A Reality Check on the Relationship between Poverty and Income Inequality for Turkey

Sadullah Çelik[1] and Deniz Şatıroğlu

Abstract

This study revisits a distinctive topic which is regarded to offer endless ways of research. The impact of poverty on income inequality has been considered a dynamic issue from the beginning of economic history (Smith, 1776), especially for developing (emerging) economies. The conventional approaches of income inequality and poverty are based on the empirical analysis of household labor force participation survey results with a mixture of other well-known variables. This paper differs from the previous literature by employing some unconventional survey data results-trying to extract information from the expectations of producers-and inflation which has the greatest distortion on income inequality for the emerging market of Turkey. Given the rationality of expectations, we believe that producers' survey results should include relevant information about the future consumption patterns of households (and thus poverty). Hence, the Retail Sector Confidence Survey (TEPE of TEPAV) is taken as a proxy for poverty (consumption) and the Consumer Price Index (TÜFE of TUİK) as a proxy for income inequality. The data set is monthly and runs through January 2011 – February 2014. The econometric methods employed consist of the recently developed and rather superior frequency-domain causality (Breitung and Candelon, 2006) and wavelet comovement analysis (Rua, 2010). Our results show that food consumption is one of the most significant determining factors of both income inequality and poverty whereas transportation and miscellaneous other goods and services are also important for Turkish economic agents.

Key Words: Poverty, income inequality, emerging market, frequency-domain causality, wavelet comovement

JEL classification: C51, I30, G01.

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1. Introduction

Welfare systems have been improving around the world more than a few decades now. Nonetheless, poverty is still one of the most compelling problems for societies. Development policies of countries usually have been formed in accordance with poverty as the top priority. Similarly, income inequality has also been at the top of the economic agenda with its social and economic importance (Rowntree, 1899). These two concepts exhibit in various economic and social problems such as distribution of earnings or wealth and how the social welfare should be maximized by focusing on questions like to which groups and at what level the government should provide social care, how income would be shared among the regions, etc. Hence, there are a lot of hypotheses that the sociologists and economists use to find out the driving factors of income distribution. The general findings suggest that inflation plays the key role as its effects have been superior (to almost any other economic or financial variable) on demand and supply. Therefore, inflation has an undeniable impact on poverty because it continuously decreases the purchasing power.

Inequality and poverty impinge upon each other both directly and/or indirectly. There are a lot of studies having been propounded in order to reveal the relationship about how income inequality affects poverty or about how inflation matters for inequality (Whelan *et al.*, 2000 and Wade, 2004). Findings presenting divergence of poverty and income inequality has put further doubt on whether these two important determinants of economic life could be linked through conventional econometric methodology. This led to a lot of research for both developed and developing countries (Among others see Ravallion, 1991, Naschold, 2002 and Çakar, 2010). However, there are still some incomplete parts left to explain the link of poverty and income inequality, especially for developing (emerging) economies like Turkey where it is hard to find real time (current) data. Using the leading economic indicators like surveys could be the solution for this puzzle which seems to present greater challenges with every new study. However, employing conventional household survey data to investigate the poverty movements of Turkey has led to more or less the same results in the literature with almost no original contribution. This paper uses the Retail Sector Confidence Survey (of TEPAV-Economic Policy Research Foundation of Turkey) results for poverty instead of household survey data results and Consumer Price Index (CPI) (of TUİK) as a proxy for income inequality with inflation being the culprit for the worsening of income distribution over the decades for many high inflation countries.

2. Literature Review

Before merging the terms of poverty and income inequality, understanding the evolution of their meanings would be helpful in terms of the literature on this relationship.

On Poverty: Examining the concept of poverty from a historical aspect, it has been defined, more generally, as the problem of being incapable to access the vital necessities for the support of one's life by Smith (1776). Rowntree (1899) referred to poverty by dividing the term into two main types as ''primary'' poverty and ''secondary'' poverty. According to Beveridge (1942) poverty is the minimum income, which is such a boundary amount that it is not only inadequate for food and clothing but also for rent and various things. In a seminal paper, Sen (1992) argued that poverty is not just about primary physical elements, but it is also about being incapable of achieving lowest level of acceptance in society leading to feelings of shame in order to participate in public. Following the argument, Nolan and Whelan (1996) make the notion of poverty broader in terms of inadequacy to take part in the life of the community despite having insufficient resources. Ravallion (1998) suggests a description of the poverty line as ''_...the monetary cost to a given person, at a given place and time, of a reference level of Senwelfare_''.

The world summit on Social Development in Copenhagen in 1995 defined ''absolute poverty'' term as:

"_...a condition characterized by severe deprivation of basic human needs, including food, safe drinking water, sanitation facilities, health, shelter, education and information_'' (UN, 1995). Therefore, the term has been defined with regard to both food and non-food related products and service.

Beyond that theoretical conceptualization, poverty profiles lie in the measurements of its lines. As Ravallion (1998) asserts ''_a distinction is sometimes made between an 'absolute poverty line' and a 'relative poverty line', whereby the former has fixed 'real value' over time and space while a relative poverty line rises with average expenditure_''. In an attempt to set an absolute poverty line, the basket of basic consumption needs is taken for the cost estimation. The minimum limit ensures the one's daily nutrition in order to sustain his/her life, designating ''absolute poverty line''. This line was measured as 1\$ per day in 1990s, and this limit was re-measured as 1.25\$ per day by the 2012 World Development Report. Manifestation of the poverty line is socially called ''relative poverty line'' indicating the average welfare level of the community. Ravallion (1998) defines relative poverty line as a

means of the poverty measurement that varies from country to country based on the economic growth.

Apparently, there are lots of definitions, methods and explanations that have been illustrated with the aim of finding a solution to the poverty issue since centuries. As a global problem, emerging countries especially have to be concerned about this important problem as it affects the countries both socially and economically. In this respect, Turkish Government aims to keep the poverty rate low but the Turkish Statistical Institute (TUİK) Report in 2010 on the relative poverty rate shows an increasing trend for both urban and rural parts in Turkey. In an attempt to combat with those kinds of problems, some political approaches have been taken into account consisting of indirect measures like faster growth and direct ones like recruitment policies tax, social security, health and education.

On Inequality: Over the past several decades, income inequality has also become a very challenging topic in several areas like poverty. Even the ratio might differ depending on the country in question it is well known that income inequality has been increasing in OECD countries. There are two conventional measurements for income inequality; Lorenz Curve and the Gini coefficient. OECD (2011) findings show that, by the late 2000s, Gini coefficient has increased showing that income inequality has become distorted.

The path breaking study on income inequality has been by Kuznets (1955) who argued a ''U'' shaped relation of per capita income and income distribution, in which income distribution would not be in equal terms at first but gradually would get better with increasing per capita income. Paukert (1973) supported Kuznets' hypothesis but Anand and Kanbur (1984) found contrasting results. On the other hand, Adelman and Morris (1973) argued that higher inequality leads to higher economic growth but could not obtain statistically significant results using time series data for 44 countries with the distribution of income based on size. Another study by Cardoso (1992) examined the effect of inflation on poverty through real wages and savings. By using panel data method for 1965-1989 including seven Latin American countries, Cardoso analyzed the change in real wages by inflation and found that savings melt away despite higher inflationary tax which leads to an increase in income inequality and poverty by decreasing the savings of the middle-income class.[2] Similarly, Morley and Alvarez (1991) worked on sector analysis for poverty by taking real wage analysis, in which the outcome showed that during the 1989 recession, poverty rate significantly increased because

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[2] The article by Cardoso (1992) includes two different kinds of data. One of them is Brazilian data for monetary base to GDP and inflation rates in the period of 1970 to 1990 in order to assay the inflation tax effect; and these condone is for real wages, inflation rates and for annual growth rate in between the years 1977-1989 in order to present inflation and real wage results by using panel data method.

of the real wages decreasing. Undoubtedly, the change in wages is important to check for poverty but for an emerging market like Turkey, it is not possible to obtain a data set long enough to reach meaningful conclusions.

On the other hand, Ravallion (1998) and Naschold (2002) demonstrate that income inequality has an indirect impact on poverty through growth channel, and they affect each other directly by a change in income distribution which can be measured by the Gini coefficient. A similar setup is developed by Whelan *et al.* (2000) that the changes in poverty in European Union are the result of income differences of the countries. Ravallion (1991) finds that average consumption level specifies the poverty line for every country, where, if an average consumption level is high enough, the poverty line will be high in comparison with the other countries. His paper uses consumption per capita in the regression analysis with the aim of estimating the poverty line. This point is vital for this paper as the conclusion of Ravallion's regression shows if per capita consumption is increasing, the official poverty line will fall on average. In particular, given that consumption per capita is the *one and only* estimator of poverty line, this study uses a proxy for consumption patterns of the households employing the survey results (of TEPAV) for the producers' expectations (observations) of the household's consumption.

Moreover, it can be claimed that the role of inflation has the greatest impact on income inequality through the distortion that it causes on income distribution and indirectly on poverty which is associated with the purchasing power that can be observed by measuring the household's consumption patterns. In order to consolidate this view, Albanesi (2006) proves that inflation and income inequality are positively correlated which supports the deterioration of income inequality with higher inflation. Besides, higher inflation leads to an increase in poverty rates by declining purchasing power of the consumers and/or of the households. Thus, we use CPI as a proxy of income inequality.
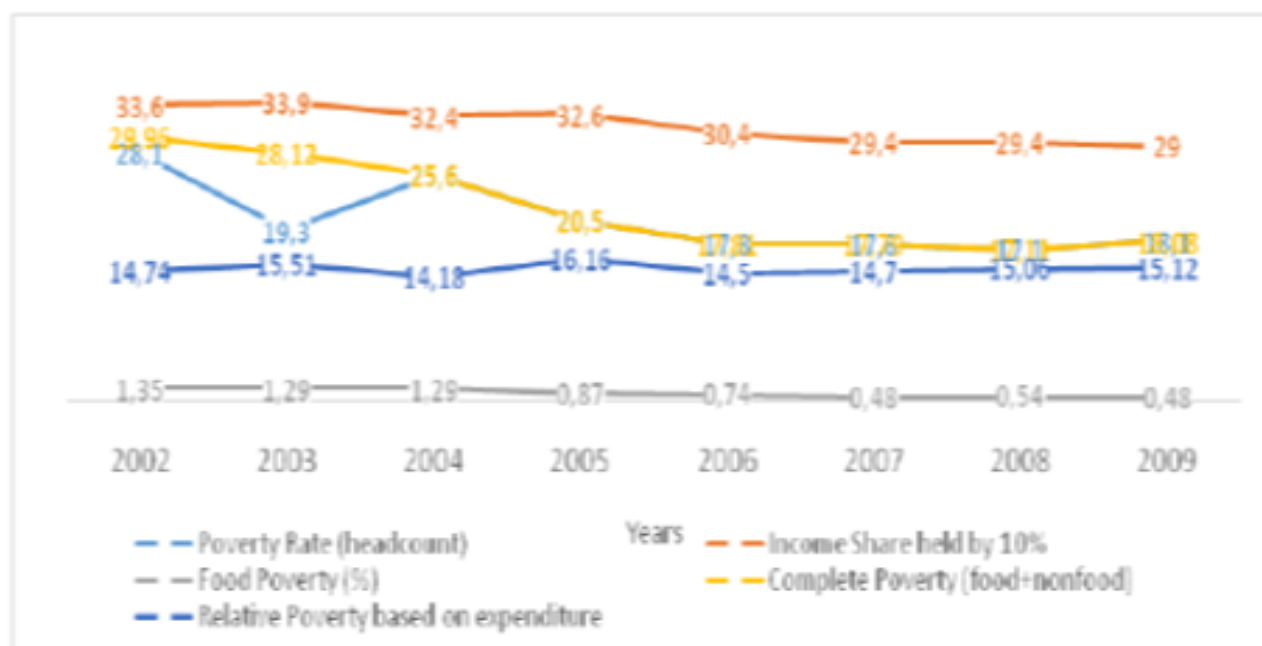
All the literature summarized includes prevalent findings for developing, developed and underdeveloped countries. On the other hand, this paper examines Turkey as it is an interesting case, being the 3rd highest country in income inequality according to OECD Report in 2014. EUROSTAT (2005) findings show that the risk of poverty rate is 23 percent in Turkey which means existing income of the household is below the current poverty line. There is also a dilemma on the current economic situation in Turkey. Even it ranks top twenty as gross domestic product (GDP) on the base of purchasing power parity (PPP) of the World Bank (2014) data, inflation is still relatively high and a great concern in Turkey. Not surprisingly, income inequality is a prior problem and OECD (2011) income distribution and

poverty database ranks Turkey as the highest distorted income country after Chile and Mexico due to the fact that its Gini coefficient is 0.41 as of the late-2000s. There are only a few detailed studies that examine poverty and income inequality relationship for Turkey. Çakar (2010) provides the guidelines for identifying the methodological aspects of Turkey as a developing country sample; and for comparing welfare regimes among Southern European countries by dwelling on the similarities and differences of those countries in terms of poverty changes. EUROMOD micro-data covering multi-country simulations and 2004 Household-Budget Survey micro-data results are used. The paper aims to understand applicability of the rules in order to control the effectiveness of the poverty policies because the evaluation of the utility of implemented policies has a great importance in terms of analyzing the poverty risk. The results show that the predictors of the poverty rate risk are similar among Southern European countries and Turkey. On the other hand, Aran *et al.* (2010) assess how the poverty and inequality have changed in recent years in Turkey and demonstrate that the poverty rate in Turkey has been decreasing in the last decade in the growth channel as a result of higher growth rate; and in consumption level as a result of changing consumption patterns using the Household Budget Survey annual dataset between 2003 and 2006. The findings by Aran *et al.* (2010) mean that even though absolute poverty has declined in these specific years based upon higher consumption growth, the inequality between groups including rural and urban areas has not changed. Therefore, a large part of the population have not benefited from this higher consumption growth so inequality problem continues to exist.
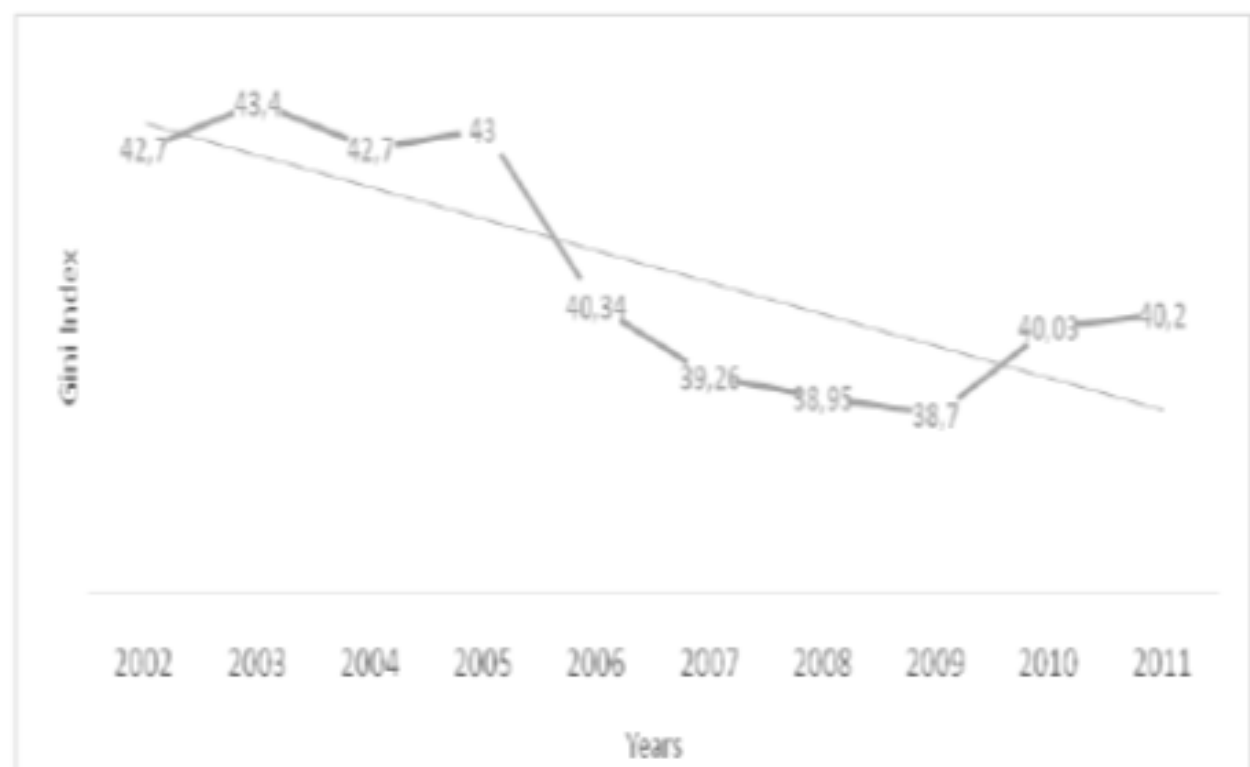
It would be useful to begin with poverty and income inequality rates and their movements over time by using data from the World Bank and Turkish Statistical Institute (TUİK). In Graph 1, we have the official poverty rates and income share in Turkey in the years from 2002 to 2009 and in Graph 2 the Gini index movements in Turkey from 2002 till 2011. These graphs indicate the direct measurements of poverty and income inequality according to the specific years. However, this paper employs indirect measurements by using proxies due to the fact that there is no poverty data available after 2009, and there is no Gini index data after 2011. Hence, a new approach is required to discover poverty and income inequality analysis in Turkey which operates indirectly but at least provides some early signals.[3]

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[3] Gini coefficient could be calculated by applying a formula but official poverty rates are only announced by TUİK after a sophisticated data assembling process. This study uses monthly aggregates instead of annual data so that we get an earlier picture of the relationship.

Graph 1. Official Poverty Rates and Income Share in Turkey

	2002	2003	2004	2005	2006	2007	2008	2009
Income Share held by 10%	33,6	33,9	32,4	32,6	30,4	29,4	29,4	29
Complete Poverty (food+nonfood)	28,95	28,12	25,6	20,5	17,8	17,7	17,1	18,08
Poverty Rate (headcount)	28,1	19,3						
Relative Poverty based on expenditure	14,74	15,51	14,18	16,16	14,5	14,7	15,06	15,12
Food Poverty (%)	1,35	1,29	1,29	0,87	0,74	0,48	0,54	0,48

Legend:
- – – Poverty Rate (headcount)
- – – Food Poverty (%)
- – – Relative Poverty based on expenditure
- – – Income Share held by 10%
- – – Complete Poverty (food+nonfood)

Years

Graph 2. Gini Index for Turkey

Gini Index

2002	2003	2004	2005	2006	2007	2008	2009	2010	2011
42,7	43,4	42,7	43	40,34	39,26	38,95	38,7	40,03	40,2

Years

Most simply, the poverty rate movements vary according to their categories such as non-food poverty, food poverty etc. The poverty rate with respect to the headcount index, the light blue line, shows that from 2002 to 2004, the rate first decreased, but then it increased. After 2004, the poverty rate (headcount) and the complete poverty rate (food and non-food components) lines crossed with each other first in 2004, and then, they started to show the same movements as they either increased or decreased in the same years. Similarly, the poverty rates based on expenditure do not differ from the others a lot since the differences in rates among the years seem to resemble the movements of the other poverty rates.

Moreover, if a comparison is made related to the basis of relative poverty rates based on expenditure, since the empirical analysis uses consumption as a base of poverty, and the Gini index, it can be observed that while the poverty rates based on expenditure are moving up, the Gini index in Turkey also gets higher until the year 2006 (or whenever Gini index rate is high, the poverty rates based on expenditure goes up vice versa). For instance, the rate of the poverty based on consumption reaches its peak value in 2005, whereas, in the same year, the Gini index reaches the second highest level. The same relation can also be observed between the line of the income share held by 10% and of the poverty rate based on expenditure.

On the other hand, the food poverty line shows relatively more independent movements than poverty rate based on expenditure. When the year 2005 is one of the most specific years in terms of the higher rates, there is a decline of the food poverty rate after the year 2004. Hence, the food poverty may give different results during the analysis of the relation of poverty and inequality. Therefore, food consumption and its overall view play a significant role for the development of this study.[4]

There is a linear relation between poverty rates and the Gini index during some certain years while it shows no specific linkage between those measurements in other years. If they interact with one another, it rises up a question that which one has a greater impact on the other one. Is it true that the poverty rate is getting higher in one year when compared to the past data because of getting the Gini index higher? Or, could it be possible that the Gini index may go up due to the fact that the poverty rate tends to increase.

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[4] Food and non-food discrimination and the changes in the food poverty rates may be a clue of exploring a linkage not only between income inequality and complete poverty but also between food poverty rates and income inequality. The empirical part will focus more on the the consumption patterns of the food sectors.

Apparently, there is a need to investigate the relationship between poverty and income inequality in Turkey due to the fact that the movements of poverty and inequality may sometimes differ. One's movement is sometimes decreasing whereas the other one is increasing, or vice versa. The crux of the problem may be hidden behind their relations. Although there are some remarkable papers having investigated the link between poverty and income inequality such as Naschold (2002)'s findings explained above, there are no such kind of existing studies having been conducted before for Turkey. Consequently, a basic promise of this research is to probe the effect of poverty on income inequality in Turkey. Next section evaluates those effects, or tries to find the linkage between the poverty changes and income inequality.

3. Data and Methodology

This part consists of two sections; the data and the methodology. It aims to predict the impact of poverty on income inequality by analyzing inflation via CPI and consumption patterns.

3.1. The data

The data consists of the survey from TEPAV used as a proxy for poverty and the other one consumer price index which is a proxy for income inequality.

3.1.1. The data for Poverty

The RSCS micro data of TEPAV is based on six monthly survey questions runs through January 2011 – February 2014. The six survey questions are as follow:

1. In what direction has been the status of your business within the past 3 months? (increased, the same, decreased)

2. What do you think about your existing stock level? (above the average, normal, below the average)

3. In what direction do you think that your orders from the suppliers will change for the next 3 months? (will increase, will be the same, will decrease)

4. In which direction do you think that your sales are going to be for the next 3 months? (will increase, will be the same, will decrease)

5. In which direction will the number of your employees change for the next 3 months? (will increase, will remain the same, will decrease)

6. What do you think that your selling price is going to be within the next 3 months? (will increase, no idea, will decrease)

The first question checks the past, second the current and the last four measure the producers' expectations for the future. Data is seasonally adjusted so that a better general picture will be obtained when checking the poverty movements and income inequality analysis.

3.1.2. The data for Income Inequality

The role of inflation has the greatest impact on income inequality through the distortion of income distribution. Hence, the Consumer Price Index (of TUİK) is regarded as a proxy for income inequality since CPI represents the prices and enables to check the price changes. Everybody can consume more if there is no change in inflation in the economy. Thus, low rates of inflation should lead to a lower degree of income inequality. Datt and Ravallion (1998) argue that the share of income held by the poor is going to be lower with a higher level of inflation.[5] TEPAV data period is used for CPI data as well. Indices by main expenditure groups are chosen as 'food and non-alcoholic beverages', 'alcoholic beverages and tobacco', 'clothing and footwear', 'furnishing, household equipment, routine maintenance of the house', 'transportation' and 'miscellaneous goods and services'. As it is seen, those indices are similar with the sectors of TEPAV except 'alcoholic beverages' and 'non-alcoholic beverages' are separated from each other in this case.[6]

3.1.3. Matching the Model

The second step is to transform the retail sector confidence survey (RSCS) results' into the retail sector confidence index (RSCI) on account of the fact that the model requires the indexes; and furthermore, the consumer prices have been counted as index numbers, which is CPI. While calculating the index numbers of RSCS, it should be considered that the survey questions of TEPAV were mostly based on 3 month periods; therefore, the index numbers are calculated by taking three month aggregate. Therefore, there are two different index sets acquired; one of them is the consumer price index of TUIK (for income inequality) and the other one is the retail sector confidence index of TEPAV (for poverty).

Secondly, the RSCI has 'seasonally adjusted' (SA) and 'non-seasonally adjusted' (NSA) index categories. In this model, the seasonally adjusted one would be preferred to make an overall analysis about the change in poverty except from the analysis of each survey question (or except from the analysis for each sector). The drawing up of a general statement about both poverty and income inequality also requires the 'seasonally adjusted' index data set from TUIK for income inequality analysis; however, there is no monthly basis 'seasonally

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[5] See Walsh and Yu (2012).

[6] The next part will explain how the segments are matched.

adjusted' data available. For this reason, this paper converts the CPI data of each month into the 'seasonally adjusted' data with DEMETRA seasonal adjustment software. Thus, this paper attains the SA data sets of the CPI and of the CA data sets of RSCI without dispersion of sector categories.

Lastly, the sector categories of the RSCI are picked in accordance with the main expenditure groups of CPI. However, the category of RSCI of TEPAV is arranged as 'food, beverages and tobacco' where the similar category of the CPI of TUIK is separated as 'food and non-alcoholic beverages' and 'alcoholic beverages and tobacco'. In order to have index numbers of both data sets with the same categories, this study harmonizes 'food and non-alcoholic beverages' and 'alcoholic beverages and tobacco' expenditure groups of the CPI in one segment by multiplying the weight of alcoholic beverages with 0.2, and with 0.8 of the weight of non-alcoholic beverages. The sectors of both CPIs and RSCIs are matched one to one with each other.

3.2. The Methodology

The focus of the review paper by Stock and Watson (1989) is based upon the determining indexes by forecasting of the macroeconomic indicators.[7] This paper aims to check the link between Turkey's poverty changes by taking the RSCI as a proxy and Turkey's income inequality movements by taking the CPI as a proxy; furthermore, intends to investigate how income inequality of Turkey has been affected by the poverty of Turkey. In line with this purpose, besides using the phenomenon methods of 'time domain causality' and of 'Geweke', the recently developed frequency-domain causality and wavelet co-movement methods are also employed in this study.

Essentially, the causality analysis by Granger (1969) is preferred to control whether the poverty causes income inequality or income inequality causes poverty in the time dimension. The Geweke framework developed by Geweke (1982) is used in order to behold how many percentage of income inequality is explained by poverty. Therefore, the Geweke addresses to the questions like 'do they fluctuate together?' or like 'do they have the same degree of volatility'. Furthering that, Breitung and Candelon (2006) propose frequency-domain

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[7] The paper by Stock and Watson evaluates various indexes by working on a large number of disaggregated series in which the main findings show which index has the ability to use forecast methodology on a monthly basis.

causality test in order to demonstrate that the movements of the variables are different or not in the short and the long-run.[8]

The last measurement used in this study is wavelet co-movement, which belongs to Rua (2010), and it enables to measure the co-movements of poverty and inequality.

4. Empirical Results

The empirical results of the poverty and income inequality section are separated into three parts.

4.1. Geweke Results

The test results of Geweke are used to identify the relationship between poverty and inequality along with a set of index numbers of RSCI and of CPI. In this part, we compare the Geweke model results in terms of both CPI and the RSCI. The Geweke test analyses not only the percentage of variance of the CPI, as a proxy for income inequality, but also it is able to give the frequency of RSCI as a proxy for consumption on CPI, and in this study the frequency rate interval is determined between 0 and 3. The main results makes it viable for this study to investigate the conclusions of the percentage of variance of the RSCI explained by CPI.

In figure 4.1, Geweke's measurement is based on seasonally adjusted data of the variables. In this direction, this study reports Geweke results of the RSCI seasonally adjusted data for consumption, herein after abbreviated as '*TSA*', and seasonally adjusted data of the CPI for inequality or in abbreviated form '*CSA*'. One point should be noted about the figure that moving from left to right on the horizontal axis, the results are able to give the long-run causality on the left-hand side and the short-run causality on the right-hand side. Therefore, the frequency level zero would be corresponding to the definition of long-run causality. There is no specific conclusion that could be drawn in the figure below since the movements between *TSA* and *CSA* are fluctuating up or down, even for a short term. There are low frequency pulses between CPI and consumption patterns in the short run, which corresponds to the right hand side of the figure. Thus, the percentage of variance of *CSA* (seasonally adjusted index results of CPI of TUIK) explained by *TSA* (seasonally adjusted index results of RSCI of TEPAV) is lower than 10 percent.

The most specific result of the figure 4.1 is that the data of RSCI (of TEPAV) has Geweke causality measurement with the highest percentage of significant variance of *CSA* explained

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[8] For further details, please check Breitung and Candelon (2006).

by *TSA*, 90%, at a frequency level of 2 while the second highest percentage of estimates is 60% at a frequency level of 2.7. Moreover, the long-run result of the test has the local maximum percentage of significant estimates, which is around 55%.
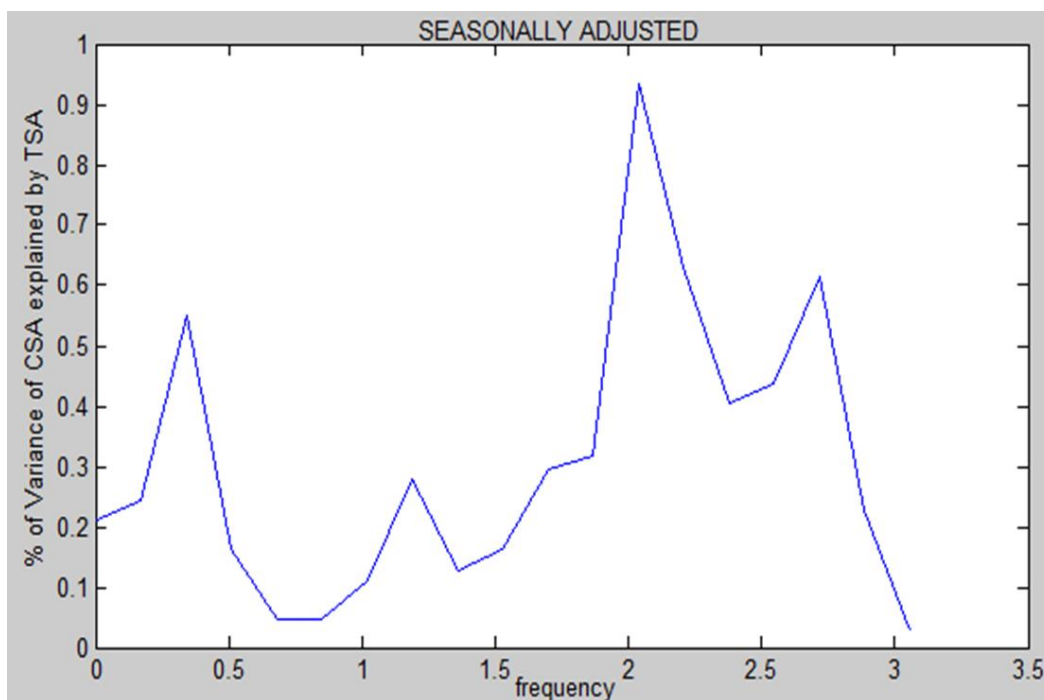

Figure.1 - Geweke Seasonally Adjusted Feedback of Retail Sector Confidence Index and Consumer Price Index, 2011-2014

The proxy of poverty should be reported that it is not able to explain the proxy of income inequality in the very short run between 1 and 3 quarters. On the other hand, in progress of time, Geweke's causality among them rises up. However, simply, it is hard to observe a specific conclusion about the seasonally adjusted variable of RSCI that has the causal impact on the seasonally adjusted CPI to a very big extent.

4.1.1. Geweke Feedbacks of the Survey Questions

The results of consumer price index for inequality show that there are fluctuant effects between inequality and the poverty in the short and the long run (Appendix Figure 1.1 to Figure 1.6). There is statistical significant level of correlation in the high frequency between 'food and beverages' and the CPI. The sellers' responses of 'food and beverages' sector and existing CPI results indicate that the volatility of the CPI and of the RSCI is quite high in the short run.

4.2. Frequency Domain Causality Analysis' Results

Frequency Domain Causality not only follows the path of Granger (1969) and Geweke (1982), but also it develops the test results by moving forward with an observation of the indicators at given frequencies in a given time period. Therefore, this test can be referred as a causality test in the frequency domain that would be applied to Turkey. This method serves to predict the short- and long-run movements of the CPI and the RSCI test results.[9]

Before mentioning about the frequency domain causality outcomes, it might be helpful to check the Granger's causality test for *CSA* and *TSA*. While applying the test procedures, significance level of ten per cent was chosen rather than choosing five percent due to the fact that the data used in the analysis consists of short time interval. Even though the significance level was taken as 10% for the Granger's causality, for the frequency domain causality test, %5 and %10 significance levels were chosen for the same time length, in which case the broken lines in the figures denote the critical values.

Table 1 presents the result of the causality tests based on a pair wise comparison with the aid of 2 lags, which gives a number of observations 36. According to the test results, *TSA* does not Granger Cause *CSA* whereas *CSA* causes *TSA* at % 10 level. The proxy of income inequality (CPI), briefly Granger causes the proxy of consumption (RSCI) since the proxy of consumption does not cause the proxy of income inequality.[10]

Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
TSA does not Granger Cause CSA	36	1.13458	0.3345
CSA does not Granger Cause TSA		2.85006	0.0731

Table 1 – Pairwise Granger Causality Tests

Finding Granger's causality (1969) may cause to have some missing parts for the analysis since the movements of the variables in time are also important to explore what kind of causal relation the variables used in the analysis have. Therefore, rather than testing the Granger's causality, it should be required to discover the interactions of the variables by testing the null hypothesis in the time domain with their critical values. Through the interpretation of the

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[9] This paper aims to observe the linkage between the CPI and the RSCI.

[10] For the Granger's causality, only seasonally adjusted data set, which is the general one, was investigated in this study rather than analyzing the survey results one by one since the next parts include the causal relation test results for the each of the survey questions such as frequency domain causality framework which follows the test procedures of Granger (1969). Geweke's causality test also measures both of the variables.

frequency domain causality graphs, the link can be identified by the local power analysis for some specific time intervals rather than finding the general causality conclusion.

Applying a frequency domain causality test for a bivariate system by including the variable of *TSA – CSA* and of *CSA – TSA*, I can check the hypothesis that there is not any causality between poverty and inequality in both time and frequency domain. The blue line (*TSA –> CSA*), shows that causality is from *TSA* towards *CSA* and the green line the causality in the opposite direction. At the end low and high frequency TSA causes CSA and in the medium frequency CSA causes TSA.[11]
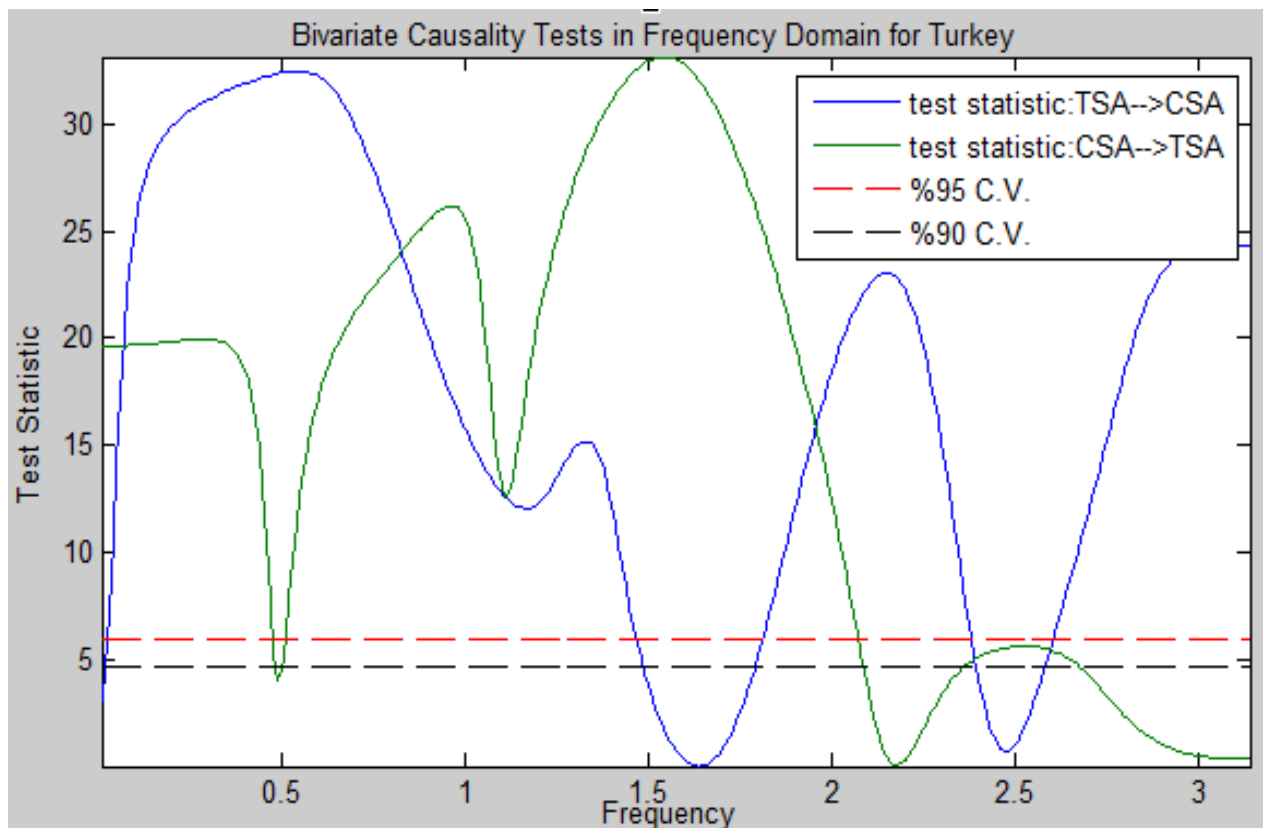
Figure 2 - Frequency Domain Causality 'Seasonally Adjusted' Test Result of Retail Sector Confidence Index and of the Consumer Price Index, 2011-2014

Moreover, the null hypothesis of no conjecturable link is rejected in the range frequency [1.7, 2.4] with a significance level of 0.05. Due to the fact that the right hand side gives the short-term results as it mentioned previous part, this frequency range corresponds to a cycle length in between 2.5 and 4 quarters, which means less than 2 years. After more than 2 years, *TSA* causes *CSA* to a significant extent so the test rejects the hypothesis of no causality in the range

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[11] Breitung and Candelon (2006) put the frequecy interval as $(0, \pi)$ where, on the horizontal line of frequency domain causality test exceeds 3. On the other hand, in order to get the certain limit for interpreting theresults, I refer to thefrequencyrange as (0,3].

frequency [0, 1.5]. Therefore, the relation of *TSA* and *CSA* is meaningful after the frequency level of 1.5 in the long run according to a significance level of 0.05. At the right side of the blue line, it is observed that the frequency domain curve movements are bell-shaped and almost symmetric until the end of the first year.

The hypothesis of *TSA* causes *CSA* is sometimes retained, and it is sometimes rejected in the short term period. On the other hand, in general, the frequency level has powerful signals on *CSA* through *TSA* since the null hypothesis of no causality is rejected except for some certain frequency levels explained before.[12]

After around a frequency level of 1.7, corresponding to almost 7 quarters of a time length, the test statistics will be meaningful with a high frequency level over a long time period. The important result should be reported that the CPI, which enables to interpret the impacts of inflation, affects the RSCI with a high frequency except for the ranges around [2.4, 2.6] and around [1.5, 1.8] with 5% critical value.

The relation of *CSA* with *TSA* (the green line) has low power signals for frequencies in the intervals [2.8, 3]. Even though the *TSA* causes *CSA* until the 2.2 frequency level corresponding to a cycle length around 4.5 quarters, *CSA* does not cause *TSA* for a while at 5% significance level. For the interpretation of this study, it could be said that the index results about observed consumption patterns of the consumers by sellers do not trigger the consumer price index significantly for Turkey in the short-run such as between the first and the second quarters. Or in other words, in the short-run, the proxy of poverty does not cause the proxy of income inequality for Turkey's case.

In particular, even though the blue line is significant in the very short-term, which occurs until around 2.5 frequency level, the hypothesis of causal relationship between *CSA* to *TSA* is detected with more for the green line than the blue line with both 0.05 and 0.1 significance levels since the critical regions of green line are less than the blue line in total. In a nutshell, *CSA* results in *TSA* with high frequencies in the long run for Turkey. That means, in general, the consumption patterns of the consumers in the retail sectors cause the CPI changes during some

Moreover, while looking from the other side, it can be remarked that if the consumer price index, or a price level of a market basket, increases more, the households tend to purchase less goods and service. Therefore, it causes a change in the RSCI because of the consumption

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[12] Here, the null hypothesis has been mentioned as there is no causal relation between TSA and CSA and the interpretation is done according to this hypothesis considered by me.

level, at frequencies after 2.3 till around 0.5 corresponding the time length between 4.5 and 10 quarters, which means over the medium term and a bit more than medium term.

4.2.1. Frequency Domain Causality Feedbacks of the Survey Questions

Due to the fact that each sector has different causal relationship in different time periods, it is important to explore how the movements of the variables vary from sector to sector in a bivariate system. It is important to consider sectoral movements of chosen proxies to obtain the specific conclusion rather than finding a general one.

The trends of the survey questions (of TEPAV, of TUIK) are similar with each other in which case the test statistics results are almost fine. In general, the variables of both the CPIs and the RSCIs move together in 'foods and beverages' sectors in each question. Therefore, it can be seen that the answers of the sellers based on future expectations would react towards the causal relation of the RSCI and of the CPI in a frequency domain. While the frequencies of the variables are sometimes moving together, they are not under some circumstances. Nevertheless, in both cases, the results report that survey answers for the future basis in consumption affect the CPIs variables. Besides, the RSCIs variables tend to be affected more because of changes in CPI at some frequency levels (Figure 2.1 to Figure 2.6).

4.3 Wavelet Co-movement Analysis Results

Figure 3 shows the co-movement between two variables by using wavelet analysis. The power of the movements in short and long term among the variables has been made distinct by the wavelet co-movement analysis. Therefore, it enables us to investigate the oscillation signals by time between proxies Figure 3 is 3 dimensional and is construed with a contour plot located near the spectrum. To ease readability, the figure was colored with different colors in which each color represents various co-movement degrees calculated using correlation coefficients. The horizontal axis demonstrates the wavelet location in time while the vertical axis refers to the frequency levels in years. The light colors of the bar (right hand side of the figure) demonstrate a high oscillation of the co-movement whereas the hot colors present the low degrees. Besides these colored areas, the bottom of the figure with various degrees of co-movement denotes low frequency levels while the top of the graph shows the high level frequencies.[13]

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[13] In this paper, the low frequency levels are mentioned as around 1 because of the fact that the time range of the data set is not too big. Considering a monthly analysis, the outcomes of the wavelet co-movement gives the frequency levels in the interval [0.25, 1]. The paper by Rua (2010) presents the frequency intervals at a range in between 0.25, 8. Thus, the lowest frequency degree is given as 8, but of course, the data length should also be considered for the frequency levels. For further details, please see Rua (2010).
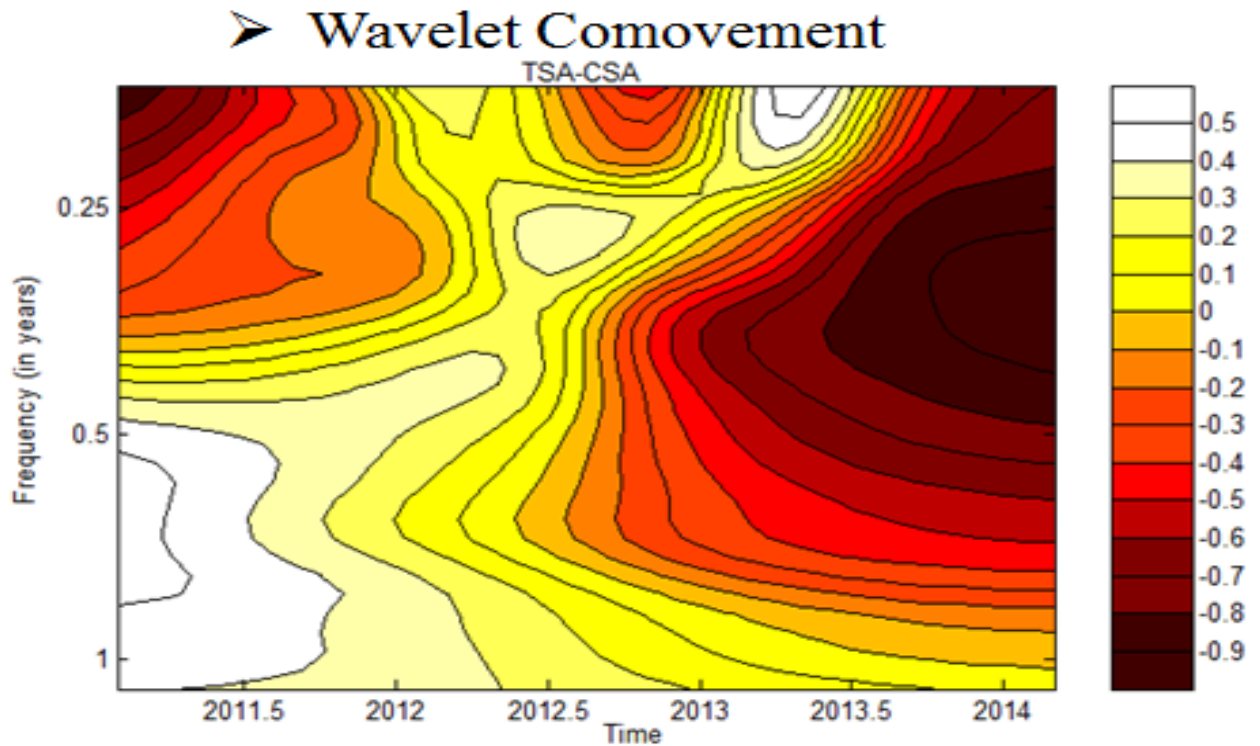
Figure 3 - Wavelet Comovement Power Spectrum for Seasonally Adjusted Data Sets of Retail Sector Confidence Index and of the Consumer Price Index

The figure above presents the seasonally adjusted data in terms of the aggregate indexes among the retail sector confidence and consumer price in the time frequency space. The first specific result in the figure is that the survey results of the retail sector of TEPAV signifies a *relatively* high degree of co-movement at short term fluctuations with the consumer prices in the beginning of the time period, which corresponds to the year 2011. This positive co-movement degree keeps going on till the mid-year of 2012. The episodes in question providing these kinds of results might be because of 2008-2012 global economic crisis which also has a great impact on the markets of Turkey. Note that the rate of consumer price index increases in 2011 in contrast with the previous year rate in which the consumption patterns of the households, conversely, decreased in the same year. Similarly, inflation rate of Turkey is quite high in 2011 (10.5 per cent) in contrast with the other years. The effect of a high inflation due to the global crisis might be the common ground of TSA and CSA wavelet results whereas inflation is calculated by using consumer price index, and affects the consumption of the households.

It can be concluded for the co-movement degree that it has been decreased in time in which there is almost zero degree co-movement at lower frequencies spread over an extensive area

until the end of the period. Moreover, the co-movement degree between 0 and 0.3 covers the middle of the spectrum corresponding to the year range of 2012-2013 for all frequencies.

There is a weak or negative co-movement result that can be observed after the mid 2012 at almost all frequency levels except for one point which is located on the top of the figure. The relatively high co-movement can be seen in a small area in the year 2013 as it was the beginning of the time period, but this time, with high frequency levels. On the other hand, rather than the light colored areas, there is negative degree co-movement that is regarded until the edge of the time period at the similar business cycle frequency ranges. After the year 2014, the forecast value of the variables keeps going on like the results of the previous years (through two years ago) with the same frequency valuations in the intervals smaller than one till zero.

4.3.1. Wavelet Co-movement Feedbacks of the Survey Questions

Figures 3.1 to 3.6 in Appendix include all survey questions of TEPAV for the retail sector confidence and for the CPIs sectors. Each sector denotes the various degrees of co-movements whether the test results are statistically significant or not.

Briefly, a general statement of sectors indicates that there is a strong co-movement between the 'textile and shoes' and 'miscellaneous goods and services' sectors of TUIK, in terms of CPI, and of the TEPAV, and in terms of RSCI. Unexpectedly, 'food and beverages' sectors do not give the expected results, apart from the question six and question two, since a low or a negative degree co-movement has been found between the sectors in question in the time frequency space. In 'transportation' sector, the co-movement is positively (negatively) significant at several frequency levels in the beginning of the time period, but then the trend has changed in direction of negative (positive) oscillation in the course of time. As it has been mentioned before in the seasonally adjusted wavelet analysis, it may be possible to observe significant co-movement degrees among the variables during the episode of the crisis in Turkey. However, for the sectorial analysis, there are no significant findings that have been discovered that the degrees of co-movement between the proxy for income inequality and the proxy for consumption have increased significantly among the sector pairs in the period of crisis, corresponding the beginning of the time interval of this analysis.

5. Conclusion

This paper provides a new perspective into the poverty and income inequality analysis by means of using proxies instead of putting all direct measurements into one single analysis. Therefore, this study employs indirect measurement by referring to the Granger's causality test, frequency domain causality test and to recently developed frequency-domain causality and wavelet co-movement analysis. In particular, all those methods enable to investigate both the causal relations, the percentages of the variances explained by the other variables, frequency levels and the co-movement degrees in the specific durations and the frequency domains.

In this study, it is reported that, in the Geweke causality tests, food and beverages sector of TEPAV, through the survey results of the retail sector confidence, gives the most comprehensive result for the changes in CPI. The hypothesis of consumption as a proxy for poverty is highly significant in 'food and beverages' sector in the Geweke causality test results. The changes in consumption, including both past consumption of consumers and future consumption expectations of sellers from consumers, of the 'food and beverages' sector of TEPAV, lead Geweke's to cause changes in consumer price of 'food and beverages' sector of CPI. It can be observed that if the consumption level decreases in the retail sector of 'food and beverages', it leads to an increase in the consumer prices of 'food and beverages' sector, which causes a change in CPI due to the fact that it has the highest weight in main expenditure groups. Then, it turns out to be a chain that the inflation rate automatically tends to rise up while it makes the income inequality distorted. It has been identified in this paper that *TFOOD* has influenced *CFOOD* to a higher degree since the percentages of *CFOOD* explained by *TFOOD* is a high degree at long term frequency fluctuations.

For the frequency domain causality tests, the test results for some sectors of the CPI and of the TEPAV, namely 'food and beverages' and 'transportation' provide supportive outcomes with the hypothesis, which is claimed in this paper, promoting that poverty causes income inequality in a frequency domain. On the other hand, I have concluded that even though the proxy for consumption sometimes gives predictable results for the rejection of the null hypothesis in a frequency domain, CPI causes a change in consumption of the consumers in retail sectors to a great extent.

During the research, one point that should be taken into consideration in a wavelet co-movement power spectrum is that the observations of the sellers about the consumption levels of the consumers via retail sector confidence (based on both past and future) and the change

in consumer price of the sectors via CPI have represented strong oscillations, in general, in the sectors of 'textile and shoes' and 'miscellaneous goods and services' at several frequencies along the time line. On the other hand, it is possible to identify the degree of co-movement between the seasonally adjusted data sets if the retail sector confidence and consumer price index reports positive degree oscillations in the beginning of the time interval. However, then the degree of co-movement turns into the negative for all frequencies in the current time scale.

Overall, all those findings highlight the distortion of income, in which case inflation channel elicits a change in the consumption level at several frequency levels as well as in the pair wise Granger's causality test statistics' results, but still, the speculation of the poverty causes income inequality that obtains its validity through some important sectors.

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APPENDIX

Figure 1.0 – Highest Geweke Results by Sector
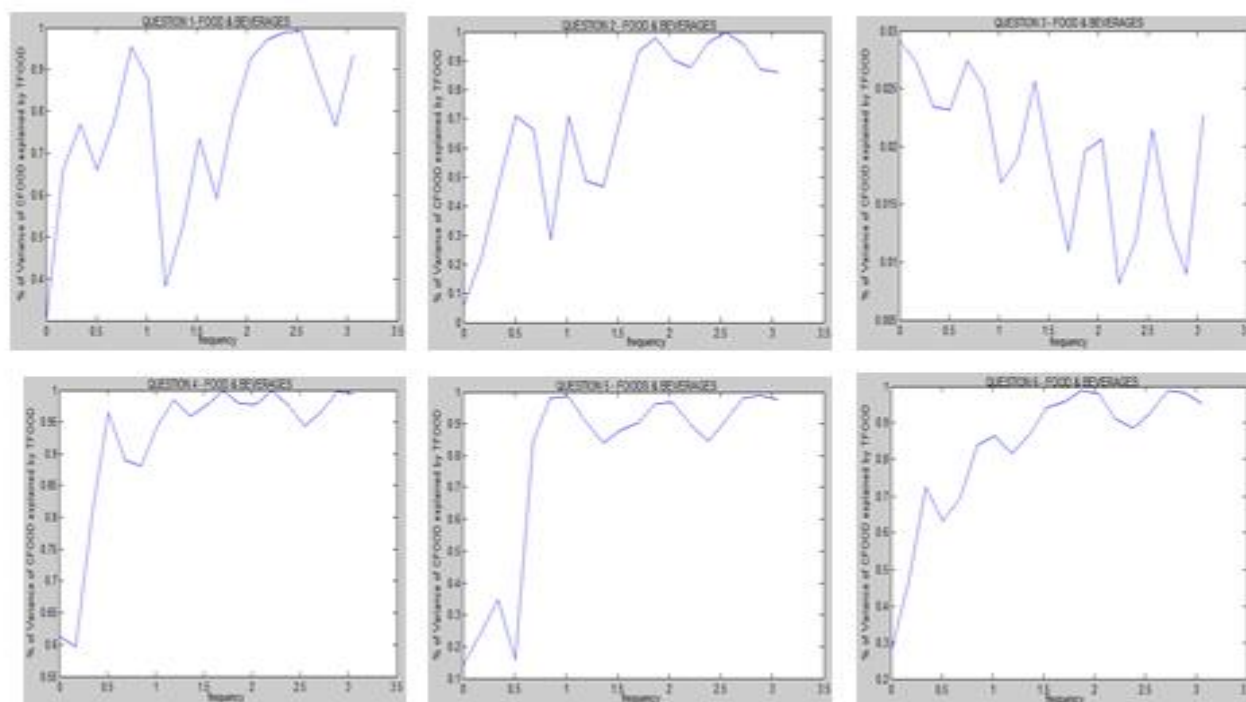
Figure 1.1 – Geweke Results for Question 1
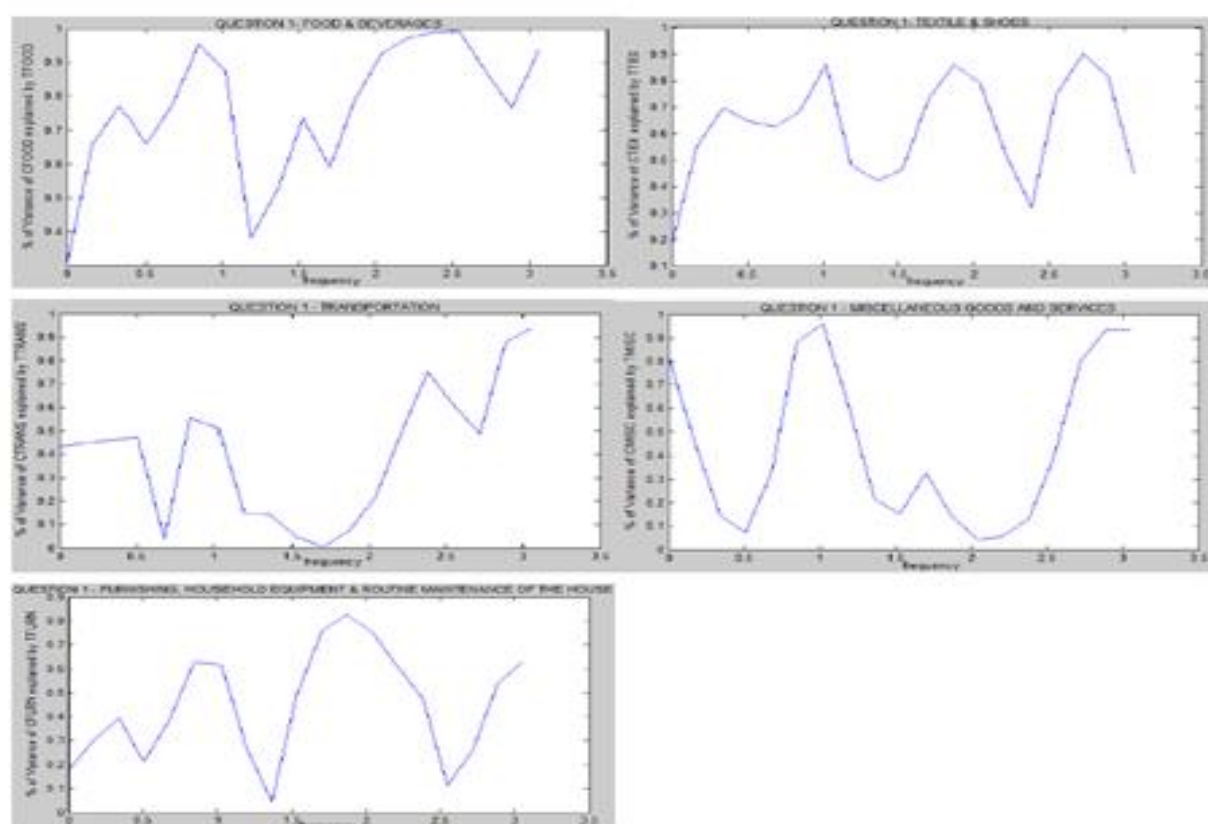
Figure 1.2 – Geweke Results for Question 2
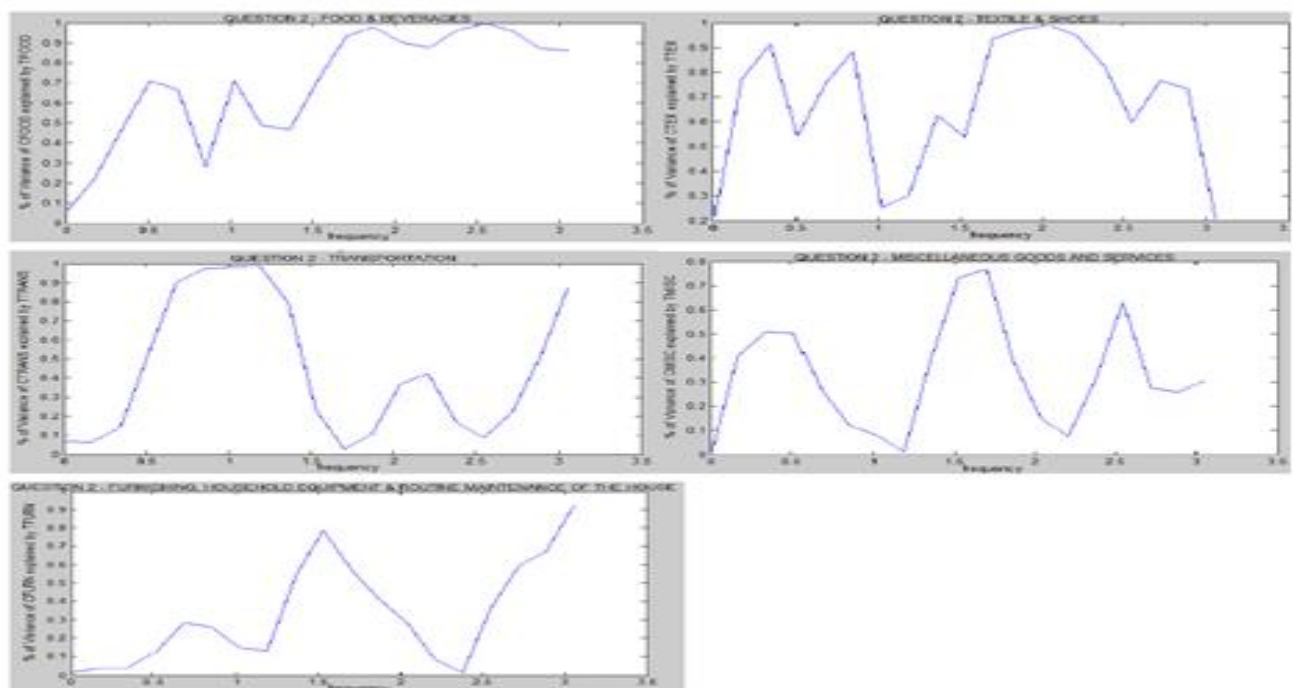
Figure 1.3 – Geweke Results for Question 3
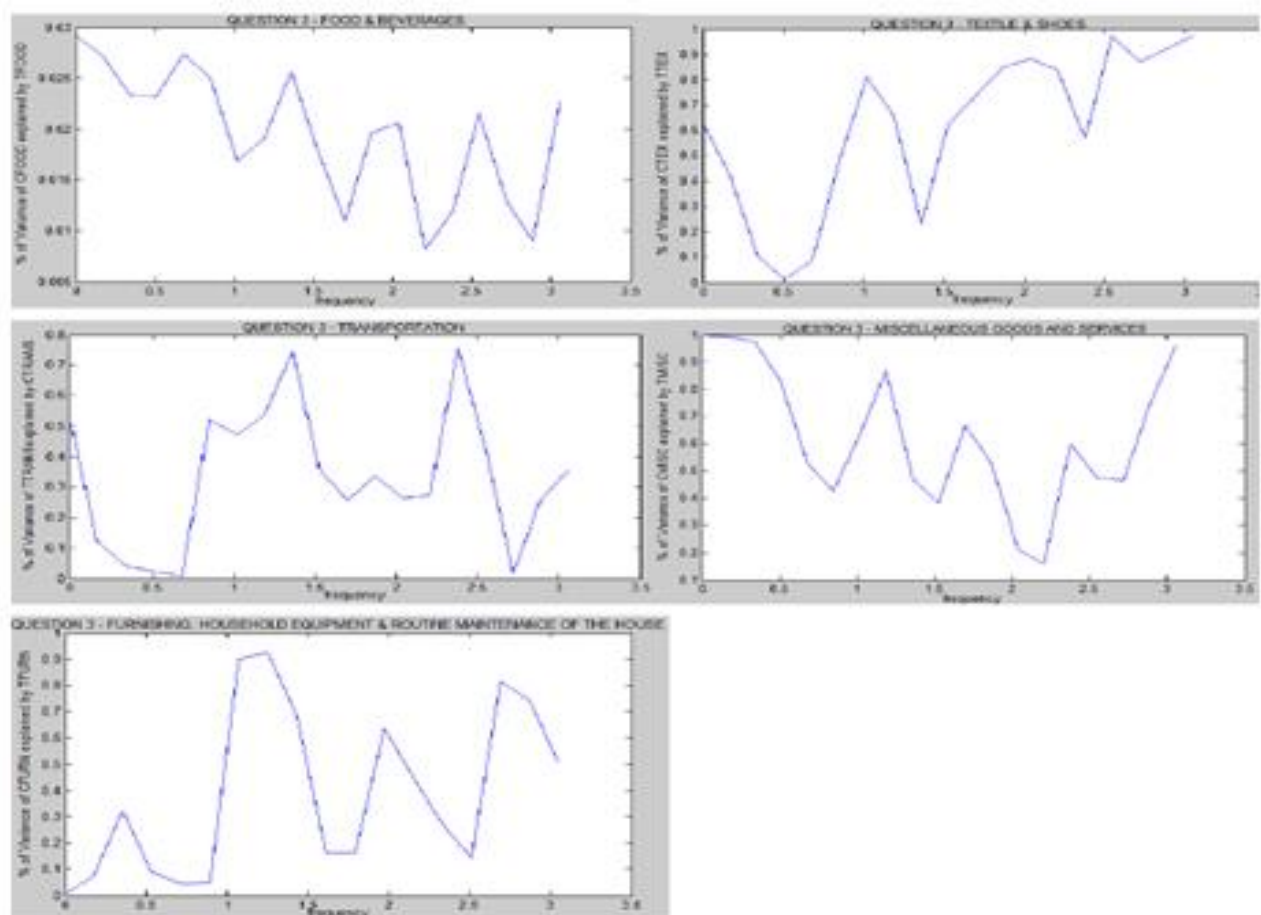
Figure 1.4 – Geweke Results for Question 4
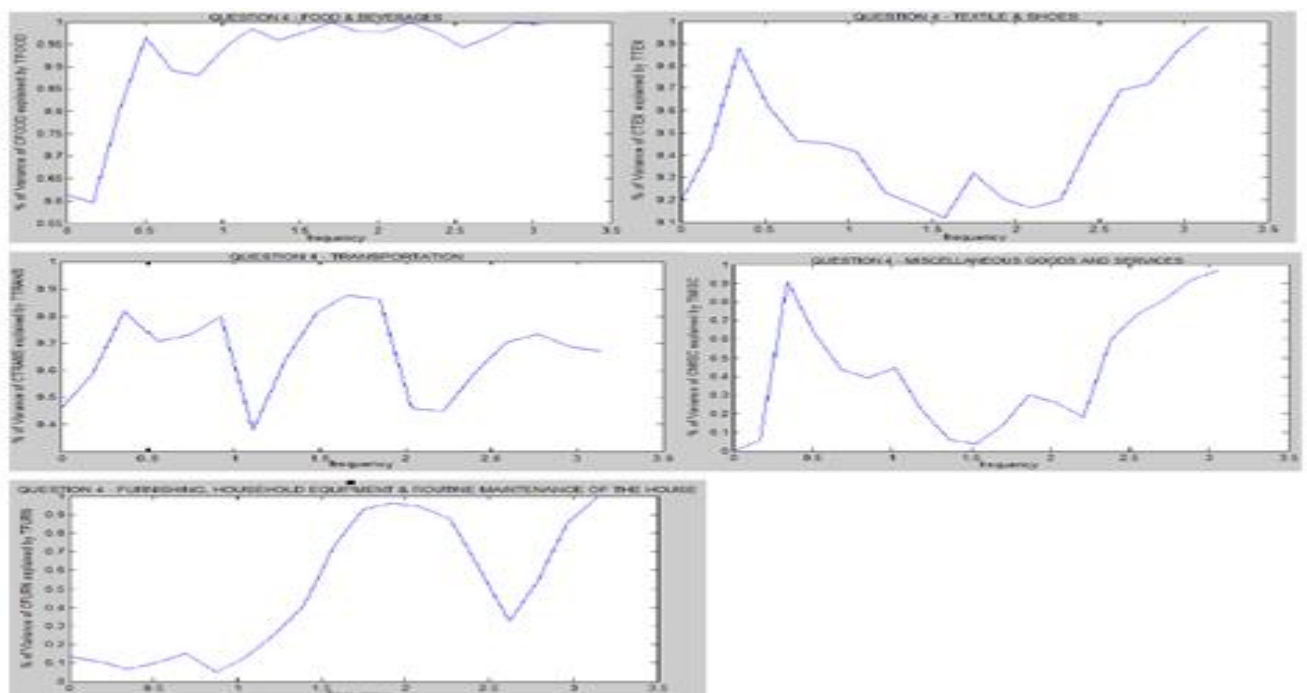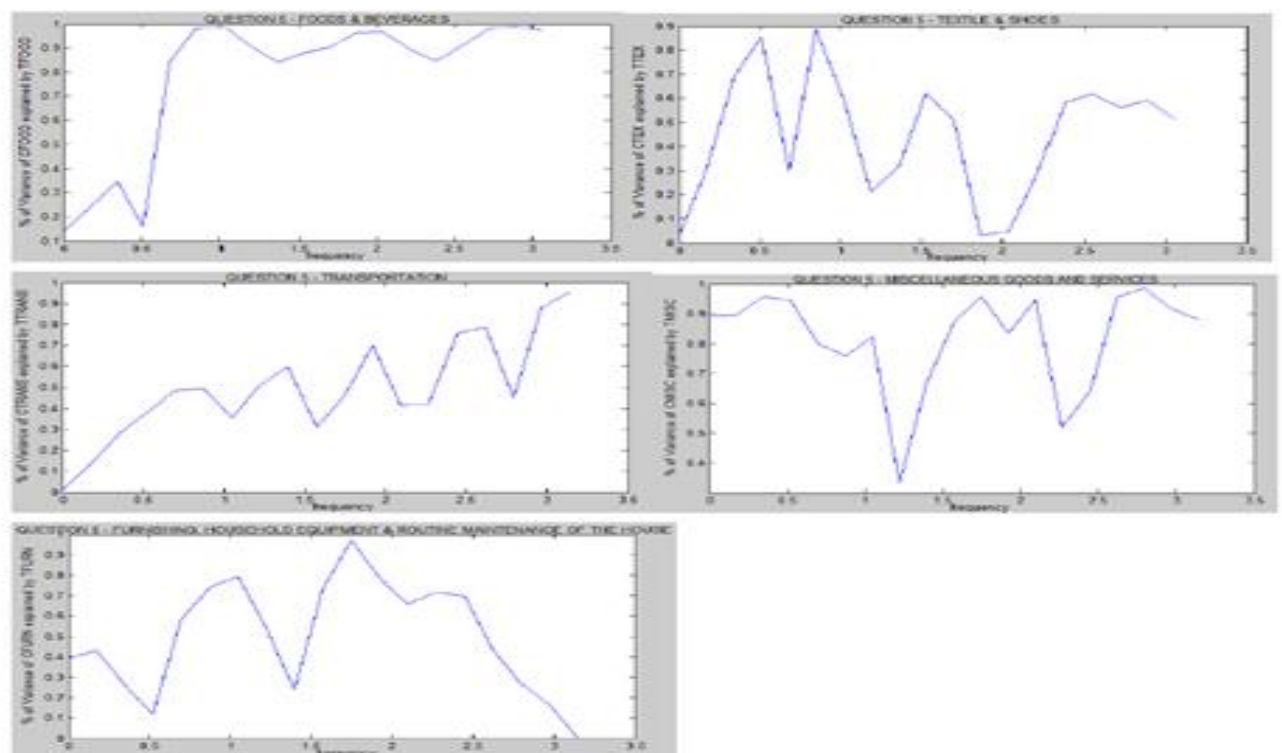

Figure 1.5 – Geweke Results for Question 5
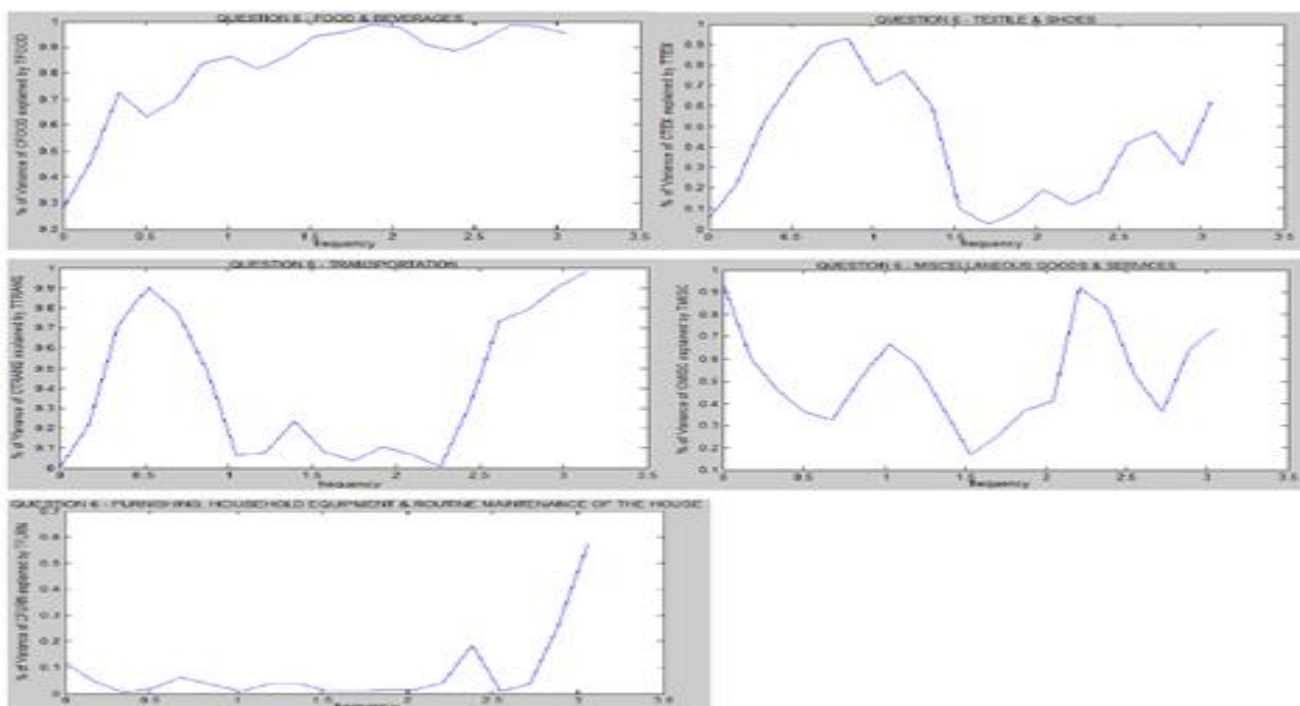
Figure 1.6 – Geweke Results for Question 6

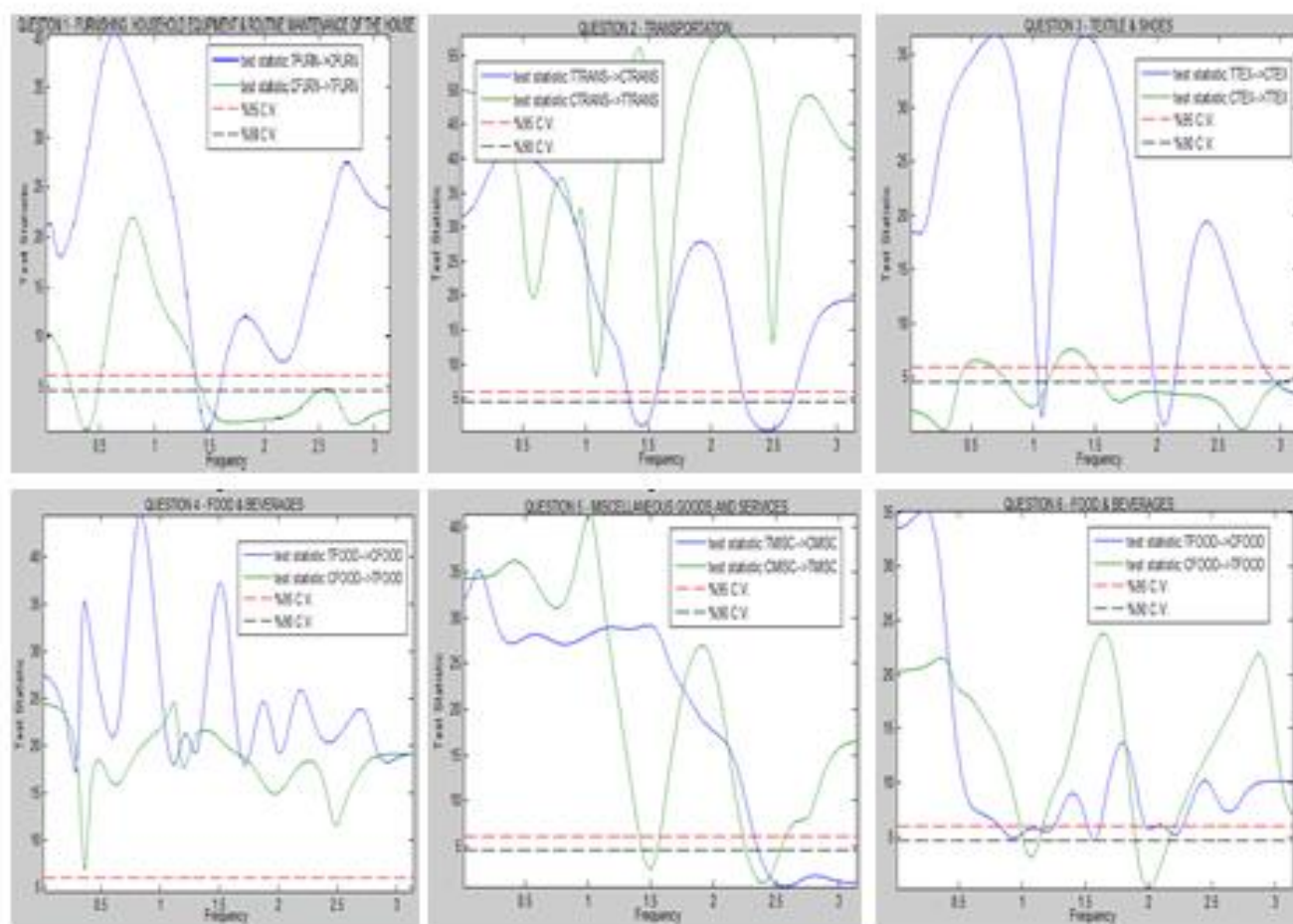**Figure 2.0** – Highest Bivariate Causality Test Results by Sector
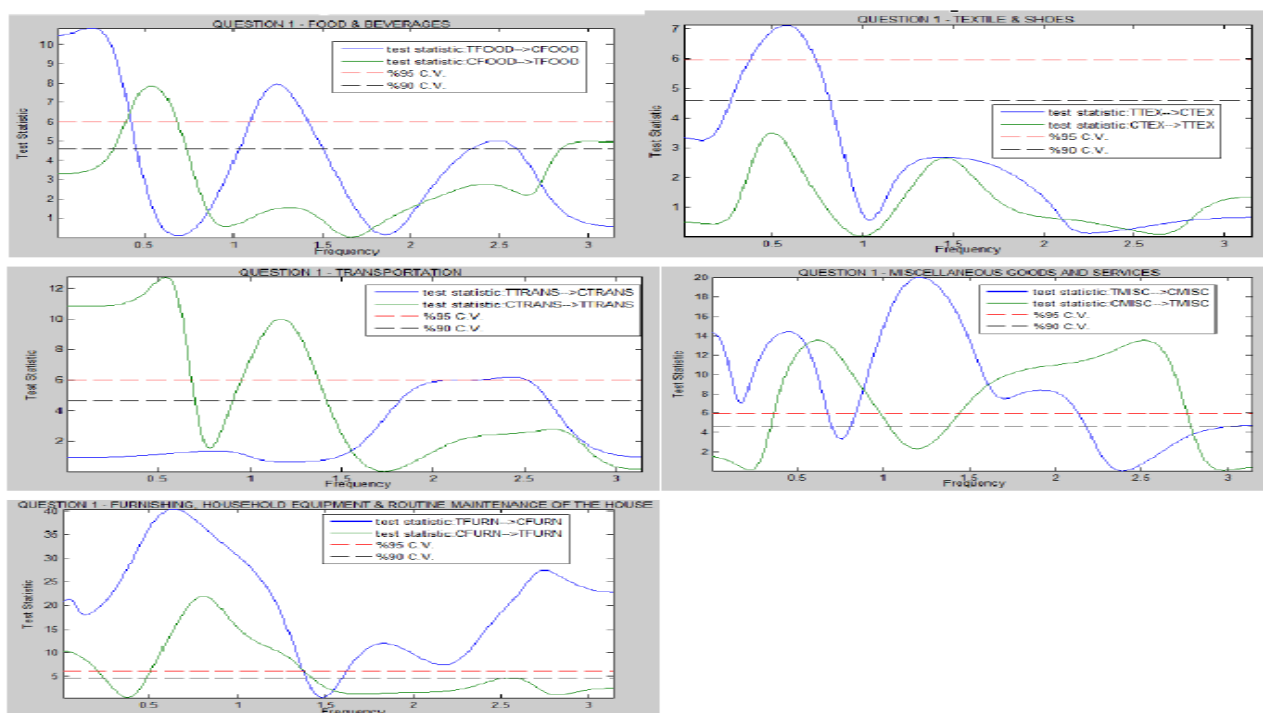
Figure 2.1 – Bivariate Causality Test for Question 1

Figure 2.2 – Bivariate Causality Test for Question 2
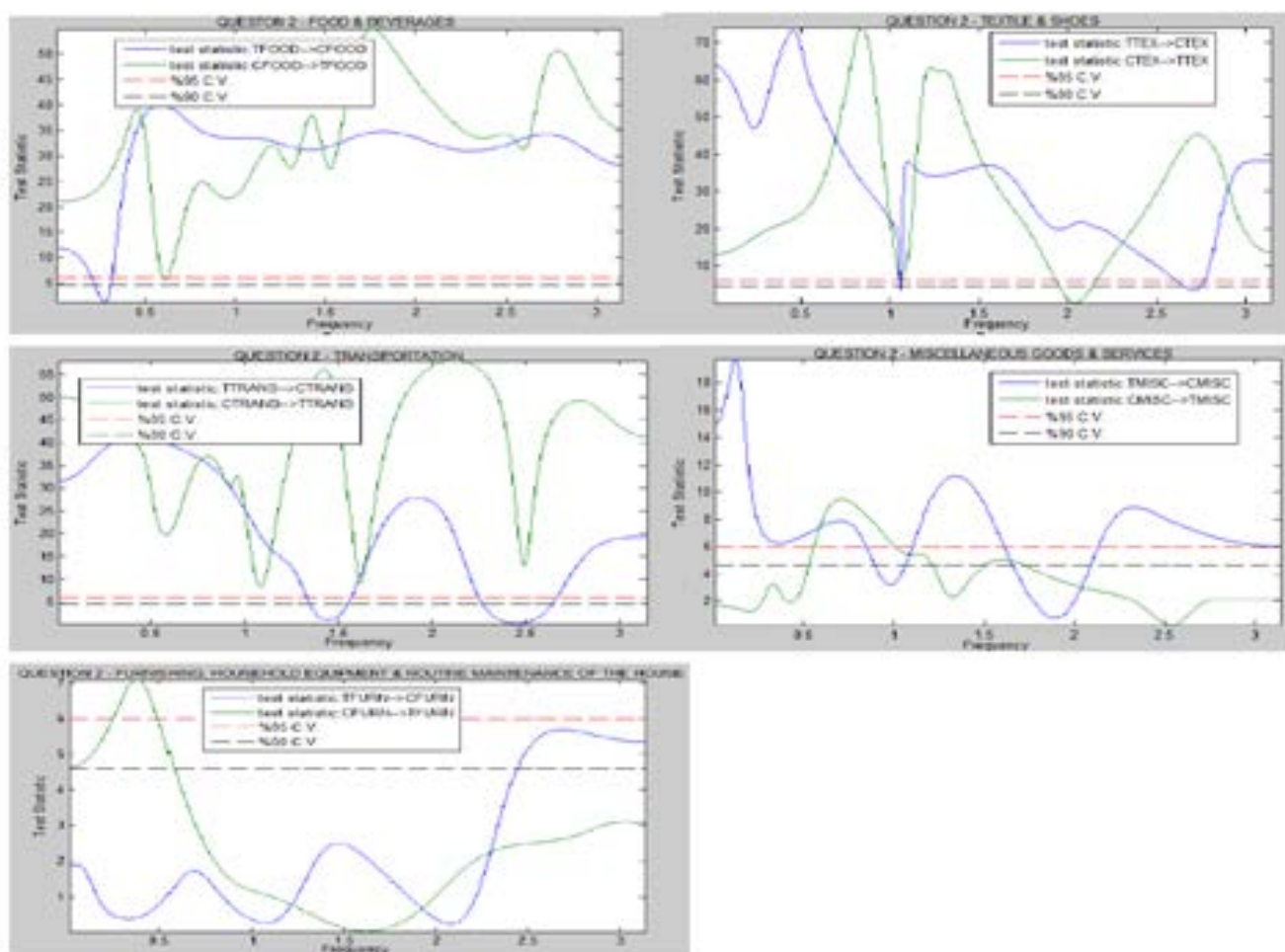
Figure 2.3 – Bivariate Causality Test for Question 3
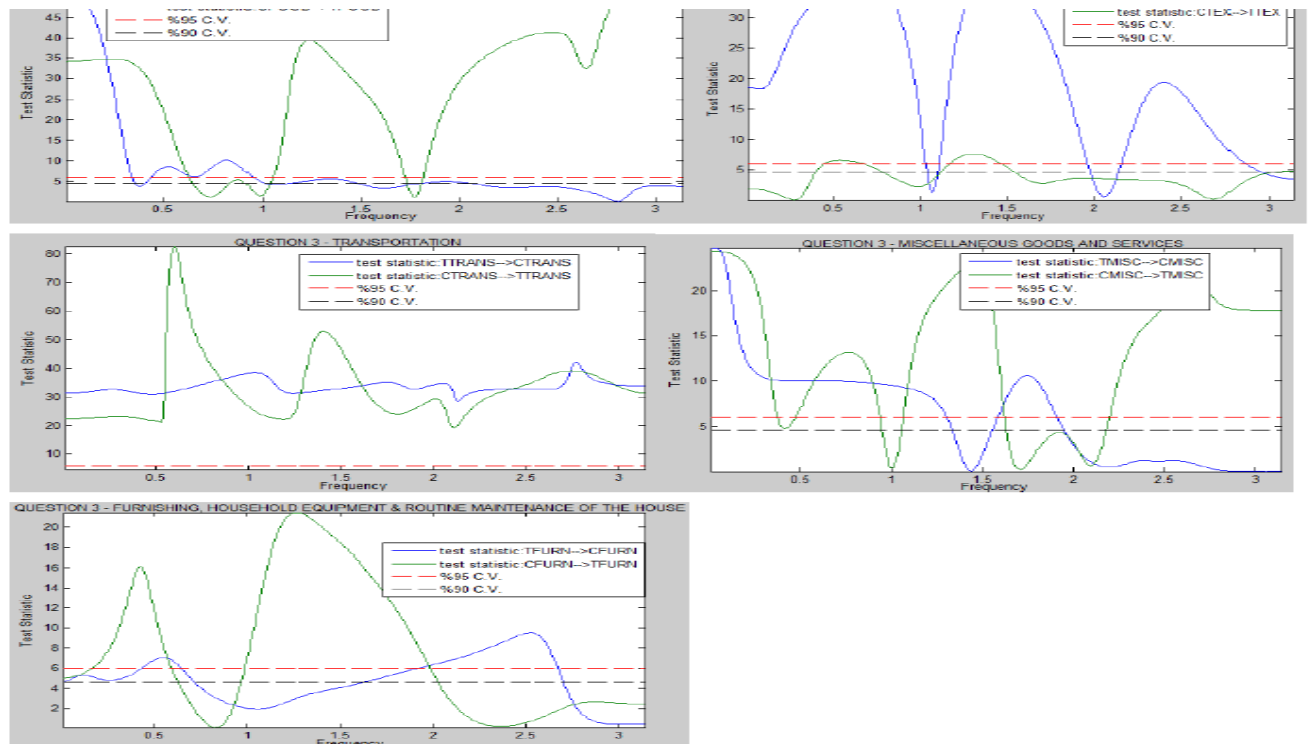
Figure 2.4 – Bivariate Causality Test for Question 4
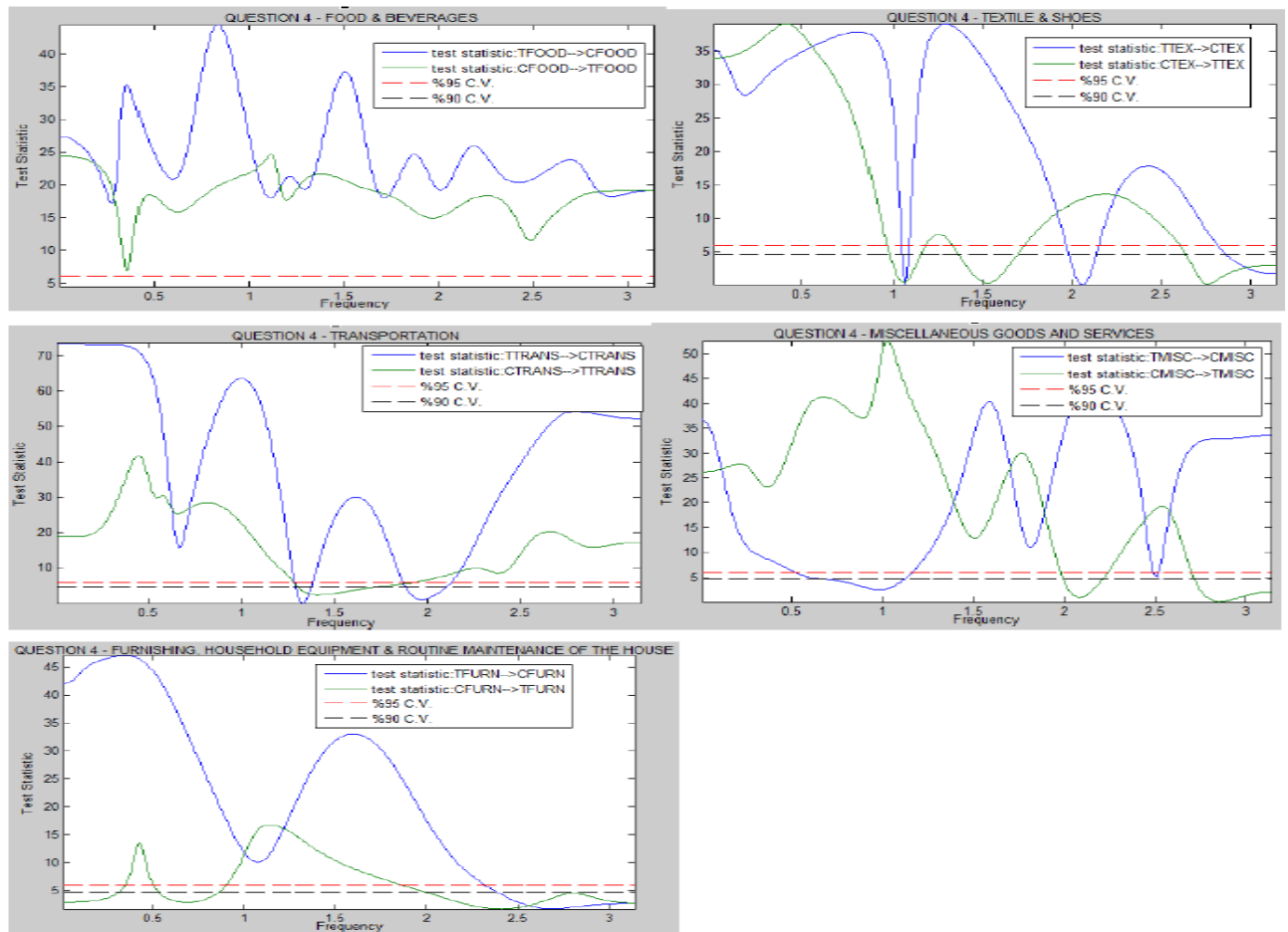
Figure 2.5 – Bivariate Causality Test for Question 5
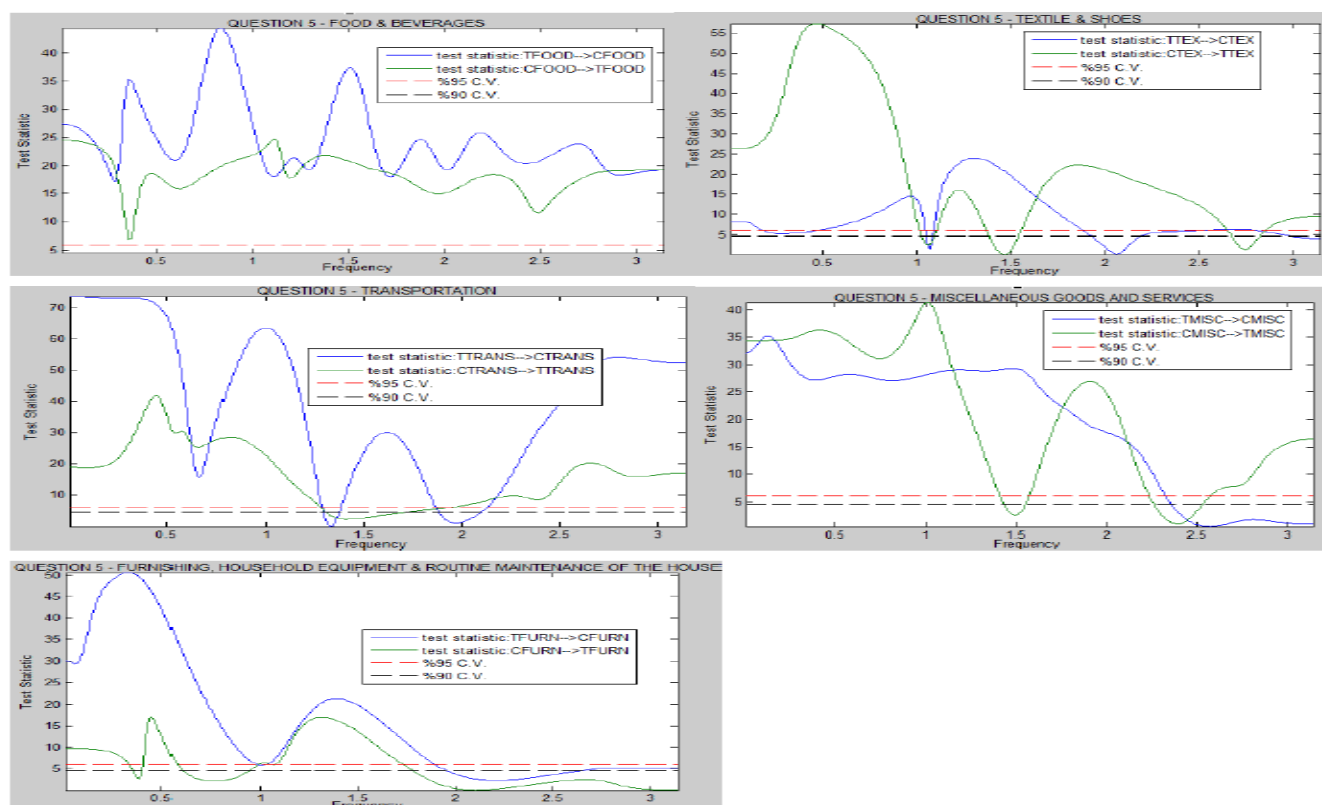
Figure 2.6 – Bivariate Causality Test for Question 6
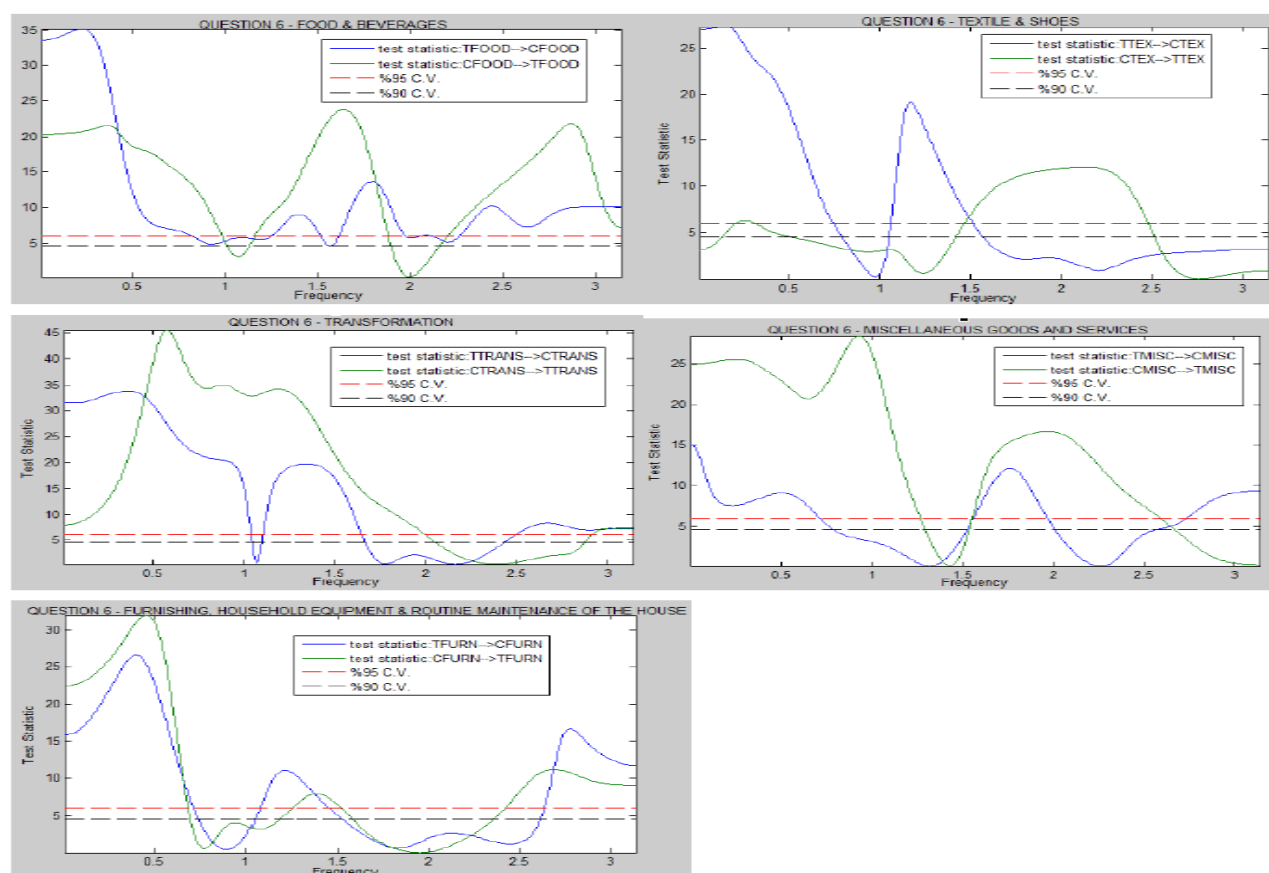
Figure 3.0. Highest Wavelet Comovement Results by Sector
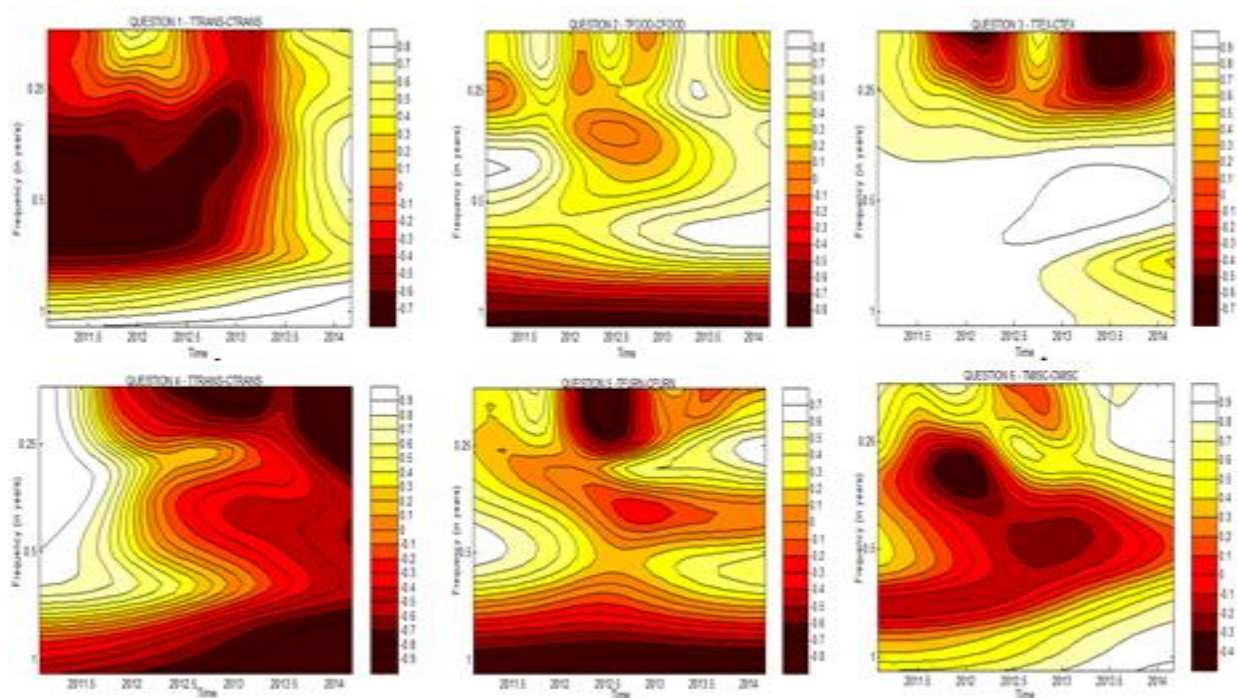
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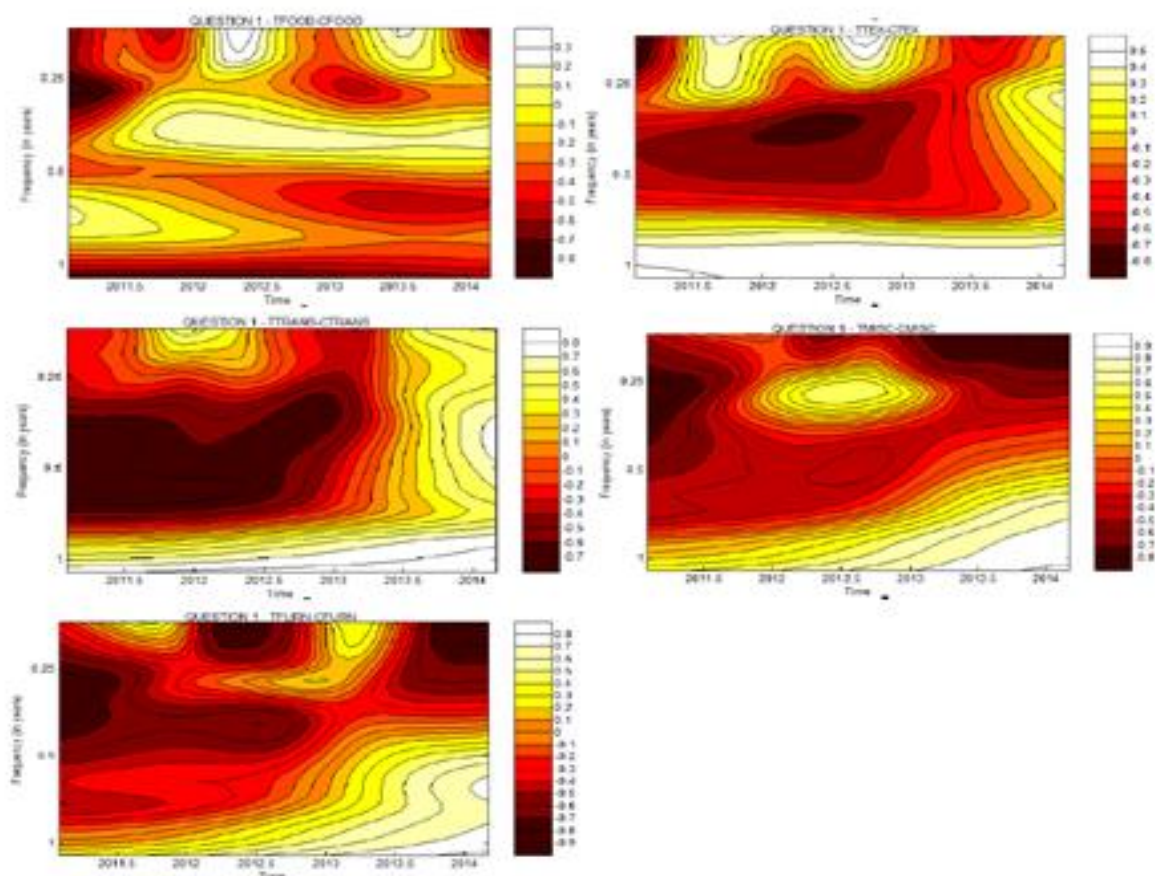
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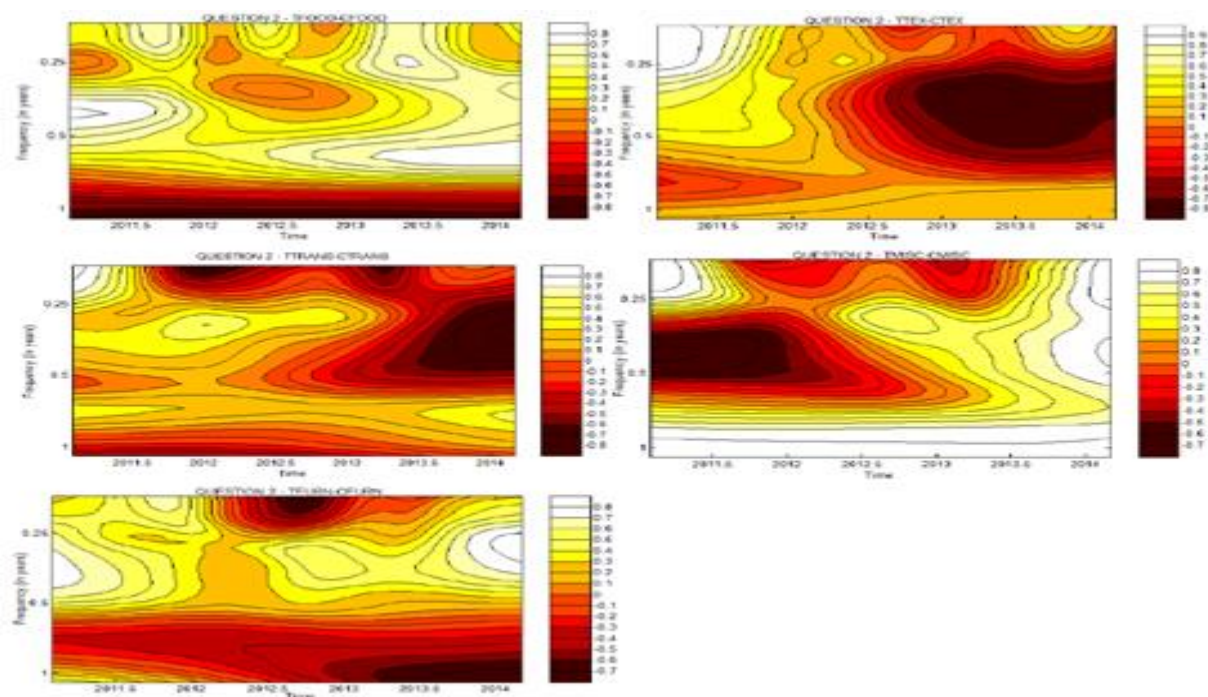
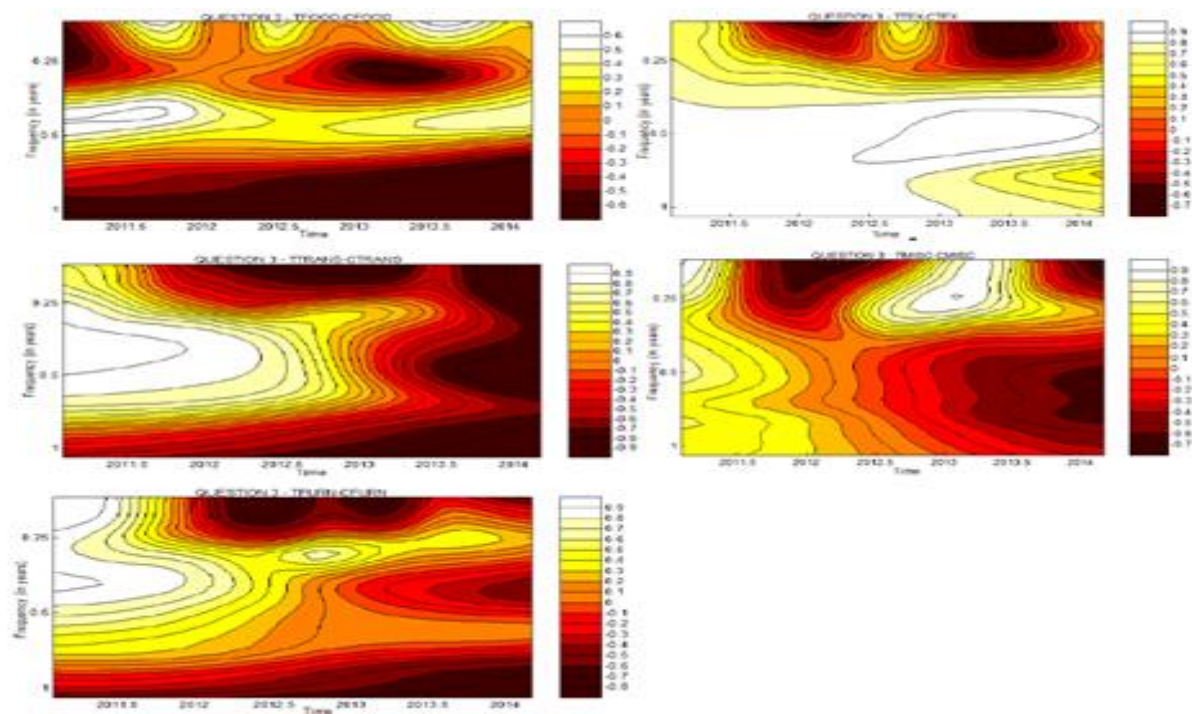**Figure 3.3** – Wavelet Comovement Results for Question 3

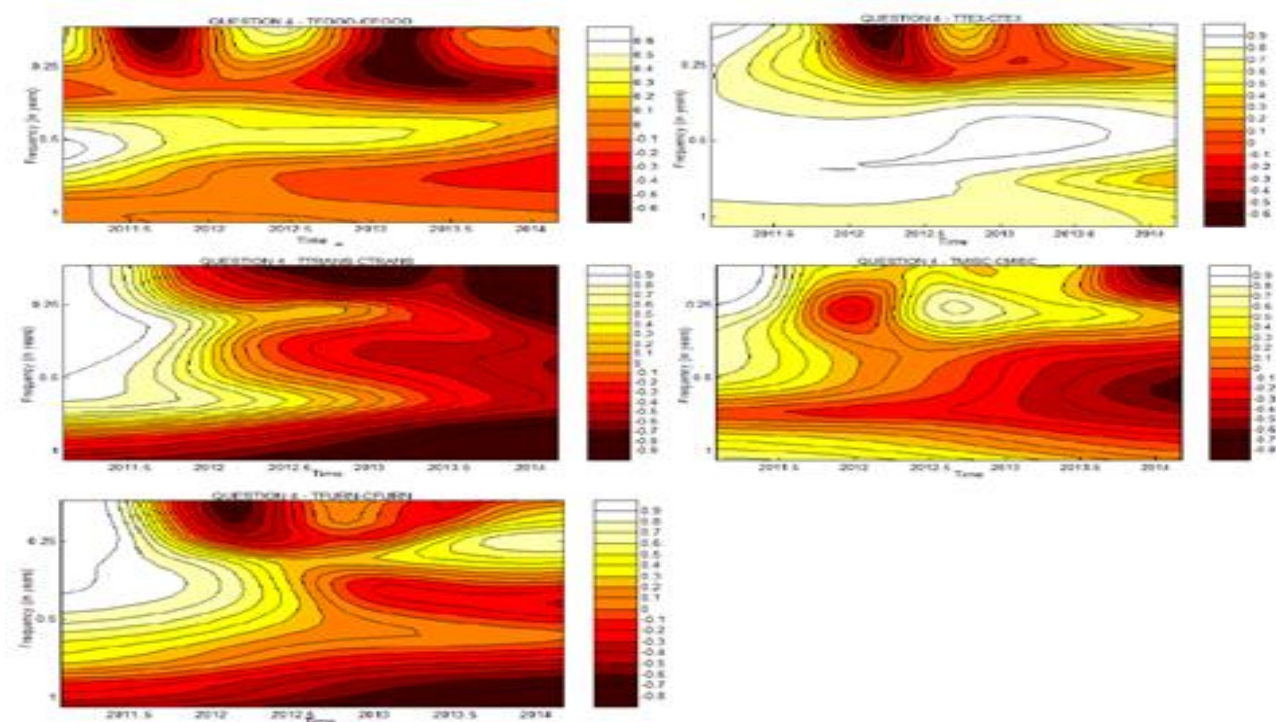**Figure 3.4** – Wavelet Comovement Results for Question 4
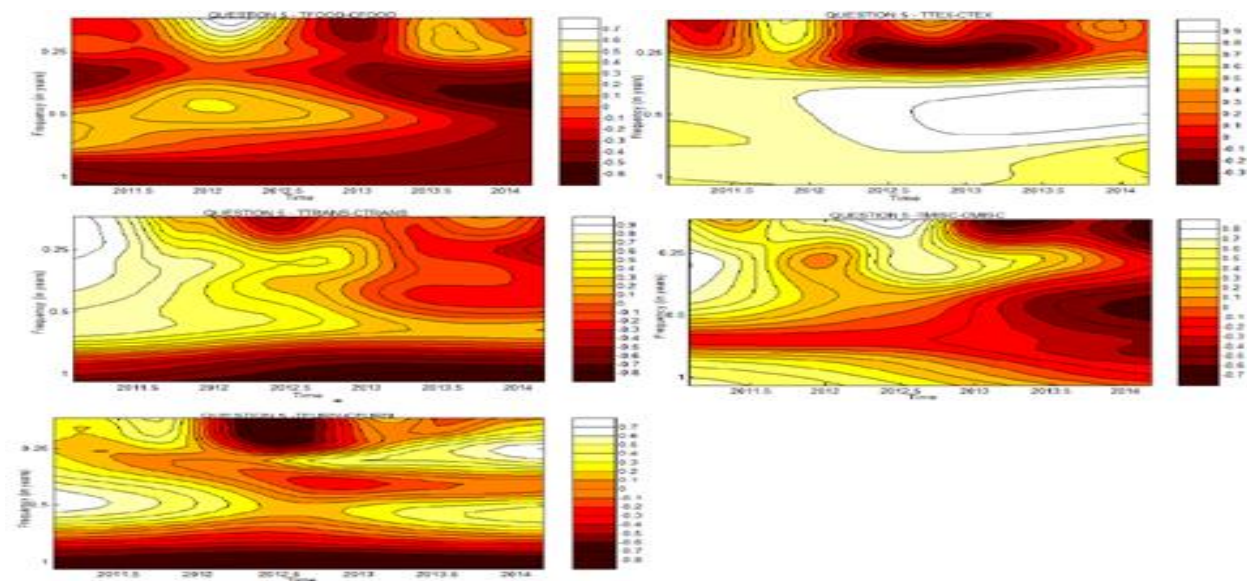

Figure 3.5 – Wavelet Comovement Results for Question 5

Figure 3.6 – Wavelet Comovement Results for Question 6