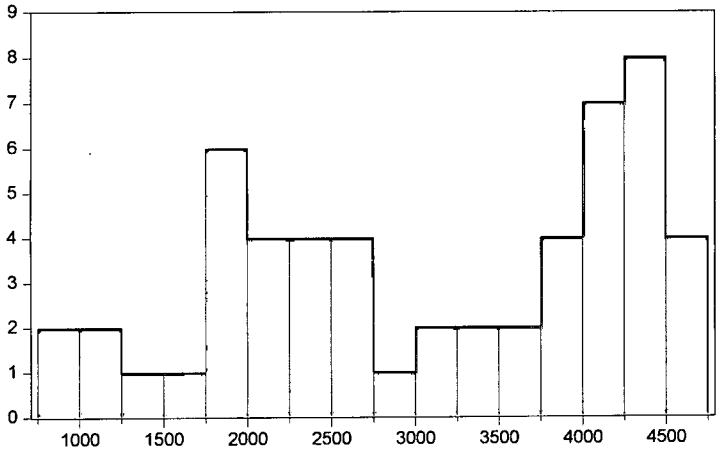


Series: MRKH	
Sample 12/01/2002 3/01/2016	
Observations 54	
Mean	1555.407
Median	1507.000
Maximum	2429.000
Minimum	590.0000
Std. Dev.	543.9297
Skewness	0.003313
Kurtosis	1.788238
Jarque-Bera	3.303925
Probability	0.191673

Figure 4.10: Histogram market size (housing), source: e-views

The probability of J.B. for the market size in the housing industry is around 0.19 implying that this variable is normally distributed at the 5% significance level.

4.3.10 Market Size in the Transport Industry

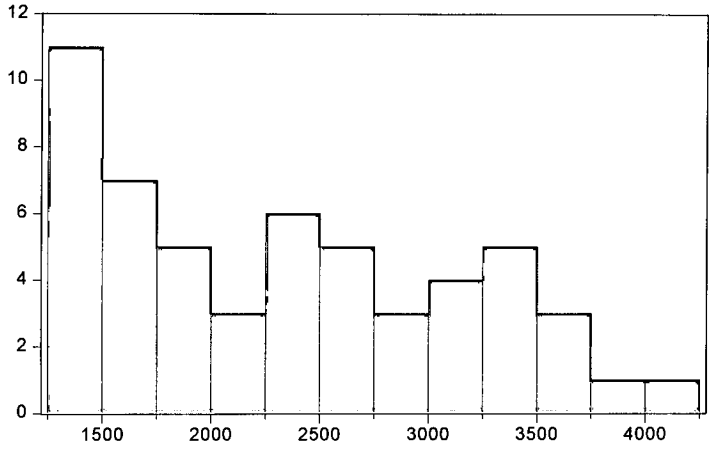


Series: MRKT	
Sample 12/01/2002 3/01/2016	
Observations 54	
Mean	3114.519
Median	3281.000
Maximum	4544.000
Minimum	855.0000
Std. Dev.	1150.382
Skewness	-0.301547
Kurtosis	1.712468
Jarque-Bera	4.548290
Probability	0.102885

Figure 4.11: Histogram market size (transport), source: e-views

The probability of J.B. for the market size in the transport industry is around 0.1 implying that this variable is normally distributed at the 5% significance level.

4.3.11 Currency in Circulation

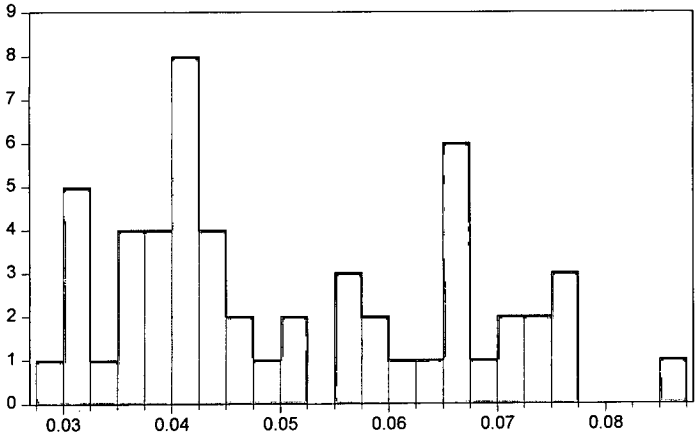


Series: CURRENCY_IN_CIRCULATION_	
Sample 12/01/2002 3/01/2016	
Observations 54	
Mean	2355.144
Median	2325.900
Maximum	4013.800
Minimum	1339.400
Std. Dev.	806.9905
Skewness	0.421358
Kurtosis	1.921014
Jarque-Bera	4.217360
Probability	0.121398

Figure 4.12: Histogram currency in circulation, source: e-views

The probability of J.B. for the currency in circulation is around 0.12 implying that this variable is normally distributed at the 0.05 significance level.

4.3.12 The Unemployment Rate



Series: UNEMPLOYMENT_RATE	
Sample 12/01/2002 3/01/2016	
Observations 54	
Mean	0.050870
Median	0.045000
Maximum	0.085000
Minimum	0.029000
Std. Dev.	0.015213
Skewness	0.427500
Kurtosis	1.908964
Jarque-Bera	4.323119
Probability	0.115145

Figure 4.13: Histogram unemployment rate, source: e-views

The probability of J.B. for the unemployment rate is around 0.11 implying that it is normally distributed at the 0.05 significance level.

4.4 Testing the Correlations

As stated in the methodology chapter, detecting associations between the variables shall induce (or not) a further step in inferential statistics where we attempt to detect causal relationships. This section is devoted for the detection of linear associations between the degrees of concentration and consumer price indices by testing hypotheses 1 to 6 through the Pearson correlation test conducted using the SPSS.

4.4.1 Testing Hypothesis 1

H1: As the degree of concentration in the food and beverage industry increases, the CPI-food and beverage increases.

Correlations

		CR1.fb	CR3.fb	CR4.fb	CR5.fb	CPI.fb
CR1.fb	Pearson Correlation	1	.774**	.672**	.549**	-.037
	Sig. (2-tailed)		.000	.000	.000	.793
	N	54	54	54	54	54
CR3.fb	Pearson Correlation	.774**	1	.945**	.834**	-.271*
	Sig. (2-tailed)	.000		.000	.000	.047
	N	54	54	54	54	54
CR4.fb	Pearson Correlation	.672**	.945**	1	.965**	-.515**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	54	54	54	54	54
CR5.fb	Pearson Correlation	.549**	.834**	.965**	1	-.669**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	54	54	54	54	54
CPI.fb	Pearson Correlation	-.037	-.271*	-.515**	-.669**	1
	Sig. (2-tailed)	.793	.047	.000	.000	
	N	54	54	54	54	54

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

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

Table 4.1: Pearson Correlations, concentration (F&B) with CPI (F&B), source: SPSS

As shown in the above figure, the correlation between the CR4 and CR5 indices in the food and beverage industry and the $CPI_{F\&B}$ are significant at the 0.01 level, with a negative value indicating that there is a significant negative linear relationship between the degree of concentration in the

food and beverage industry and the corresponding CPI. In addition, there is a significant negative correlation between the CR3 index and the $CPI_{F\&B}$ at the 0.05 level, however, there is no significant correlation with the CR1 index. Thus, H1 is rejected, since as the degree of concentration in the food and beverage industry increases, the CPI- food and beverage decreases.

4.4.2 Testing Hypothesis 2

H2: As the degree of concentration in the housing industry increases, the CPI- housing increases.

Correlations

		CR1.housing	CR3.housing	CR4.housing	CR5.housing	CPI.housing
CR1.housing	Pearson Correlation	1	.957**	.945**	.939**	-.190
	Sig. (2-tailed)		.000	.000	.000	.169
	N	54	54	54	54	54
CR3.housing	Pearson Correlation	.957**	1	.997**	.993**	-.167
	Sig. (2-tailed)	.000		.000	.000	.227
	N	54	54	54	54	54
CR4.housing	Pearson Correlation	.945**	.997**	1	.999**	-.178
	Sig. (2-tailed)	.000	.000		.000	.198
	N	54	54	54	54	54
CR5.housing	Pearson Correlation	.939**	.993**	.999**	1	-.178
	Sig. (2-tailed)	.000	.000	.000		.198
	N	54	54	54	54	54
CPI.housing	Pearson Correlation	-.190	-.167	-.178	-.178	1
	Sig. (2-tailed)	.169	.227	.198	.198	
	N	54	54	54	54	54

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

Table 4.2: Pearson Correlations, concentration (housing) with CPI (housing), source: SPSS

As revealed in the above figure, there are no significant correlations between $CPI_{housing}$ and any of the 4 concentration ratio indices. Thus, H2 is rejected.

4.4.3 Testing Hypothesis 3

H3: As the degree of concentration in the transport industry increases, the CPI- transport increases.

Correlations

		CR1.transport	CR3.transport	CR4.transport	CR5.transport	CPI.transport
CR1.transport	Pearson Correlation	1	.977**	.962**	.944**	.159
	Sig. (2-tailed)		.000	.000	.000	.250
	N	54	54	54	54	54
CR3.transport	Pearson Correlation	.977**	1	.997**	.988**	.134
	Sig. (2-tailed)	.000		.000	.000	.334
	N	54	54	54	54	54
CR4.transport	Pearson Correlation	.962**	.997**	1	.997**	.134
	Sig. (2-tailed)	.000	.000		.000	.335
	N	54	54	54	54	54
CR5.transport	Pearson Correlation	.944**	.988**	.997**	1	.125
	Sig. (2-tailed)	.000	.000	.000		.366
	N	54	54	54	54	54
CPI.transport	Pearson Correlation	.159	.134	.134	.125	1
	Sig. (2-tailed)	.250	.334	.335	.366	
	N	54	54	54	54	54

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

Table 4.3: Pearson Correlations, concentration (transport) with CPI (transport), source: SPSS

We can conclude from the above figure that none of the correlations are significant. For that reason, there is no significant association between the degree of concentration in the transport industry and $CPI_{transport,}$ in other words, H3 is rejected.

4.4.4 Testing Hypothesis 4

H4: There is a positive relation between one (or more) concentration ratio index (indices) in the food and beverage industry and the overall CPI.

Correlations

		CR1.fb	CR3.fb	CR4.fb	CR5.fb	OverallCPI
CR1.fb	Pearson Correlation	1	.774**	.672**	.549**	-.028
	Sig. (2-tailed)		.000	.000	.000	.838
	N	54	54	54	54	54
CR3.fb	Pearson Correlation	.774**	1	.945**	.834**	-.272*
	Sig. (2-tailed)	.000		.000	.000	.047
	N	54	54	54	54	54
CR4.fb	Pearson Correlation	.672**	.945**	1	.965**	-.505**
	Sig. (2-tailed)	.000	.000		.000	.000
	N	54	54	54	54	54
CR5.fb	Pearson Correlation	.549**	.834**	.965**	1	-.653**
	Sig. (2-tailed)	.000	.000	.000		.000
	N	54	54	54	54	54
OverallCPI	Pearson Correlation	-.028	-.272*	-.505**	-.653**	1
	Sig. (2-tailed)	.838	.047	.000	.000	
	N	54	54	54	54	54

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

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

Table 4.4: Pearson Correlations, concentration (F&B) with overall CPI, source: SPSS.

As shown in the above figure, the correlation between the CR4 and CR5 indices in the food and beverage industry and the overall CPI are significant at the 0.01 level, with a negative value indicating that there is a significant negative linear relationship between the degree of concentration in the food and beverage industry and the overall CPI. In addition, there is a significant negative correlation between the CR3 index and the overall CPI at the 0.05 level, although there is no significant correlation with the CR1 index. Thus, H4 is rejected, since there is a negative relation between 3 concentration ratio indices in the food and beverage industry and the overall CPI.

4.4.5 Testing Hypothesis 5

H5: There is a positive relation between one (or more) concentration ratio index (indices) in the housing industry and the overall CPI.

Correlations

		CR1.housing	CR3.housing	CR4.housing	CR5.housing	OverallCPI
CR1.housing	Pearson Correlation	1	.957**	.945**	.939**	-.252
	Sig. (2-tailed)		.000	.000	.000	.066
	N	54	54	54	54	54
CR3.housing	Pearson Correlation	.957**	1	.997**	.993**	-.234
	Sig. (2-tailed)	.000		.000	.000	.088
	N	54	54	54	54	54
CR4.housing	Pearson Correlation	.945**	.997**	1	.999**	-.245
	Sig. (2-tailed)	.000	.000		.000	.074
	N	54	54	54	54	54
CR5.housing	Pearson Correlation	.939**	.993**	.999**	1	-.244
	Sig. (2-tailed)	.000	.000	.000		.075
	N	54	54	54	54	54
OverallCPI	Pearson Correlation	-.252	-.234	-.245	-.244	1
	Sig. (2-tailed)	.066	.088	.074	.075	
	N	54	54	54	54	54

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

Table 4.5: Pearson Correlations, concentration (housing) with overall CPI, source: SPSS

As revealed, there are no significant correlations between any of the 4 concentration ratio indices in the housing industry and overall CPI, which leads to the rejection of H5.

4.4.6 Testing Hypothesis 6

H6: There is a positive relation between one (or more) concentration ratio index (indices) in the transport industry and the overall CPI.

Correlations

		CR1.transport	CR3.transport	CR4.transport	CR5.transport	OverallCPI
CR1.transport	Pearson Correlation	1	.977**	.962**	.944**	.224
	Sig. (2-tailed)		.000	.000	.000	.103
	N	54	54	54	54	54
CR3.transport	Pearson Correlation	.977**	1	.997**	.988**	.253
	Sig. (2-tailed)	.000		.000	.000	.065
	N	54	54	54	54	54
CR4.transport	Pearson Correlation	.962**	.997**	1	.997**	.276*
	Sig. (2-tailed)	.000	.000		.000	.044
	N	54	54	54	54	54
CR5.transport	Pearson Correlation	.944**	.988**	.997**	1	.295*
	Sig. (2-tailed)	.000	.000	.000		.030
	N	54	54	54	54	54
OverallCPI	Pearson Correlation	.224	.253	.276*	.295*	1
	Sig. (2-tailed)	.103	.065	.044	.030	
	N	54	54	54	54	54

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

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

Table 4.6: Pearson Correlations, concentration (transport) with overall CPI, source: SPSS

As shown in the above figure, the correlation between the CR4 and CR5 indices in the transport industry and the overall CPI are significant at the 0.05 level, with a positive value indicating that there is a significant positive linear relationship between the degree of concentration in the transport industry and the overall CPI. Thus, H6 is not rejected, since there is a positive relation between 2 concentration ratio indices in the transport industry and the overall CPI.

As a conclusion, the encouraging results of this section, where significant associations were proven, have triggered the attempt to find causal relationships in 3 of the suggested generated models which were stated in chapter 3. Thus, we shall proceed in the other stages of inferential statistics through the application of the linear regression method on models 1, 4 and 6 and thus test hypotheses 7, 10 and 12 of this thesis.

4.5 The Unit Root Tests

According to Granger and Newborn (1974), a "spurious regression", or in other words, a nonsense regression, exists when causal relationships are detected for variables that are non-stationary. To be more precise, a non-stationary variable is that which does not have a constant mean, variance and auto-covariance, and thus is based on the selected sample. As a result, this might result in misleading results in regression since it violates the requirements of a linear regression model to ensure the best linear unbiased estimators denoting significant causal relationships where no actual causal relationships do exist. For that reason, to ensure the best results, and real results, the unit root tests are first conducted.

According to the results revealed in the previous section, the variables that are promoted to the next stage and are used in the inferential statistics are: CPI (F&B), the overall CPI, the CR4 index in the food and beverage industry, and the CR4 index in the transport industry, the market size in the food and beverage industry, the currency in circulation, the unemployment rate. Thus, the unit root test is applied on each in order to verify whether they should be used in levels or differenced in the regression method[6].

For further understanding of the revealed data, the test that is used for unit roots is the Augmented Dickey Fuller test which not only detects the presence of unit roots but also tackles the issue of autocorrelation. The null hypothesis in this test assumes the existence of a unit root. Thus, in order to be able to use the variable in the regression method, this hypothesis should be rejected, so that no unit root shall exist and consequently the variable would be stationary. As a rule of thumb, the null hypothesis is rejected at the 5% significance level if the probability is equal or less than 0.05, and is rejected at the 1% significance level if the probability is equal to or below 0.01.

[6] Once differenced a non-stationary variable is typically rendered stationary and thus can be used in the regression.

4.5.1 CPI (Food and Beverage)

Null Hypothesis: CPIF_B has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.615306	**0.8581**
Test critical values:	1% level	-3.560019	
	5% level	-2.917650	
	10% level	-2.596689	

*MacKinnon (1996) one-sided p-values.

Table 4.7: unit root test CPI(F&B), source: e-views

As shown in the above figure, the probability exceeds 0.05, thus the null hypothesis is not rejected and a unit root does exist. For that reason, the CPI (F&B) is differenced where the unit root test is retested.

Null Hypothesis: D(CPIF_B) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.107402	**0.0000**
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597285	

*MacKinnon (1996) one-sided p-values.

Table 4.8: unit root test 1st difference CPI(F&B), source: e-views

The probability is 0.0 thus, the null hypothesis is rejected at the 0.01 level and we are 99% confident that the differenced CPI (F&B) has no unit root and can be used in the regression.

4.5.2 The Overall CPI

Null Hypothesis: OVERALL_CPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-0.862203	**0.7925**
Test critical values:	1% level	-3.560019	
	5% level	-2.917650	
	10% level	-2.596689	

*MacKinnon (1996) one-sided p-values.

Table 4.9: unit root test overall CPI, source: e-views

The results prove the existence of a unit root, thus the overall CPI is differenced too, where results allow the use of the 1st difference of the overall CPI in the regression.

Null Hypothesis: D(OVERALL_CPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.586959	**0.0000**
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597285	

*MacKinnon (1996) one-sided p-values.

Table 4.10: unit root test 1st difference overall CPI, source: e-views

4.5.3 The CR4 Index in the Food and Beverage Industry

Null Hypothesis: CR4F_B has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.475012	**0.1275**
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Table 4.11: unit root test CR4 (F&B), source: e-views

The CR4 index also has a unit root, thus its 1st difference is tested and the below results show that the 1st difference is stationary thus can be used in regression.

Null Hypothesis: D(CR4F_B) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.30371	**0.0000**
Test critical values:	1% level	-3.568308	
	5% level	-2.921175	
	10% level	-2.598551	

*MacKinnon (1996) one-sided p-values.

Table 4.12: unit root test 1st difference CR4 (F&B), source: e-views

4.5.4 The CR4 Index in the Transport Industry

Null Hypothesis: CR4T has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.763470	**0.0000**
Test critical values:	1% level	-3.560019	
	5% level	-2.917650	
	10% level	-2.596689	

*MacKinnon (1996) one-sided p-values.

Table 4.13: unit root test CR4 (transport), source: e-views

The null hypothesis is rejected at the 0.01 significance level, thus, we are 99% confident that the CR4 index in level is stationary and can be used in the regression analysis.

4.5.5 The Control Variables

The unit root test is applied on the control variables used in the models which are: the market size in the food and beverage industry, the currency in circulation and the unemployment rate. The results are shown in tables 4.30 to 4.37 in the appendix and consequently the variables that are used in the regression are: the 1st difference of the market size in the food and beverage industry, the 2nd differences of both the currency in circulation and the unemployment rate[7].

[7] Since the 1st difference of both the currency in circulation and the unemployment rate was also non-stationary, a 2nd difference was used in the regression since it made the variables stationary.

4.6 The Multiple Linear Regression

Based on the outcomes of the correlation tests and the unit root tests in the preceding sections, the models that are used in the regression approach are stated in this section one by one, revealing the results of each, by stating the significant variables and the validity of both, the application of this method and the results reached in each model.

4.6.1 Relationship between $CPI_{F\&B}$ and Concentration in the F&B Industry

$$1^{st} \text{ Model: } CPI_{F\&B} = \beta 0 + \beta 1\ CON_{F\&B} + \beta 2\ MRK_{F\&B} + \beta 3\ MONEY + \varepsilon$$

Due to the existence of unit roots, the differenced variables will be used in regression. Thus, instead of testing whether the concentration itself affects CPI, we are testing whether the change in concentration affects the change in CPI and the modified functional form is:

$$\mathbf{D(CPI_{F\&B}) = \beta 0 + \beta 1\ D(CON_{F\&B}) + \beta 2\ D(MRK_{F\&B}) + \beta 3\ D2(MONEY) + \varepsilon}$$

4.6.1.1 Testing for Multicollinearity

Correlations

		dCR4.fb	dMRK.fb	d2Currency
dCR4.fb	Pearson Correlation	1	-.012	.184
	Sig. (2-tailed)		.934	.191
	N	53	53	52
dMRK.fb	Pearson Correlation	-.012	1	-.257
	Sig. (2-tailed)	.934		.066
	N	53	53	52
d2Currency	Pearson Correlation	.184	-.257	1
	Sig. (2-tailed)	.191	.066	
	N	52	52	52

Table 4.14: Testing multicollinearity (1st model), source: SPSS

As shown in the above table, there are no significant correlations among the explanatory variables themselves and thus they can all be retained in the model.

4.6.1.2 Results of the Multiple Linear Regression Model

Dependent Variable: D(CPIF_B)
Method: Least Squares
Date: 04/20/17 Time: 14:58
Sample (adjusted): 6/01/2003 3/01/2016
Included observations: 52 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.060166	0.531840	1.993393	0.0519
D(CR4F_B)	-12.82523	19.88444	-0.644988	0.5220
D(MRKF_B)	-0.013930	0.032083	-0.434181	0.6661
CURRENCY_D2_	-0.002455	0.001907	-1.287113	0.2042

R-squared	0.049105	Mean dependent var	0.913342
Adjusted R-squared	-0.010326	S.D. dependent var	2.728030
S.E. of regression	2.742079	Akaike info criterion	4.929113
Sum squared resid	360.9118	Schwarz criterion	5.079209
Log likelihood	-124.1569	Hannan-Quinn criter.	4.986656
F-statistic	0.826255	Durbin-Watson stat	1.971583
Prob(F-statistic)	0.485913		

Table 4.15: regression results (1st model), source: e-views

4.6.1.3 Testing Normality, Heteroskedasticity and Auto-correlation

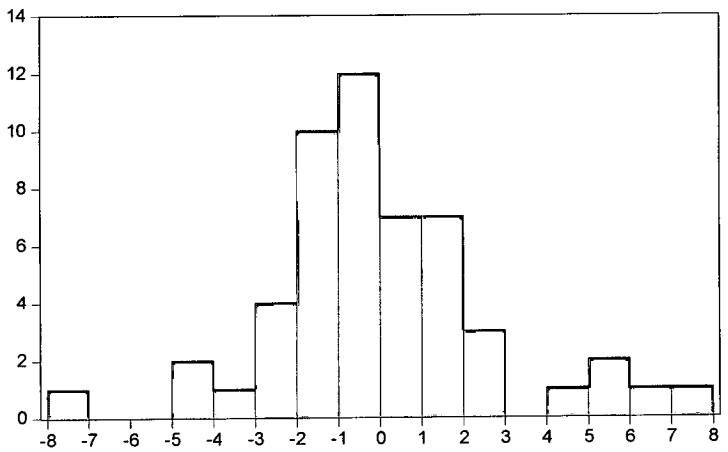


Figure 4.14: Histogram residuals (1st model), source: e-views

As shown in the Jarque Bera test revealed above, the probability is below 0.05 but above 0.01, thus rejecting normality at the 0.05 significance level. However, the residuals are normally-distributed at the 0.01 significance level.

Heteroskedasticity Test: White

F-statistic	0.918636	Prob. F(9,42)	0.5187
Obs*R-squared	8.552638	Prob. Chi-Square(9)	0.4796
Scaled explained SS	12.34490	Prob. Chi-Square(9)	0.1946

Table 4.16: white test (1st model), source: e-views

The white test was conducted on e-views to further validate the results. As shown in the table above, the three versions of the white test (F-statistic, Obs*R-squared and the scaled explained SS) resulted in the same conclusion, while having the three probabilities (0.5187, 0.4796 and 0.1946) above 0.05, thus rejecting heteroskedasticity.

Furthermore, according to the Durbin Watson Statistic (1.97) which falls in the range of 1.6 to 2.2, there is no auto-correlation, thus the dependent variable (change in CPI-Food & beverage) does not depend on itself back in time.

4.6.1.4 Validating Hypothesis 7

H7: An increase in the change in the concentration ratio index in the food and beverage industry increases the change in CPI- food and beverage.

The p-values of the explanatory variable D(CR4-F&B) and of the control variables D(Market size) and D2(currency in circulation) are 0.522, 0.6661 and 0.2042 respectively. Thus, the null hypothesis, being that the coefficient is equal to zero, is accepted in the 3 cases, revealing the existence of insignificant variables.

As a result, H7 is rejected. Not only has the coefficient of the concentration ratio index given the value -12.82523, showing a negative relationship between the change in concentration and the change in CPI, the variable is insignificant, thus rejecting any causal relationship between both variables.

4.6.2 Relationship between the Overall CPI and Concentration in the Food and Beverage Industry

$$2^{nd} \text{ Model: overall CPI} = \beta 0 + \beta 1 \text{ CON}_{F\&B} + \beta 2 \text{ MONEY} + \beta 3 \text{ UNEMPLOYMENT} + \varepsilon$$

Due to the existence of unit roots, the differenced variables will be used in regression. Thus, instead of testing whether the concentration itself affects overall CPI, we are testing whether the change in concentration affects the change in the overall CPI and the modified functional form is:

$$\mathbf{D(\text{overall CPI}) = \beta 0 + \beta 1\ D(CON_{F\&B}) + \beta 2\ D2(MONEY) + \beta 3\ D2(UNEMPLOYMENT) + \varepsilon}$$

4.6.2.1 Testing for Multicollinearity

Correlations

		dCR4.fb	d2Currency	D2. unemployme ntRATE
dCR4.fb	Pearson Correlation	1	.184	-.139
	Sig. (2-tailed)		.191	.325
	N	53	52	52
d2Currency	Pearson Correlation	.184	1	.674**
	Sig. (2-tailed)	.191		.000
	N	52	52	52
D2.unemploymentRATE	Pearson Correlation	-.139	.674**	1
	Sig. (2-tailed)	.325	.000	
	N	52	52	52

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

Table 4.17: testing multicollinearity (2nd model), source: SPSS

As shown in the above table, there is a significant correlations between the change in unemployment rate and the change in currency in circulation. Thus, regression is conducted twice, each time by eliminating one of the two control variables, for robustness reasons.

4.6.2.2 Results of the Multiple Linear Regression Model

4.6.2.2.1 1st Regression with the Elimination of the Change in Unemployment Rate

Dependent Variable: D_OVERALL_CPI
Method: Least Squares
Date: 04/28/17 Time: 15:39
Sample (adjusted): 6/01/2003 3/01/2016
Included observations: 52 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.574308	0.257124	2.233581	0.0301
CR4F_B_D_	4.665638	13.41273	0.347851	0.7294
CURRENCY_D2_	-0.001508	0.001243	-1.213260	0.2308

R-squared	0.029473	Mean dependent var	0.568641
Adjusted R-squared	-0.010140	S.D. dependent var	1.841571
S.E. of regression	1.850884	Akaike info criterion	4.125165
Sum squared resid	167.8629	Schwarz criterion	4.237737
Log likelihood	-104.2543	Hannan-Quinn criter.	4.168323
F-statistic	0.744021	Durbin-Watson stat	1.722923
Prob(F-statistic)	0.480491		

Table 4.18: regression results (1st elimination in 2nd model), source: e-views

Testing Normality, Heteroskedasticity and Auto-correlation for the 1st regression

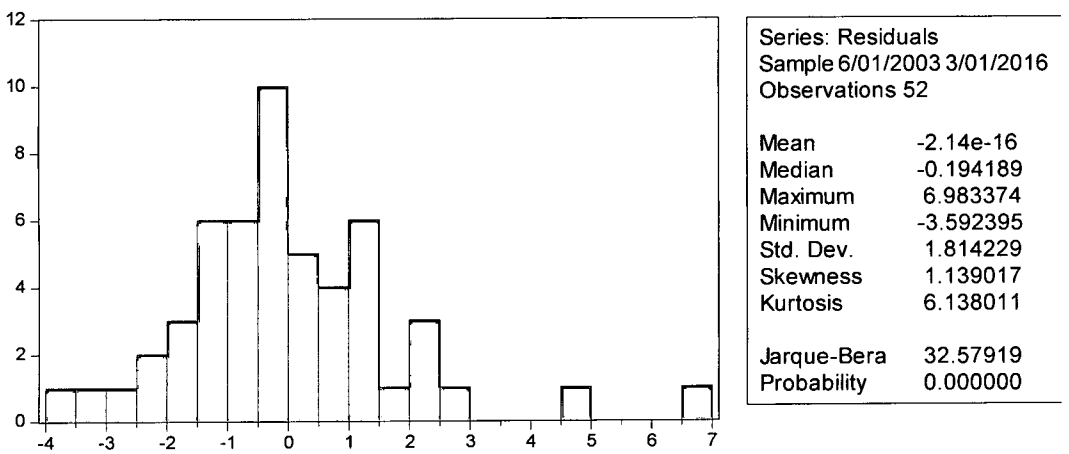


Figure 4.15: Histogram residuals (1st elimination in 2nd model), source: e-views

As shown in the Jarque Bera test revealed above, the probability is below 0.05 and 0.01, thus rejecting normality at the 0.05 significance level and at the 0.01 significance level. However, the results of the heteroskedasticity test were encouraging, thus the results are valid.

Heteroskedasticity Test: White

F-statistic	0.413898	Prob. F(5,46)	0.8367
Obs*R-squared	2.238704	Prob. Chi-Square(5)	0.8152
Scaled explained SS	5.106780	Prob. Chi-Square(5)	0.4030

Table 4.19: white test (1st elimination in 2nd model), source: e-views

The white test was conducted on e-views to further validate the results. As shown in the table above, the three versions of the white test (F-statistic, Obs*R-squared and the scaled explained SS) resulted in the same conclusion, while having the three probabilities (0.8367, 0.8152 and 0.403) above 0.05, thus rejecting heteroskedasticity.

Furthermore, according to the Durbin Watson Statistic (1.72) which falls in the range of 1.6 to 2.2, there is no auto-correlation, thus the dependent variable (change in overall CPI) does not depend on itself back in time.

4.6.2.2.2 2nd Regression with the Elimination of the Change in the Currency in Circulation

Dependent Variable: D_OVERALL_CPI
Method: Least Squares
Date: 04/28/17 Time: 15:55
Sample (adjusted): 6/01/2003 3/01/2016
Included observations: 52 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.568402	0.253322	2.243794	0.0294
CR4F_B_D_	-1.490932	13.11721	-0.113662	0.9100
D2_UNEMPLOYMENT_RATE	-25.14388	14.53590	-1.729778	0.0900

R-squared	0.057849	Mean dependent var	0.568641
Adjusted R-squared	0.019394	S.D. dependent var	1.841571
S.E. of regression	1.823626	Akaike info criterion	4.095492
Sum squared resid	162.9549	Schwarz criterion	4.208063
Log likelihood	-103.4828	Hannan-Quinn criter.	4.138649
F-statistic	1.504328	Durbin-Watson stat	1.700316
Prob(F-statistic)	0.232247		

Table 4.20: regression results (2nd elimination in 2nd model), source: e-views

Testing Normality, Heteroskedasticity and Auto-correlation for the 2nd regression

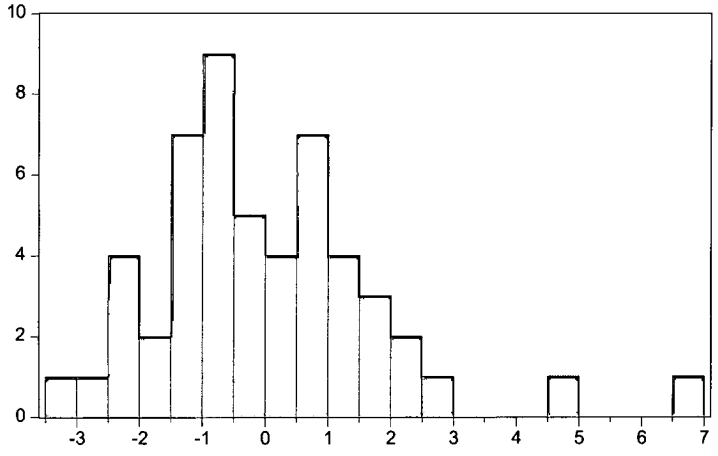


Figure 4.16: Histogram residuals (2nd elimination in 2nd model), source: e-views

As shown in the Jarque Bera test revealed above, the probability is below 0.05 and 0.01, thus rejecting normality at the 0.05 significance level and at the 0.01 significance level. However, the results of the heteroskedasticity test were encouraging, thus the results are valid.

Heteroskedasticity Test: White

F-statistic	0.734209	Prob. F(5,46)	0.6016
Obs*R-squared	3.843171	Prob. Chi-Square(5)	0.5722
Scaled explained SS	8.176440	Prob. Chi-Square(5)	0.1468

Table 4.21: white test (2nd elimination in 2nd model), source: e-views

The white test was conducted on e-views to further validate the results. As shown in the table above, the three versions of the white test (F-statistic, Obs*R-squared and the scaled explained SS) resulted in the same conclusion, while having the three probabilities (0.6016, 0.5722 and 0.1468) above 0.05, thus rejecting heteroskedasticity.

Furthermore, according to the Durbin Watson Statistic (1.7) which falls in the range of 1.6 to 2.2, there is no auto-correlation, thus the dependent variable (change in overall CPI) does not depend on itself back in time.

4.6.2.3 Validating Hypothesis 10

H10: An increase in the change in the concentration ratio index in the food and beverage industry increases the change in the overall CPI.

The p-values of the explanatory variable D(CR4-F&B) and of the control variables D2(Unemployment rate) and D2(currency in circulation) are all above 0.05. Thus, the null hypothesis is accepted in both regressions, revealing the existence of insignificant variables.

As a result, H10 is rejected, showing no causal relationship between the change in concentration in the food and beverage industry and the change in overall CPI.

4.6.3 Relationship between the Overall CPI and Concentration in the Transport Industry

$$3^{rd} \text{ Model: overall CPI} = \beta 0 + \beta 1\ CON_{transport} + \beta 2\ MONEY + \beta 3\ UNEMPLOYMENT + \varepsilon$$

Due to the existence of unit roots, some differenced variables will be used in regression. Thus, instead of testing whether the concentration affects overall CPI, we are testing whether it affects the change in the overall CPI, the modified functional form is:

$$\mathbf{D(overall\ CPI)=\beta 0 + \beta 1\ CON_{transport} + \beta 2\ D2(MONEY) + \beta 3\ D2(UNEMPLOYMENT) + \varepsilon}$$

4.6.3.1 Testing for multicollinearity

Correlations

		CR4.transport	d2Currency	D2. unemployme ntRATE
CR4.transport	Pearson Correlation	1	.056	.210
	Sig. (2-tailed)		.691	.134
	N	54	52	52
d2Currency	Pearson Correlation	.056	1	.674**
	Sig. (2-tailed)	.691		.000
	N	52	52	52
D2.unemploymentRATE	Pearson Correlation	.210	.674**	1
	Sig. (2-tailed)	.134	.000	
	N	52	52	52

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

Table 4.22: testing multicollinearity (3rd model), source: SPSS

As shown in the above table, there is a significant correlations between the change in unemployment rate and the change in currency in circulation. Thus, regression is conducted twice, each time by eliminating one of the two control variables, for robustness reasons.

4.6.3.2 Results of the Multiple Linear Regression Model

4.6.3.2.1 1st Regression with the elimination of the change in unemployment rate

Dependent Variable: D_OVERALL_CPI
Method: Least Squares
Date: 04/28/17 Time: 16:04
Sample (adjusted): 6/01/2003 3/01/2016
Included observations: 52 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.232802	0.847041	0.274842	0.7846
CR4T	2.262178	5.431768	0.416472	0.6789
CURRENCY_D2_	-0.001457	0.001223	-1.191435	0.2392

R-squared	0.030508	Mean dependent var	0.568641
Adjusted R-squared	-0.009063	S.D. dependent var	1.841571
S.E. of regression	1.849897	Akaike info criterion	4.124098
Sum squared resid	167.6838	Schwarz criterion	4.236670
Log likelihood	-104.2266	Hannan-Quinn criter.	4.167255
F-statistic	0.770975	Durbin-Watson stat	1.712130
Prob(F-statistic)	0.468091		

Table 4.23: regression results (1st elimination in 3rd model), source: e-views

Testing Normality, Heteroskedasticity and Auto-correlation for the 1st regression

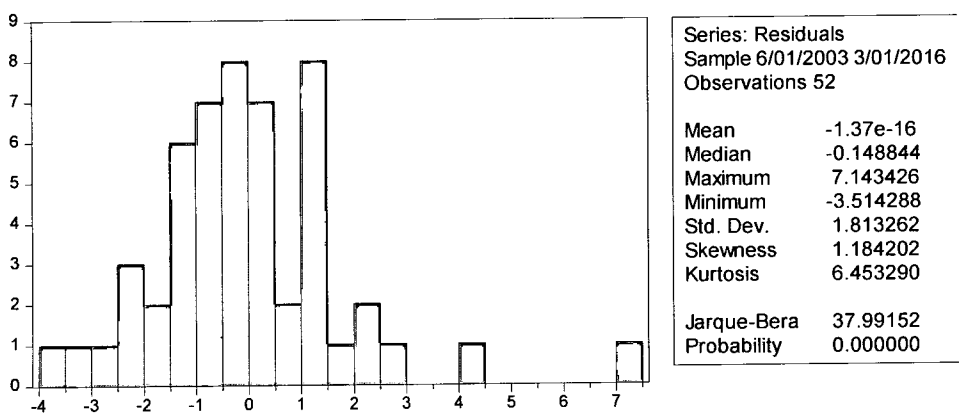


Figure 4.17: Histogram residuals (1st elimination in 3rd model), source: e-views

As shown in the Jarque Bera test revealed above, the probability is below 0.05 and 0.01, thus rejecting normality at the 0.05 significance level and at the 0.01 significance level. However, the results of the heteroskedasticity test were encouraging, thus the results are valid.

Heteroskedasticity Test: White

F-statistic	0.204821	Prob. F(5,46)	0.9588
Obs*R-squared	1.132474	Prob. Chi-Square(5)	0.9512
Scaled explained SS	2.741842	Prob. Chi-Square(5)	0.7397

Table 4.24: white test (1st elimination in 3rd model), source: e-views

The white test was conducted on e-views to further validate the results. As shown in the table above, the three versions of the white test (F-statistic, Obs*R-squared and the scaled explained SS) resulted in the same conclusion, while having the three probabilities (0.9588, 0.9512 and 0.7397) above 0.05, thus rejecting heteroskedasticity.

Furthermore, according to the Durbin Watson Statistic (1.712) which falls in the range of 1.6 to 2.2, there is no auto-correlation, thus the dependent variable (change in overall CPI) does not depend on itself back in time.

4.6.3.2.2 2nd Regression with the elimination of the change in the currency in circulation

Dependent Variable: D_OVERALL_CPI
Method: Least Squares
Date: 04/28/17 Time: 16:20
Sample (adjusted): 6/01/2003 3/01/2016
Included observations: 52 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.027563	0.846403	-0.032565	0.9742
CR4T	4.022117	5.438949	0.739503	0.4631
D2_UNEMPLOYMENT_RATE	-27.19186	14.64411	-1.856847	0.0693

R-squared	0.068002	Mean dependent var	0.568641
Adjusted R-squared	0.029962	S.D. dependent var	1.841571
S.E. of regression	1.813773	Akaike info criterion	4.084657
Sum squared resid	161.1988	Schwarz criterion	4.197228

Log likelihood	-103.2011	Hannan-Quinn criter.	4.127814
F-statistic	1.787618	Durbin-Watson stat	1.672444
Prob(F-statistic)	0.178100		

Table 4.25: regression results (2nd elimination in 3rd model), source: e-views

Testing Normality, Heteroskedasticity and Auto-correlation for the 2nd regression

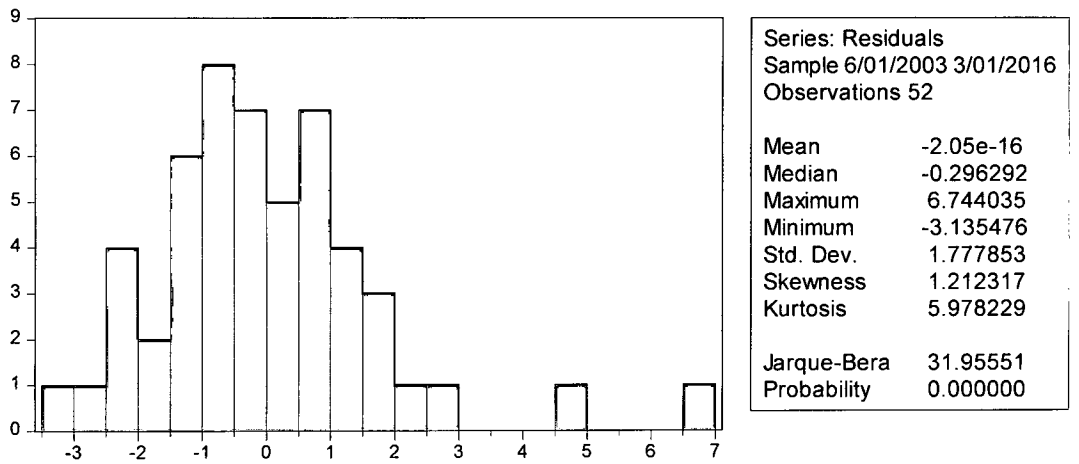


Figure 4.18: Histogram residuals (2nd elimination in 3rd model), source: e-views

As shown in the Jarque Bera test revealed above, the probability is below 0.05 and 0.01, thus rejecting normality at the 0.05 significance level and at the 0.01 significance level. However, the results of the heteroskedasticity test were encouraging, thus the results are valid.

Heteroskedasticity Test: White

F-statistic	0.152270	Prob. F(5,46)	0.9783
Obs*R-squared	0.846646	Prob. Chi-Square(5)	0.9740
Scaled explained SS	1.871251	Prob. Chi-Square(5)	0.8667

Table 4.26: white test (2nd elimination in 3rd model), source: e-views

The white test was conducted on e-views to further validate the results. As shown in the table above, the three versions of the white test (F-statistic, Obs*R-squared and the scaled explained SS) resulted in the same conclusion, while having the three probabilities (0.9783, 0.974 and 0.8667) above 0.05, thus rejecting heteroskedasticity.

Furthermore, according to the Durbin Watson Statistic (1.67) which falls in the range of 1.6 to 2.2, there is no auto-correlation, thus the dependent variable (change in overall CPI) does not depend on itself back in time.

4.6.3.3 Validating Hypothesis 12

H10: An increase in the concentration ratio index in the transport industry increases the change in the overall CPI.

The p-values of the explanatory variable CR4-transport and of the control variables D2(Unemployment rate) and D2(currency in circulation) are all above 0.05. Thus, the null hypothesis is accepted in both regressions, revealing the existence of insignificant variables.

As a result, H12 is rejected, showing no causal relationship between the concentration in the transport industry and the change in overall CPI.

4.7 Conclusion

This paper originated from the problem of inflation and with the purpose of finding solutions to this problem three stages were conducted. At the first stage, an evaluation of the market structure of the Lebanese markets since 2002 and its evolution until 2016 was done. This evaluation allowed us first to conclude that although the three industries, namely the food and beverage, housing and transport industries, are not completely oligopolistic, they cannot be considered very competitive, with the food and beverage being the least competitive among the three. Second, competition in the three industries has not witnessed any critical changes since 2002 till 2016, although it has slightly increased in the food and beverage industry and slightly decreased in the transport industry.

At the second stage, through the Pearson correlations test, the linear association between prices and the degrees of concentration were tested at two levels, at the specific industry levels and at the overall level. The results verified a significant negative linear relationship between the degree of concentration in the food and beverage industry and its corresponding CPI and with the overall

CPI, opposite to what was originally hypothesized. In addition, a significant positive linear relationship between the degree of concentration in the transport industry and the overall CPI was proved, confirming the related hypothesis. Thus, this encouraged us to move these variables to the third stage for further testing.

At the third stage, causal relationships for the above mentioned significant associations were investigated through the multiple linear regression approach. In order to validate the results, unit root tests were conducted first that forced the usage of some differenced variables understudy, and thus the main target of the tests became to investigate whether the changes in prices are affected by concentration (or the change in concentration). As a result, no causal relationships were detected and what was previously hypothesized has been rejected.

Chapter 5: Conclusions and Recommendations

5.1 Introduction

The market structure of the three main Lebanese industries was thoroughly investigated in this paper for the period 2002-2016, along with its effect on CPI. In the first chapter, the link between competition, mainly market concentration, and prices was introduced with their general influence on welfare. In addition, the importance of such a study, linking the industry specific degree of concentration to the corresponding CPI and to the overall CPI, especially in Lebanon, was highlighted. Consequently, this paper was prepared to first evaluate the degrees of concentration in the food and beverage, housing and transport industry and then attempt to find their relationship with their corresponding industry specific CPIs and the overall CPI. In chapter 2, the literature tackling the relationship between concentration and prices was discussed, where the importance of this paper became more significant due to the scarcity of studies that link competition in specific industries to the overall CPI. The majority of the studies investigated the degree of concentration in a certain market and the prices in that specific market, instead of tackling broad industries and CPIs. Although these studies use different price and concentration indexes, control variables, time periods, sample sizes and data collection methods, the majority detected a positive significant relationship between concentration and prices. In the third chapter, the data collection sources and methods were stated, in addition to an explanation of the variables and relationships understudy with their expected outcomes, thus generating the hypotheses and models tested in this paper. In chapter 4, an evaluation of the degree of concentration in each of the three industries understudy was done followed by the descriptive statistics of all the variables. The results of this evaluation prove that although not oligopolistic, according to the threshold taken in this paper, the firms operating in each of the three industries have been fairly to slightly competing in the period 2002-2016, especially in the food and beverage industry which appeared to be the least competitive. In addition, the number of operating firms in each of the three industries has tremendously increased in the period understudy, however only slight changes in the degrees of concentration have been revealed, triggering the need for further detailed investigation on the leading firms in these

industries, which was not feasible[8] in this study. Next, a Pearson correlation test followed by a multiple linear regression were conducted, where unexpected negative linear associations and insignificant causal relationships were proven, which will be further analyzed in the next section of this chapter. Following the analysis of the results of this study, this chapter continues with three sections stating the limitations encountered, the potential implications and the proposed recommendations, respectively.

5.2 Analysis of the Results

As formerly mentioned, the majority of the literature proved a significant positive relationship between concentration and prices, thus confirming the well-known belief, that prices are increased as an effect of a decrease in competition. However, in this paper the results were dramatically different, where only linear associations were detected, and were unexpectedly negative in 2 out of the 3 significant ones.

To be more precise, considering the food and beverage industry, two significant linear associations were detected. The first relationship was between its degree of concentration and its industry specific CPI, and the second between its degree of concentration and the overall CPI, which unexpectedly both opposed the hypothesized theory by being negative associations. However, when analyzed in the regression approach, no causal relationships were detected between the changes in concentration and the changes in both CPIs. In addition, the control variables, market size, the currency in circulation and the unemployment rate were also unexpectedly insignificant, thus rejecting the two models. The conclusion that was reached in this industry, where increases in concentration were associated to decreases in prices, brings us to the theory of countervailing power discussed in chapter 2, revealed by Chen (2003) and Ciapanna and Rondinelli (2014) where in both studies, negative linear and causal relationships between concentration and prices were revealed, thus concluding how more competition might hinder the welfare of citizens[9]. In the case

[8] In the data collection process, we were not allowed to retrieve the names of the firms. In order to compute the degrees of concentration, we were only given the sales of the 5 firms with the highest sales in each industry in each time period.

[9] The existence of power within one firm helps in the creation of power within all the suppliers or buyers that deal with it, because of the "reward" they receive through the portion of market power they gain too, thus a negative relationship between countervailing power and retail prices for consumers exists.

of Lebanon, further investigation should be done on the leading companies in these industries which was not feasible in this paper due to the reasons explained previously, in order to make sure whether the results confirm the countervailing theory or relate to different causes and theories.

Next, considering the housing industry, neither linear nor causal relationships were detected, rejecting any link between concentration and prices. This brings us back to the determinants of prices in this industry, which could be the costs of production, including the wages and perhaps the prices of imported material, which both were potential control variables in the industry-specific model, however, due to the unavailability of data in Lebanon, the inclusion of these variables in this study was not an option.

Finally, in the transport industry, only one significant relationship was detected, which proves, as expected, a positive association between the degree of concentration and the overall CPI. However, here too, the causal relationship was unexpectedly rejected. It is worth mentioning that another unexpected result related to this industry was the insignificant relationship between concentration and the industry specific CPI although a significant one with the overall CPI was detected. A probable reason for that, could be the relationship between concentration and another variable, thus linking the concentration in this industry to the overall CPI and not to its industry specific CPI. This requires further analysis, and could be an interesting topic for further study.

As a final note on this section, the results of the study done by Gisser and Johnson (1979) discussed in chapter 2, have pointed out to the fact that only dramatic changes in industry concentrations have an effect on the overall average price level. To be more precise, the result of the paper was that when the oligopolistic market becomes completely monopolized there will be significant increases in the CPI. It is worth mentioning that this study was the one of the few studies in the literature and the only study discussed in chapter 2 that investigates the relationship between industry concentration and CPI instead of specific prices for a certain product or market, which is the most similar to this thesis. This makes the insignificant causal relationships more realistic in the case of Lebanon given that no dramatic changes in the degrees of concentration have been witnessed in the period 2002-2016, and according to the adopted threshold, the industries understudy were not oligopolistic or monopolistic.

5.3 Limitations of the Research

Being a study investigating the Lebanese markets, a lot of barriers existed, which have affected the final results of the thesis although they could have been avoided had the topic been different. However, the main interest of this paper was an investigation on the current market structure of the main Lebanese markets and the detection of a potential relationship between competition and prices in Lebanon to perhaps suggest some modifications to its laws to enhance the welfare of Lebanese citizens.

The major barrier existed in the availability of data to compute the degree of concentration and sales was our only tool for that computation. The fact that the VAT department in the ministry of Finance was the only available source of data on sales limited our study to the period between 2002 and 2016, since that department was established in 2002.

In addition, the lack of available microeconomic data concerning some industry specific variables, such as, compensation of employees, number of employees and other indices related to each industry have also affected the final results of the thesis. Had such data been available in the market understudy, they could have been used as control variables in the industry-specific models, and perhaps enhanced, if not modified, the results of the analysis conducted. In addition to that, what was unexpected, was the unavailability of some macroeconomic quarterly data too, such as GDP per capita which was supposed to be used as a control variable in some of the models.

Finally, the lack of public data is a main concern and limitation for studies in Lebanon. Data collection in this paper is a process that consumed almost half the total time that was needed to accomplish the paper, which was much more than expected. This was due to the unavailability of public data for Lebanon and the bureaucracy that still exists in many of its departments which actually required a lot of appointments and visits for three different purposes, first to check whether the data is actually available in those departments, second to get an approval on collecting that data and third for the actual collection of the data. This has not only consumed time, but also so much effort and has caused some demotivation and a lot of encounters at different stages while writing this thesis.

5.4 Theoretical and Practical Implications

This study attempts to fill a gap in the literature tackling competition in Lebanon. In addition, it is primarily replicating the study done in 2003 in the report prepared by the Consultation and Research Institute (CRI) of Lebanon, which evaluated the degree of concentration of the Lebanese industries and provided a ground for the Lebanese Competition Law. Furthermore, this study might serve in increasing awareness on competition and introducing new variables in the assessment of price levels by generating new models.

As the above mentioned report has provided a ground for the Lebanese Competition Law, this paper could be used in evaluating it and maybe come up with new policies or solutions to problems arising from the Lebanese market structure. In addition, it could enlighten people who hold positions that can manipulate or affect the welfare of the Lebanese citizens through the decisions they make. To be more precise, since 2015, the ministry of Economics and Trade has been preparing a plan of action to make the Lebanese firms more competitive and creative, however, no matter how efficient and professional the strategies would be, they will hardly be able to serve the Lebanese markets in case they are not based on the specific structure of each market, and could thus build on the specific needs of each, which makes the current study more useful.

5.5 Recommendations

Empirical studies investigating the relationship between competition and prices are very scarce in the Arab countries, and actually do not exist in Lebanon. For that reason, precise studies that attempt to find any links between concentration and prices are recommended to further understand the level of prices and its variations in the Arab region.

In addition, more enhanced and continuous evaluations of the market structure of the main industries in Lebanon should be the concern of the Lebanese government since as the results of this paper have proven and as Gaspard has mentioned in his 2003 study, which was the only study conducted on competition in Lebanon, the solution to the obstacles facing the Lebanese markets might be completely different from the solutions the government is focusing on to build its current

strategies. Thus, this makes the evaluation of the market structures and their evolution in the past couple of years, in addition to its relationship with the Lebanese prices of high priority and a government concern that should precede any other.

As a summary, what is mainly recommended is a primary evaluation of the current market structures and diversified strategies and plans of action among the different industries, accordingly. For example, in addition to focusing on ways to make the Lebanese markets more competitive, as stated in the previous section, perhaps increasing the size of the firms operating in the leading industries in Lebanon could be another solution to solve the issue of high prices and enhance the welfare of a higher proportion of the Lebanese population. A few suggestions for such a purpose could be, building bridges, first between the big firms and the small firms in order to help the small ones expand, second, with the Lebanese investors abroad which would create new and bigger markets for the small firms, along with the facilitation of the export process. Another suggestion could be to enhance the coordination between the public and private sectors to lead the small firms and move them from small to big, which will allow them to decrease their costs by taking advantage of economies of scale. Furthermore, what can help the small firms expand are, helping them use more technology, providing equal opportunities for the acquirement of resources and perhaps organizing specific expos for each market which will make the local consumers aware of all the available choices for each product category. These strategies do not substitute the importance of a well-defined law that facilitates and organizes the entry to every market and that protects both consumers and producers, that shall enhance the trust in the firms operating in Lebanon, and the products hereby offered, thus creating roots for a healthier and more trust-worthy society, and building a ground for a sustainable long-term development.

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Appendix

Subject	Year	Method	Dependent variable	Independent variable(s)	Control variable(s)	Main Result
Grocery industry	1989		prices	concentration		significant negative relationship
Basket of 35 frequently purchased grocery items	1990	regression	prices	CR4 ; effective buyer income	market size; store size; market growth	negative insignificant relationship
Re-examining #2 (1990 study)	2002	regression	prices	supermarket CR4; industry CR4 and HHI	average household income; per capita disposable income	positive significant relationship
retail grocery industry: 121 goods in 18 supermarkets	1986	regression	aggregate price index of the 121 goods	different models: HHI or CR4 or CR1 or market share	store size; sales per square foot; warehouse distance; population growth; per capita income	positive significant relationship
681 bread manufacturing plants	1992	reduced-form regression models	average output price of bread	concentration (number of competitors)	plant's costs (capital stock and input costs); production costs of competitors; demand conditions	no significant relationship
groceries and supermarkets in 332 MSAs	1993	Correlation test	prices	HHI and concentration ratios		positive significant correlation
32 food-manufacturing industries	2002	non-linear 3 Stage Least Squares	prices	HHI and concentration ratios		positive significant relationship in 68.7% of industries
Retail food industry	2006	regression	annual % change in CPI-food	relative market share; concentration ratios, HHI	population; income; labor costs; electricity costs; rent costs	positive significant relationship
5 main categories of goods in 6 Euro countries	2011	regression	change in price	HHI for 2010 (regional and national and at three trading levels (buying group, parent company, store)	regional density; evolution of labor costs	positive significant relationship (in food and beverage; tobacco and narcotics miscellaneous goods) and negative significant relationshi (in clothing and footwear, household

						equipment and maintenance)
11 dairy products (monthly data from 2008 till 2011)	2016	regression	prices	concentration in 3 different models (number of retail stores; revenue-based HHI; space-based HHI)	population; income	positive significant relationship
retail gasoline prices	1978	regression	2 sets of prices (low price stations and high price ones)	HHI; transport costs; average state motor fuel excise tax rates	population	positive significant relationship (more powerful in low price stations)
airline industry	1989	regression	fee paid (price)	HHI	variables that affect production costs; variables that affect cost and service quality; scarcity rents	positive significant relationship
banking industry	1989	regression	prices	HHI; CR3	market conditions and cost factors (growth rates of deposits; number of bank branches divided by total banks; local per capita income; local bank wage rate)	positive significant relationship
cement industry	1998	regression (model 1)	Prices	CR4	none	positive significant relationship
cement industry	1998	regression (model 2)	Prices	CR4	transportation costs (reciprocal of average plant capacity); family income	positive significant relationship
cement industry	1998	regression (model 3)	Prices	CR4	population density; population	no significant relationship
pharmaceutical industry	2004	regression	prices	market concentration denoted by number of sellers; HHI		positive significant relationship

drilling rig market (in 3 different regions)	2010	regression	average prices per region	global HHI	utilization rate; total cost index (labor index and steel index)	positive significant relationship
Greek manufacturing industries	2013	Instrumental Variable least squares	prices	HHI		positive significant relationship
CPI and concentration in 2 markets: perfectly competitive / oligopolistic	1979	regression	CPI	market concentration denoted by number of identical firms	money in circulation; velocity	only dramatic change in the industry concentration have a effect on CPI
wholesaler concentration	1992	Generalized least squares	prices	HHI (denoted by the number of workers not sales)	dummies for total number of wholesale stores for each product; area dummy variables and item dummies	positive significant relationship
retail and wholesale market structures in the grocery sector	2014	regression	prices	2 different models (buying group HHI and parent company HHI)	regional population density; per capita GDP; regional unemployment rates	positive significant relationship (for retai and negative significant relationshi (for wholesale)
concentration in Lebanon (2002 data)	2003	only estimation of CR1, CR3, CR4 & CR5 using sales of the firms				around 50% of Lebanese markets are highly concentrated

Table 2.1: Summary of the literature chapter

	Number of Firms		
Date	**Food and Beverage Industry**	**Housing Industry**	**Transport Industry**
12/31/2002	290	590	855
3/31/2003	302	628	961
6/30/2003	334	689	1,173
9/30/2003	340	721	1,233
12/31/2003	349	756	1,281
3/31/2004	440	885	1,707
6/30/2004	448	914	1,762
9/30/2004	455	930	1,790
12/31/2004	471	959	1,832
3/31/2005	490	1,002	1,914
6/30/2005	496	1,018	1,957
9/30/2005	506	1,043	1,995
12/31/2005	514	1,062	2,034
3/31/2006	525	1,100	2,120
6/30/2006	532	1,132	2,174
9/30/2006	537	1,144	2,203
12/31/2006	546	1,187	2,259
3/31/2007	564	1,234	2,395
6/30/2007	576	1,265	2,450
9/30/2007	590	1,284	2,493
12/31/2007	601	1,307	2,536
3/31/2008	610	1,347	2,609
6/30/2008	615	1,375	2,672
9/30/2008	623	1,399	2,741
12/31/2008	631	1,425	2,866
3/31/2009	647	1,466	3,139
6/30/2009	652	1,492	3,238
9/30/2009	660	1,522	3,324
12/31/2009	670	1,559	3,417
3/31/2010	687	1,610	3,606
6/30/2010	699	1,651	3,687
9/30/2010	706	1,703	3,777
12/31/2010	717	1,726	3,777
3/31/2011	736	1,774	3,923
6/30/2011	743	1,815	3,986
9/30/2011	755	1,871	4,055
12/31/2011	766	1,908	4,090

3/31/2012	785	1,960	4,183
6/30/2012	794	1,997	4,213
9/30/2012	798	2,014	4,204
12/31/2012	805	2,048	4,233
3/31/2013	816	2,086	4,240
6/30/2013	820	2,128	4,279
9/30/2013	823	2,153	4,313
12/31/2013	827	2,193	4,328
3/31/2014	835	2,225	4,368
6/30/2014	842	2,251	4,384
9/30/2014	851	2,268	4,418
12/31/2014	859	2,301	4,439
3/31/2015	862	2,323	4,475
6/30/2015	873	2,345	4,500
9/30/2015	886	2,378	4,516
12/31/2015	890	2,400	4,516
3/31/2016	902	2,429	4,544

Table 3.1: Number of firms in each industry, source: compilation of data from the VAT department

	Concentration Ratio One Index (CR1)		
Date	**Food and Beverage Industry**	**Housing Industry**	**Transport Industry**
12/31/2002	11.56%	4.99%	4.70%
3/31/2003	8.68%	3.31%	3.71%
6/30/2003	10.87%	10.93%	5.12%
9/30/2003	11.29%	9.02%	3.96%
12/31/2003	7.78%	8.46%	3.89%
3/31/2004	6.90%	8.05%	3.69%
6/30/2004	9.04%	5.78%	4.14%
9/30/2004	9.99%	6.02%	4.06%
12/31/2004	6.94%	5.53%	3.72%
3/31/2005	6.23%	7.78%	2.68%
6/30/2005	8.34%	13.35%	3.61%
9/30/2005	9.34%	5.35%	3.52%
12/31/2005	6.94%	33.92%	4.19%
3/31/2006	6.73%	4.62%	4.47%
6/30/2006	9.03%	3.28%	5.88%
9/30/2006	10.31%	4.72%	5.54%
12/31/2006	8.43%	2.74%	4.30%
3/31/2007	7.11%	2.34%	5.14%
6/30/2007	8.65%	3.90%	6.68%
9/30/2007	10.80%	3.05%	5.80%
12/31/2007	7.89%	6.46%	5.16%
3/31/2008	7.36%	2.60%	6.10%
6/30/2008	8.97%	4.10%	5.97%
9/30/2008	10.46%	2.50%	5.78%
12/31/2008	8.21%	4.24%	6.99%
3/31/2009	7.64%	3.95%	3.60%

6/30/2009	9.65%	3.87%	5.41%
9/30/2009	10.62%	3.62%	4.58%
12/31/2009	9.36%	3.67%	5.05%
3/31/2010	7.62%	3.76%	3.80%
6/30/2010	9.13%	3.49%	3.99%
9/30/2010	10.78%	3.00%	3.10%
12/31/2010	8.59%	2.64%	32.79%
3/31/2011	7.00%	3.31%	3.53%
6/30/2011	8.64%	3.89%	3.75%
9/30/2011	9.99%	3.68%	3.46%
12/31/2011	7.28%	4.16%	3.66%
3/31/2012	6.10%	4.93%	3.58%
6/30/2012	8.99%	3.68%	5.01%
9/30/2012	10.90%	3.75%	3.44%
12/31/2012	7.61%	2.79%	3.85%
3/31/2013	6.87%	3.88%	3.21%
6/30/2013	9.50%	3.34%	3.58%
9/30/2013	10.26%	4.41%	3.72%
12/31/2013	7.97%	3.52%	4.23%
3/31/2014	7.89%	5.68%	20.62%
6/30/2014	8.98%	4.75%	6.44%
9/30/2014	10.78%	7.77%	5.49%
12/31/2014	7.95%	5.04%	6.11%
3/31/2015	7.81%	9.25%	6.02%
6/30/2015	8.47%	6.36%	7.92%
9/30/2015	11.03%	7.25%	9.30%
12/31/2015	8.10%	4.46%	8.31%
3/31/2016	7.70%	6.25%	9.44%

Table 4.26: Concentration Ratio One index, source: compilation of data from the VAT department

	Concentration Ratio Three Index (CR3)		
Date	Food and Beverage Industry	Housing Industry	Transport Industry
12/31/2002	20.59%	11.69%	13.47%
3/31/2003	22.03%	8.88%	9.82%
6/30/2003	19.41%	16.67%	13.12%
9/30/2003	20.88%	14.08%	11.28%
12/31/2003	17.81%	15.37%	10.82%
3/31/2004	18.64%	13.13%	9.13%
6/30/2004	18.73%	12.40%	10.70%
9/30/2004	18.87%	14.60%	10.20%
12/31/2004	16.77%	15.48%	9.67%
3/31/2005	15.94%	18.93%	7.69%
6/30/2005	16.94%	20.10%	10.12%
9/30/2005	18.92%	10.92%	9.82%
12/31/2005	15.98%	39.99%	10.78%
3/31/2006	16.48%	11.52%	10.37%
6/30/2006	17.43%	8.26%	12.40%
9/30/2006	21.63%	13.06%	9.97%
12/31/2006	17.80%	7.50%	9.25%
3/31/2007	16.25%	6.71%	10.66%
6/30/2007	18.02%	9.82%	13.32%
9/30/2007	20.24%	8.40%	13.93%
12/31/2007	17.85%	14.43%	13.38%
3/31/2008	17.95%	7.59%	13.13%
6/30/2008	18.55%	9.66%	14.35%
9/30/2008	20.41%	7.00%	12.47%
12/31/2008	17.84%	10.19%	13.43%
3/31/2009	17.10%	8.98%	10.28%

6/30/2009	18.46%	10.25%	11.83%
9/30/2009	20.24%	9.18%	11.63%
12/31/2009	22.86%	8.98%	11.06%
3/31/2010	17.58%	9.03%	9.32%
6/30/2010	18.30%	9.01%	9.50%
9/30/2010	20.01%	8.60%	8.94%
12/31/2010	18.14%	7.68%	37.81%
3/31/2011	15.91%	8.79%	8.82%
6/30/2011	17.50%	8.90%	10.75%
9/30/2011	19.27%	9.49%	10.01%
12/31/2011	16.17%	9.99%	9.26%
3/31/2012	15.19%	11.12%	10.08%
6/30/2012	17.85%	9.99%	12.50%
9/30/2012	20.33%	9.71%	9.70%
12/31/2012	17.40%	7.81%	10.80%
3/31/2013	16.03%	10.40%	8.79%
6/30/2013	17.36%	8.08%	10.10%
9/30/2013	18.29%	9.17%	10.02%
12/31/2013	17.10%	10.37%	11.40%
3/31/2014	17.14%	13.37%	28.26%
6/30/2014	17.63%	11.15%	13.40%
9/30/2014	19.11%	13.28%	11.71%
12/31/2014	16.24%	11.67%	13.05%
3/31/2015	16.07%	20.62%	13.05%
6/30/2015	17.06%	13.98%	16.70%
9/30/2015	19.04%	12.95%	16.11%
12/31/2015	16.61%	11.14%	16.61%
3/31/2016	16.14%	14.40%	17.98%

Table 4.27: Concentration Ratio Three index, source: compilation of data from the VAT department

	Concentration Ratio Four Index (CR4)		
Date	**Food and Beverage Industry**	**Housing Industry**	**Transport Industry**
12/31/2002	23.65%	14.89%	16.69%
3/31/2003	25.00%	11.38%	12.35%
6/30/2003	22.98%	19.35%	15.92%
9/30/2003	24.58%	16.51%	13.82%
12/31/2003	22.29%	18.35%	13.98%
3/31/2004	23.85%	15.32%	11.62%
6/30/2004	22.82%	14.50%	13.18%
9/30/2004	22.68%	17.57%	12.81%
12/31/2004	20.84%	18.85%	12.31%
3/31/2005	20.10%	20.93%	9.94%
6/30/2005	20.70%	22.02%	12.44%
9/30/2005	22.64%	13.47%	12.01%
12/31/2005	19.37%	42.30%	13.76%
3/31/2006	20.34%	13.81%	12.96%
6/30/2006	21.43%	10.47%	14.75%
9/30/2006	25.39%	16.84%	11.69%
12/31/2006	21.36%	9.68%	11.40%
3/31/2007	19.92%	8.76%	12.61%
6/30/2007	22.04%	12.31%	15.44%
9/30/2007	23.99%	10.49%	16.74%
12/31/2007	21.03%	16.31%	16.09%
3/31/2008	21.34%	9.70%	15.07%
6/30/2008	21.80%	12.17%	16.70%
9/30/2008	23.50%	8.93%	14.77%
12/31/2008	20.44%	12.36%	15.98%
3/31/2009	20.23%	11.36%	13.24%

6/30/2009	21.38%	12.43%	14.46%
9/30/2009	23.04%	11.27%	14.47%
12/31/2009	25.25%	11.30%	13.80%
3/31/2010	20.50%	11.45%	11.41%
6/30/2010	21.28%	11.44%	12.12%
9/30/2010	22.61%	11.21%	11.69%
12/31/2010	20.74%	9.93%	39.32%
3/31/2011	18.69%	11.08%	11.01%
6/30/2011	20.37%	10.89%	13.95%
9/30/2011	21.94%	11.43%	12.59%
12/31/2011	19.47%	11.97%	11.45%
3/31/2012	18.17%	13.50%	12.42%
6/30/2012	20.90%	12.47%	14.78%
9/30/2012	22.88%	12.38%	12.26%
12/31/2012	20.42%	10.13%	14.16%
3/31/2013	19.04%	13.09%	11.20%
6/30/2013	19.95%	9.92%	13.01%
9/30/2013	20.95%	11.30%	12.43%
12/31/2013	19.99%	13.57%	14.58%
3/31/2014	19.81%	15.73%	30.71%
6/30/2014	20.24%	12.83%	16.05%
9/30/2014	21.57%	15.32%	14.43%
12/31/2014	19.20%	14.12%	15.82%
3/31/2015	18.96%	23.27%	16.25%
6/30/2015	20.01%	16.38%	19.83%
9/30/2015	22.24%	14.98%	19.01%
12/31/2015	19.57%	13.51%	19.40%
3/31/2016	19.11%	17.17%	20.99%

Table 4.28: Concentration Ratio Four index, source: compilation of data from the VAT department

	Concentration Ratio Five Index (CR5)		
Date	**Food and Beverage Industry**	**Housing Industry**	**Transport Industry**
12/31/2002	26.47%	17.03%	19.86%
3/31/2003	27.69%	13.57%	14.57%
6/30/2003	26.31%	21.79%	18.48%
9/30/2003	28.20%	18.72%	16.35%
12/31/2003	25.53%	20.75%	16.39%
3/31/2004	28.73%	17.24%	13.81%
6/30/2004	26.66%	16.29%	15.14%
9/30/2004	26.28%	19.75%	15.22%
12/31/2004	24.67%	21.19%	14.92%
3/31/2005	23.59%	22.90%	12.06%
6/30/2005	24.22%	23.87%	14.61%
9/30/2005	26.31%	15.89%	14.11%
12/31/2005	22.53%	44.39%	16.49%
3/31/2006	24.14%	15.97%	15.04%
6/30/2006	25.06%	12.44%	16.89%
9/30/2006	28.12%	19.33%	12.87%
12/31/2006	24.87%	11.78%	13.36%
3/31/2007	23.56%	10.60%	14.44%
6/30/2007	25.22%	14.65%	17.07%
9/30/2007	27.17%	12.26%	18.93%
12/31/2007	23.80%	18.08%	18.50%
3/31/2008	24.66%	11.39%	16.86%
6/30/2008	24.97%	13.88%	18.87%
9/30/2008	26.05%	10.78%	17.03%
12/31/2008	22.95%	14.50%	18.49%
3/31/2009	23.04%	13.65%	15.56%

6/30/2009	24.30%	14.60%	17.04%
9/30/2009	25.81%	13.28%	17.30%
12/31/2009	27.48%	13.61%	15.82%
3/31/2010	23.30%	13.50%	13.47%
6/30/2010	24.16%	13.39%	14.21%
9/30/2010	25.17%	12.86%	13.89%
12/31/2010	23.23%	11.86%	40.83%
3/31/2011	21.40%	13.23%	13.02%
6/30/2011	23.04%	12.82%	16.19%
9/30/2011	24.37%	13.33%	14.53%
12/31/2011	22.23%	13.74%	13.58%
3/31/2012	21.00%	15.86%	14.41%
6/30/2012	23.67%	14.67%	16.98%
9/30/2012	25.41%	14.53%	14.40%
12/31/2012	23.16%	12.45%	17.07%
3/31/2013	21.80%	15.77%	13.52%
6/30/2013	22.40%	11.73%	15.59%
9/30/2013	23.47%	13.27%	14.79%
12/31/2013	22.87%	16.14%	17.05%
3/31/2014	22.32%	17.85%	32.62%
6/30/2014	22.56%	14.36%	18.46%
9/30/2014	23.96%	17.35%	17.09%
12/31/2014	21.93%	16.27%	18.49%
3/31/2015	21.74%	25.48%	19.20%
6/30/2015	22.65%	18.50%	22.53%
9/30/2015	24.91%	16.82%	21.83%
12/31/2015	22.28%	15.52%	22.18%
3/31/2016	21.82%	19.41%	23.69%

Table 4.29: Concentration Ratio Five index, source: compilation of data from the VAT department

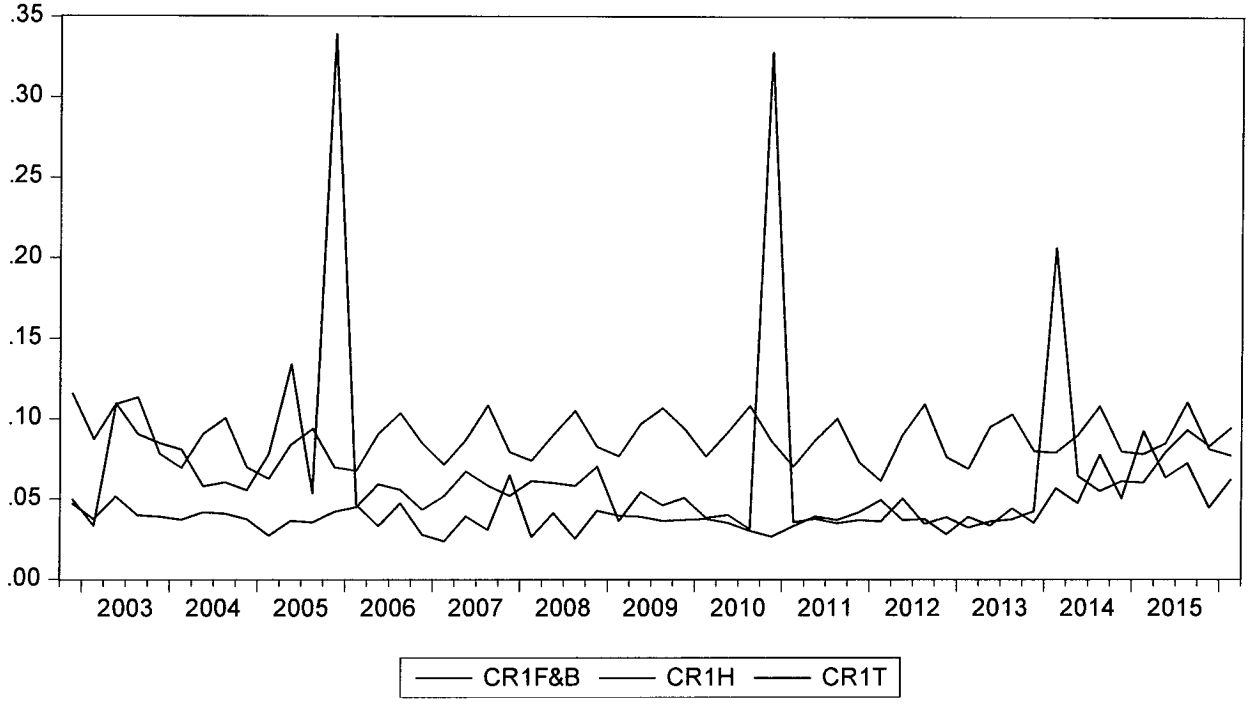

Figure 4.19: Concentration ratio one index, source: e-views

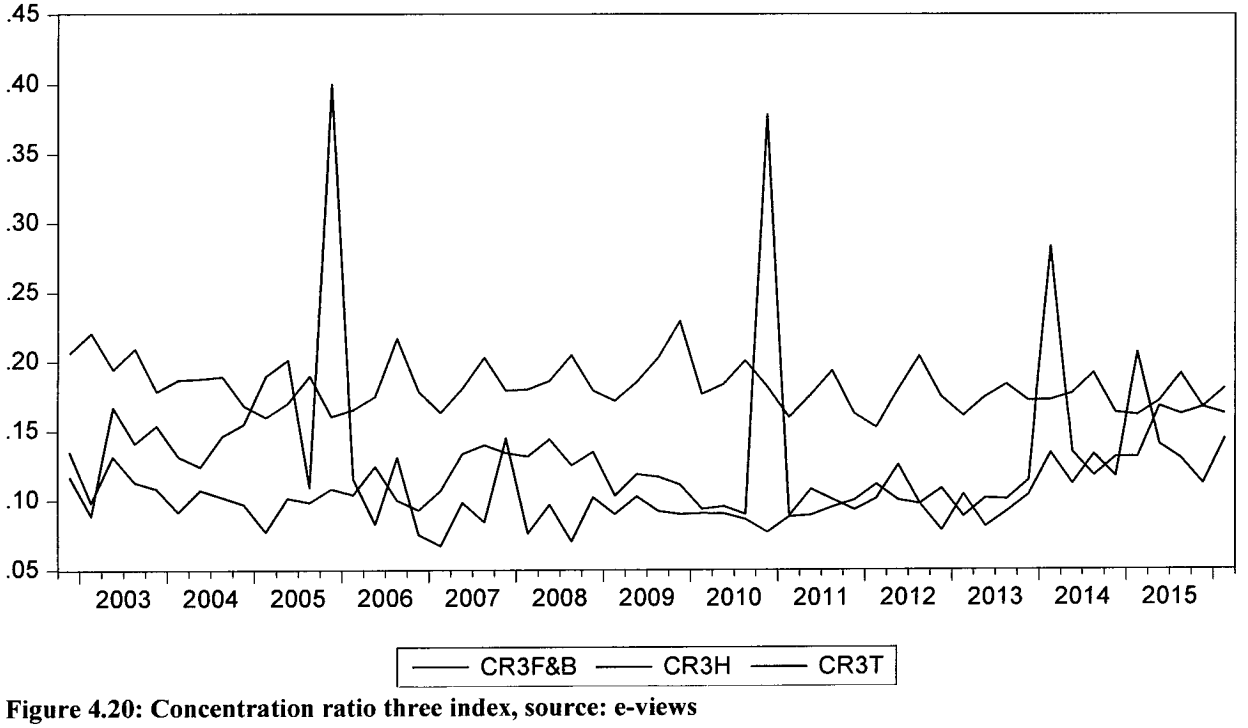

Figure 4.20: Concentration ratio three index, source: e-views

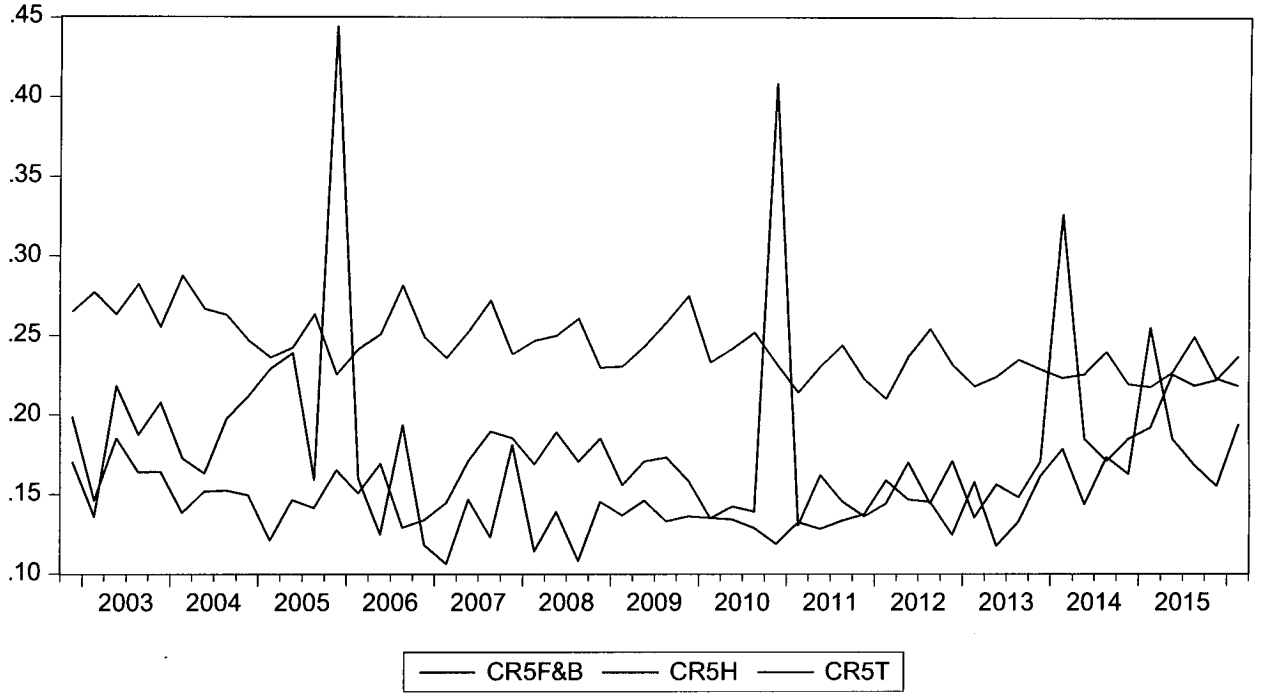

Figure 4.21: Concentration ratio five index, source: e-views

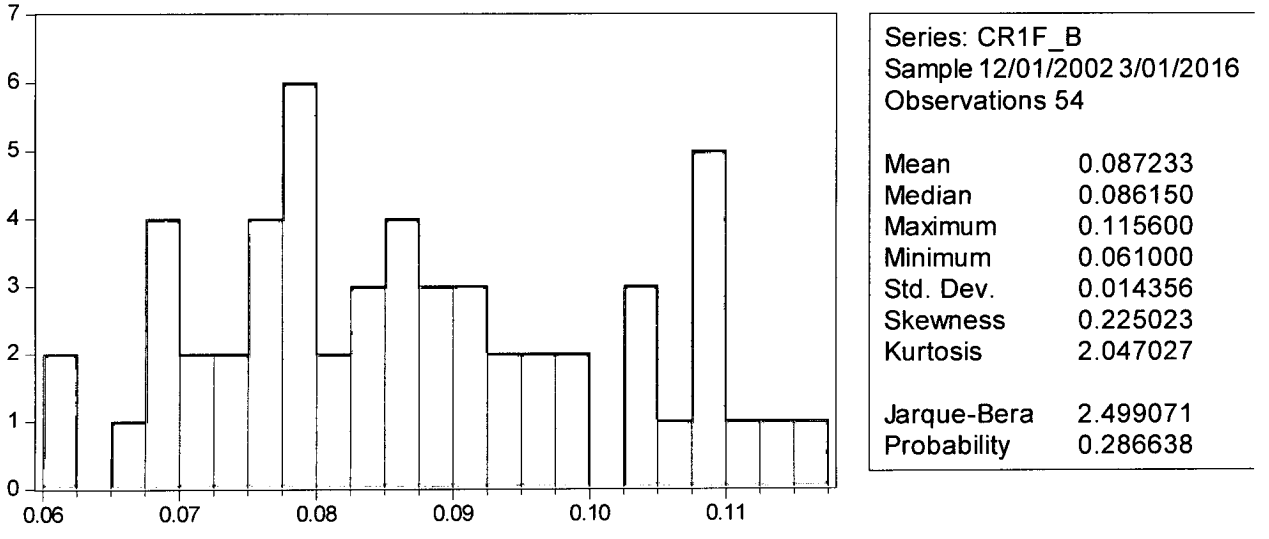

Figure 4.22: Histogram Concentration Ratio One (F&B industry), source: e-views

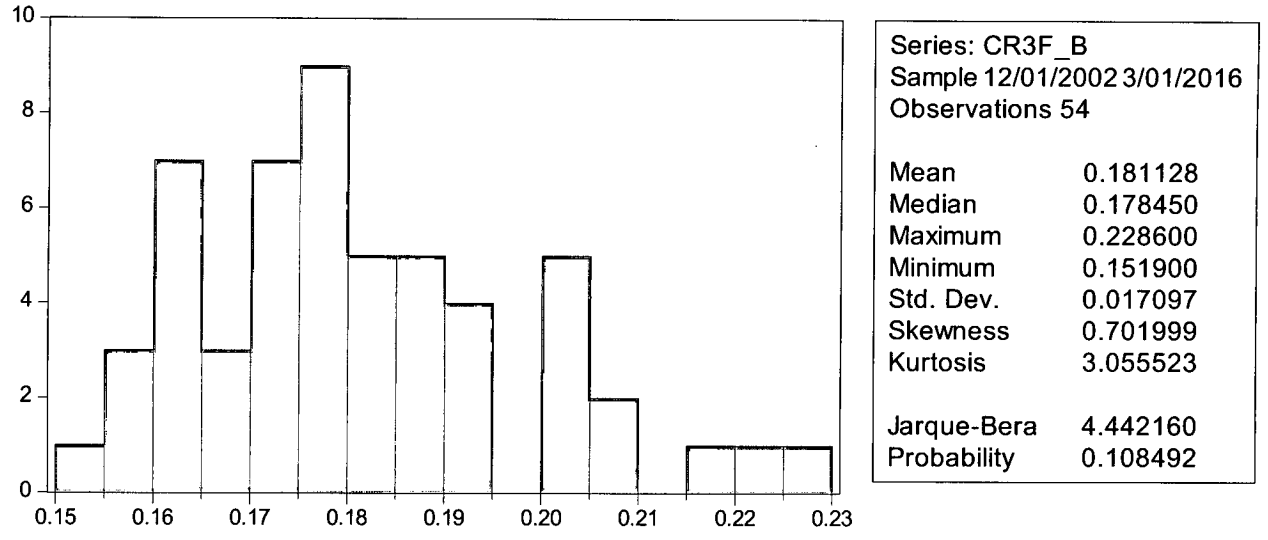

Figure 4.23: Histogram Concentration Ratio Three (F&B industry), source: e-views

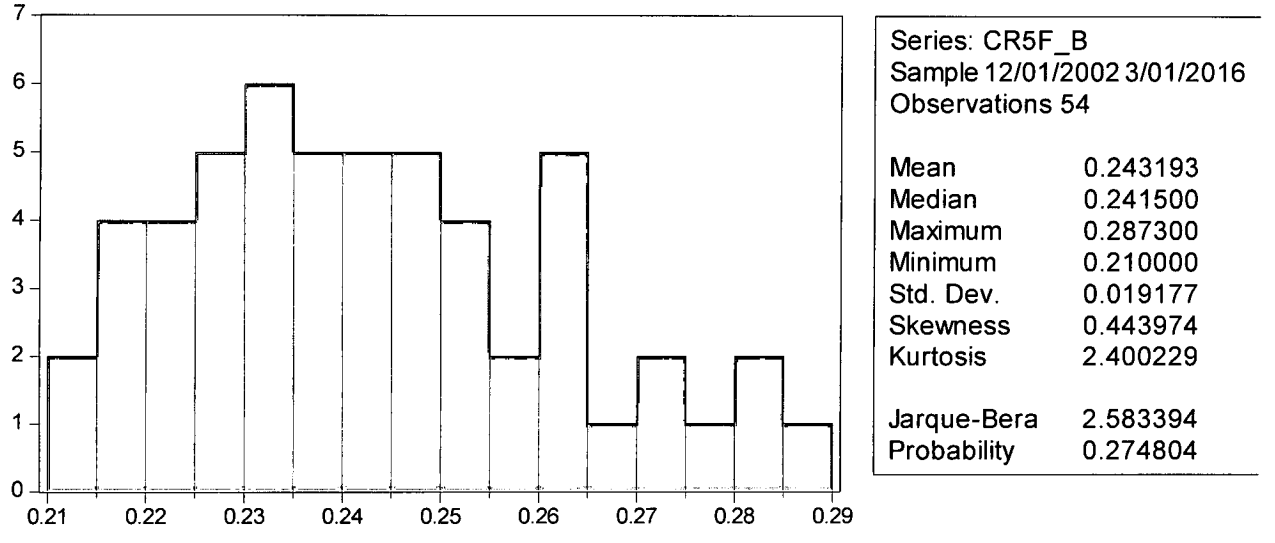

Figure 4.24: Histogram Concentration Ratio Five (F&B industry), source: e-views

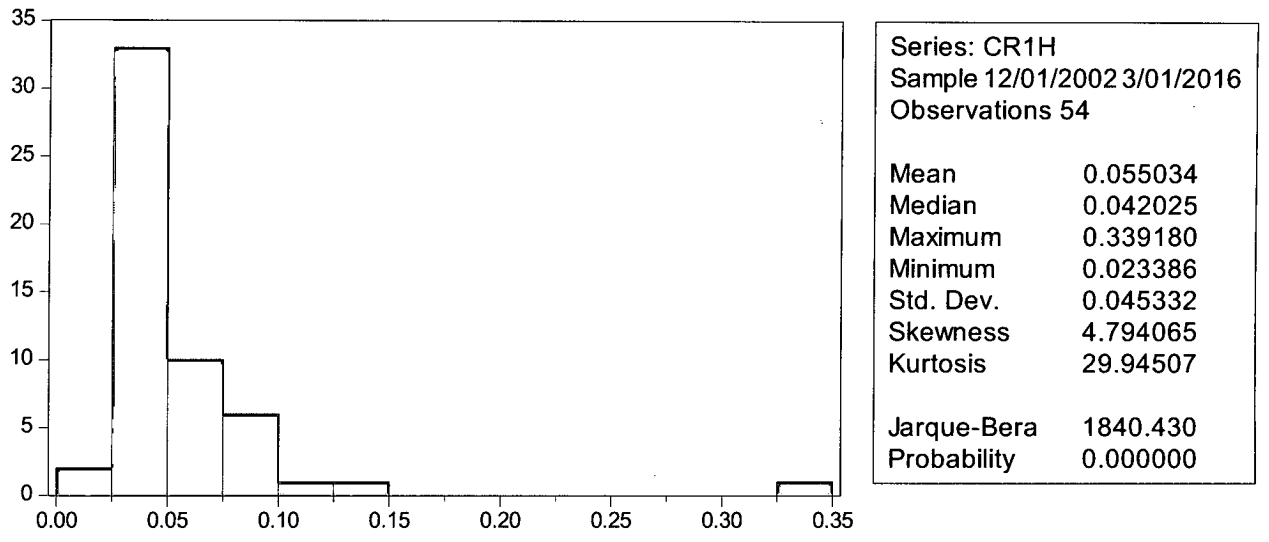

Figure 4.25: Histogram Concentration Ratio One (housing industry), source: e-views

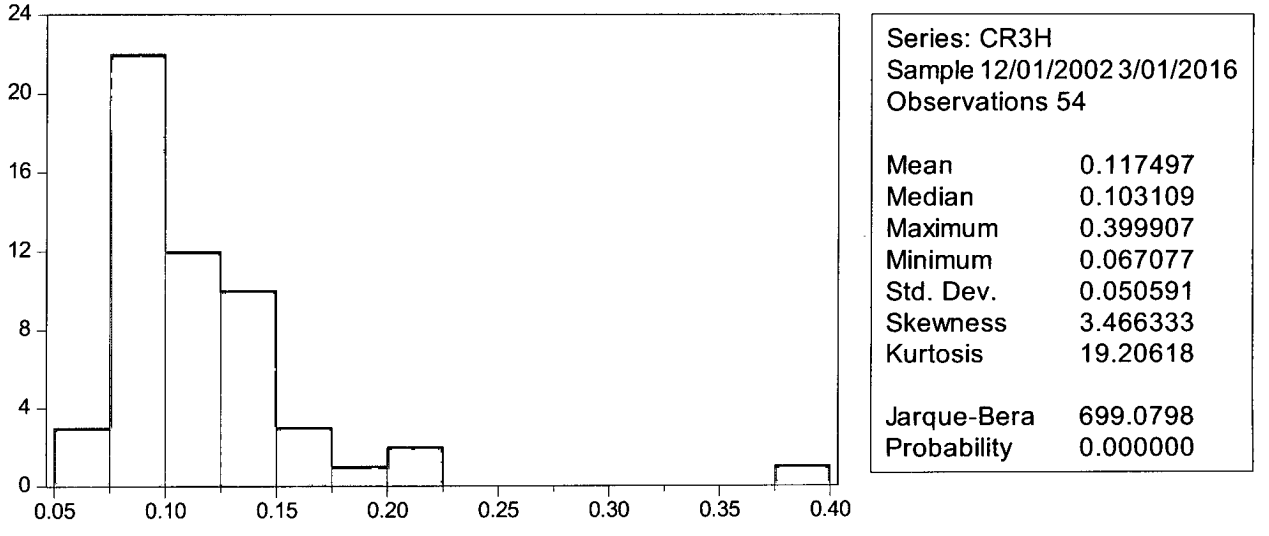

Figure 4.26: Histogram Concentration Ratio Three (housing industry), source: e-views

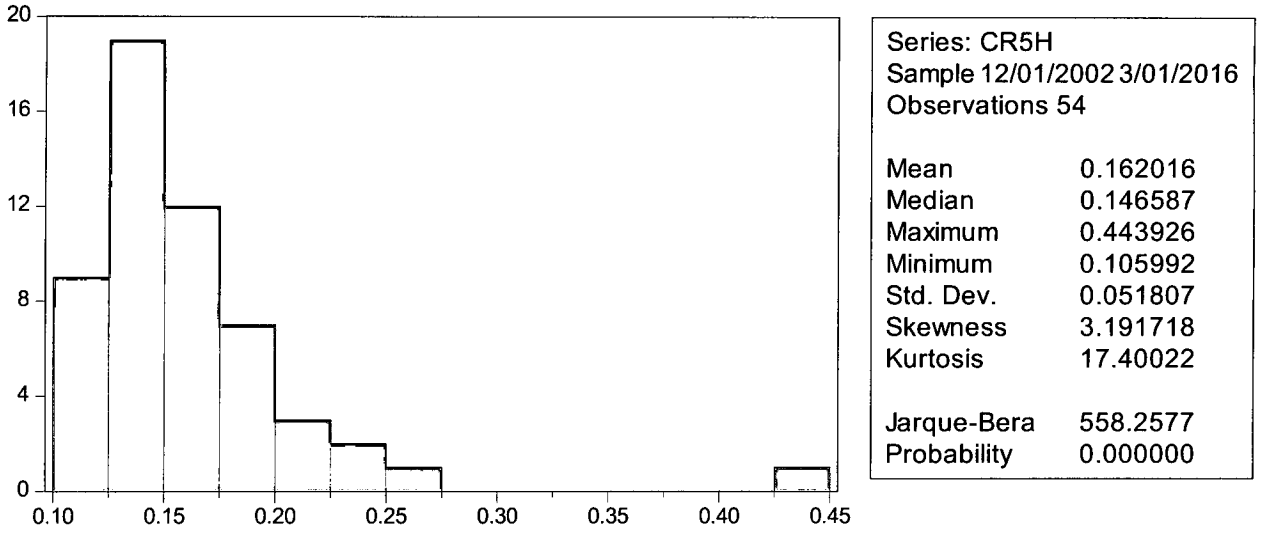

Figure 4.27: Histogram Concentration Ratio Five (housing industry), source: e-views

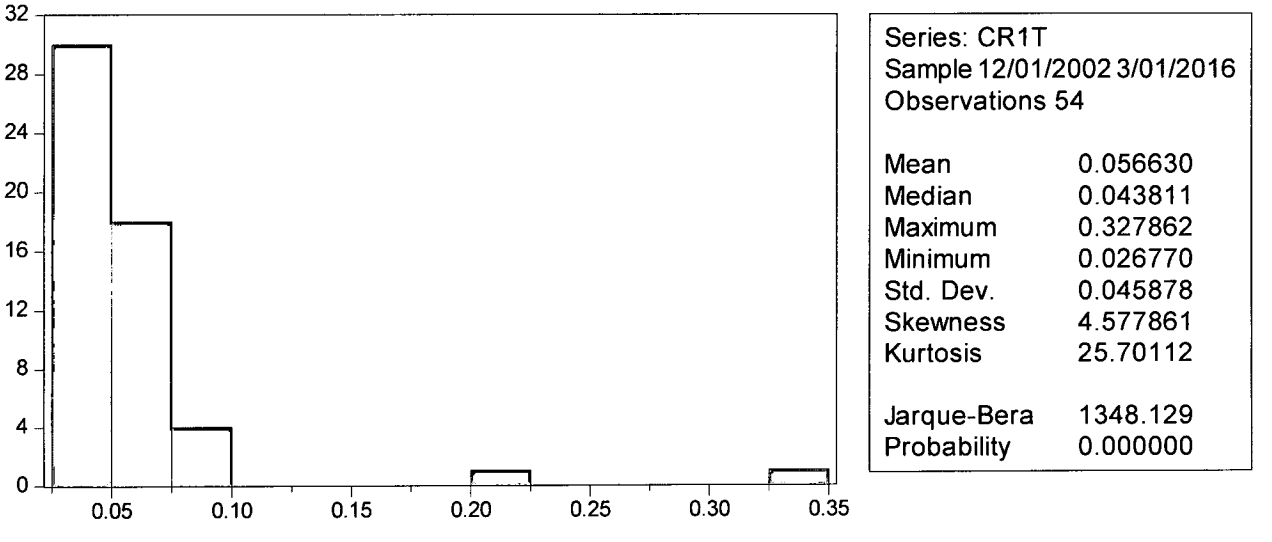

Figure 4.28: Histogram Concentration Ratio One (transport industry), source: e-views

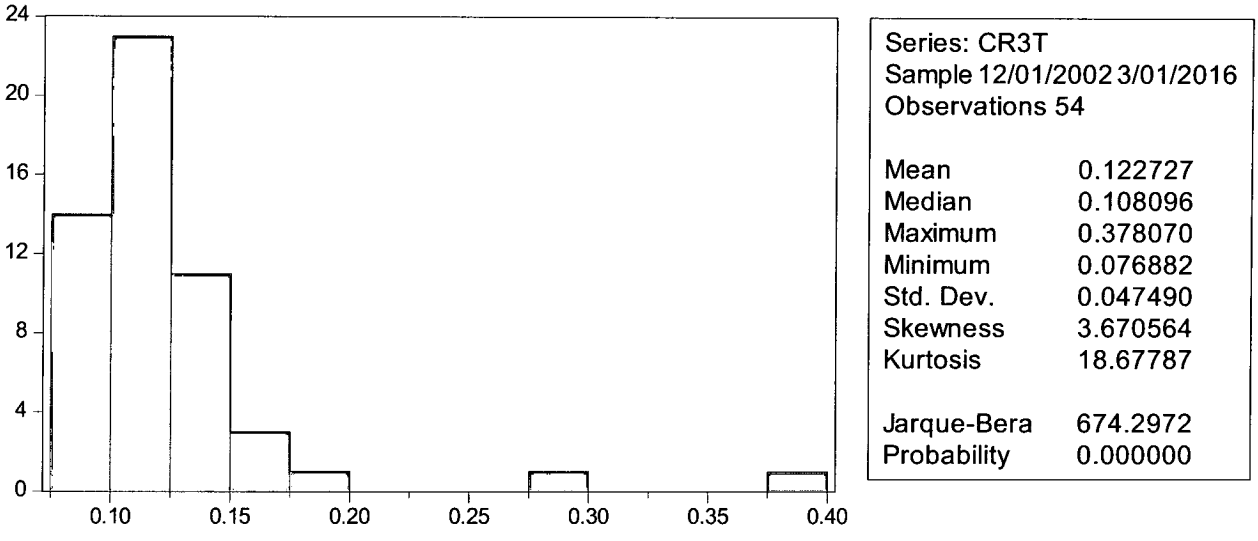

Figure 4.29: Histogram Concentration Ratio Three (transport industry), source: e-views

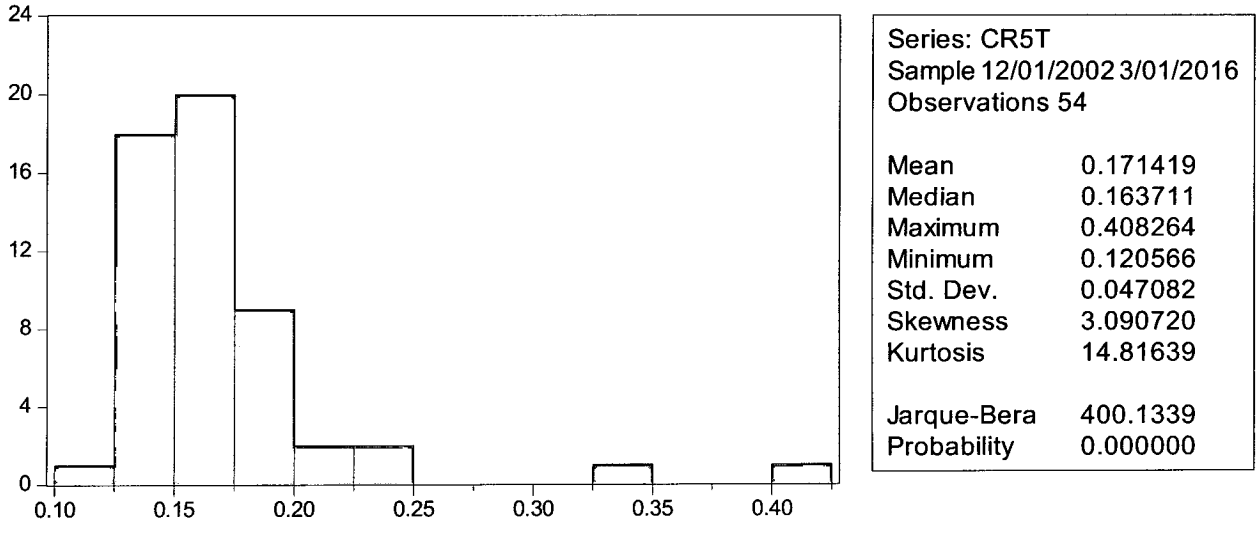

Figure 4.30: Histogram Concentration Ratio Five (transport industry), source: e-views

Null Hypothesis: MRKF_B has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.658652	0.0881
Test critical values:	1% level	-3.560019	
	5% level	-2.917650	
	10% level	-2.596689	

*MacKinnon (1996) one-sided p-values.

Table 4.30: unit root test Market Size (F&B), source: e-views

Null Hypothesis: D(MRKF_B) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.341718	0.0000
Test critical values:	1% level	-3.562669	
	5% level	-2.918778	
	10% level	-2.597285	

*MacKinnon (1996) one-sided p-values.

Table 4.31: unit root test 1st difference Market Size (F&B), source: e-views

Null Hypothesis: CURRENCY_IN_CIRCULATION_ has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		1.974154	0.9998
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.32: unit root test Currency in Circulation, source: e-views

Null Hypothesis: D(CURRENCY_IN_CIRCULATION_) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.466749	0.1297
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.33: unit root test 1st difference Currency in Circulation, source: e-views

Null Hypothesis: D(CURRENCY_IN_CIRCULATION_,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-15.16085	0.0000
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.34: unit root test 2nd difference Currency in Circulation, source: e-views

Null Hypothesis: UNEMPLOYMENT_RATE has a unit root
Exogenous: Constant
Lag Length: 4 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-2.335795	0.1652
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.35: unit root test Unemployment Rate, source: e-views

Null Hypothesis: D(UNEMPLOYMENT_RATE) has a unit root
Exogenous: Constant
Lag Length: 3 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-1.778529	0.3866
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.36: unit root test 1st difference Unemployment Rate, source: e-views

Null Hypothesis: D(UNEMPLOYMENT_RATE,2) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=10)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-11.65611	0.0000
Test critical values:	1% level	-3.571310	
	5% level	-2.922449	
	10% level	-2.599224	

*MacKinnon (1996) one-sided p-values.

Table 4.37: unit root test 2nd difference Unemployment Rate, source: e-views