

**DIFFERENT APPROACHES AND METHODS FOR STRONG SEASONAL ITEMS IN CONSUMER PRICE INDEX**

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**I. Introduction**

Due to the relatively large weight of seasonal items in Turkey, it is very important to analyze the contribution of price changes in seasonal items to total consumer price indices (CPI), exactly.

In this study, we discuss the issues in calculating seasonal items in CPI, seasonal tally and unexpected volatility. Indices from 2010 to 2016 are calculated and examined by using all of the selected methods for seasonal items. We studied the seasonal and strict weight structures for strong seasonal items and analyzed the results. Prices of fresh fruits and vegetables are derived weekly in CPI and the number and the level of prices are also examined. Estimated prices on December chained indices, imputation of missing prices and the analysis-principles of outlier prices are also studied. Because chained index is very sensitive to weights and price fluctuation, we carefully examine relevant factors/decisions (e.g., weighting sources and sampling of items). We also discuss price bouncing effects by seasonal and non-seasonal items on Turkish chained CPI and the time series analysis for fresh fruits- fresh vegetables basic headings, food and beverages main group in ECOICOP and general index.

**II. Description**

Seasonal items are either completely unavailable in creation periods or that display a price or quantity behavior in a period of the year. Items that are unavailable in certain seasons are termed strong seasonal items. The following classes and groups are considered as seasonal:

- Fresh fruits,
- Fresh vegetables,
- Clothing,
- Footwear

Seasonal items represent approximately 10.5% of total expenditure in the Turkish CPI. The weights of the consumption group and specific items in this category are obtained according to the percentage of the average monthly expenditure on them in the base year, out of the average monthly expenditure on the total basket. The data source is the Household Expenditure Survey, conducted annually by the Turkish Statistical Institute.

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**III. Methods**

There are three weights approach for seasonal items;

➤ **Fixed annual weights method:**

Monthly weights do not change from month to month within the same year. Prices in out-of-season months are estimated.

➤ **Class-confined seasonal weights method:**

Weights of seasonal products are fixed within the in-season periods

➤ **Variable weights method:**

Allocating variable weights according to the consumption pattern found in the base period.

Weightings at the level of COICOP/HICP divisions, groups and classes are required not to vary between months during the year. Nevertheless, weightings at a more detailed level of COICOP/HICP might be allowed to reflect a seasonally varying consumption pattern.

Seasonal structure of fresh fruits for variable weights

COICOP	FRESH FRUITS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
01161010200	Orange	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161020100	Apple	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161020200	Pear	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161070100	Quince	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161100100	Strawberry	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161120100	Apple	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161130100	Plum	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161210100	Water melon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161220100	Melon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161230100	Apricot	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161270100	Cherry	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161280100	Kiwi	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161300100	Lemon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161310100	Tangerine	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161340100	Banana	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161350100	Pomegranate	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161370100	Peach	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

Seasonal structure of fresh fruits for class-confined weights

COICOP	FRESH FRUITS	JAN	FEB	MAR	APR	MAY	JUNE	JULY	AUG	SEP	OCT	NOV	DEC
01161010200	Orange	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161020100	Apple	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161020200	Pear	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161070100	Quince	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161100100	Strawberry	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161120100	Apple	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161130100	Plum	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161210100	Water melon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161220100	Melon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161230100	Lemon	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161310100	Tangerine	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161340100	Banana	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161350100	Pomegranate	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****
01161370100	Peach	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****	*****

Turkey has four seasons hence it generates strong seasonal effect. The most of the seasonal products available only part of the year and we can observe great volatility on prices and unusual price fluctuations.

In season and out-of-season periods are determined by using three year HBS results.

**Advantages of fixed weighting;**

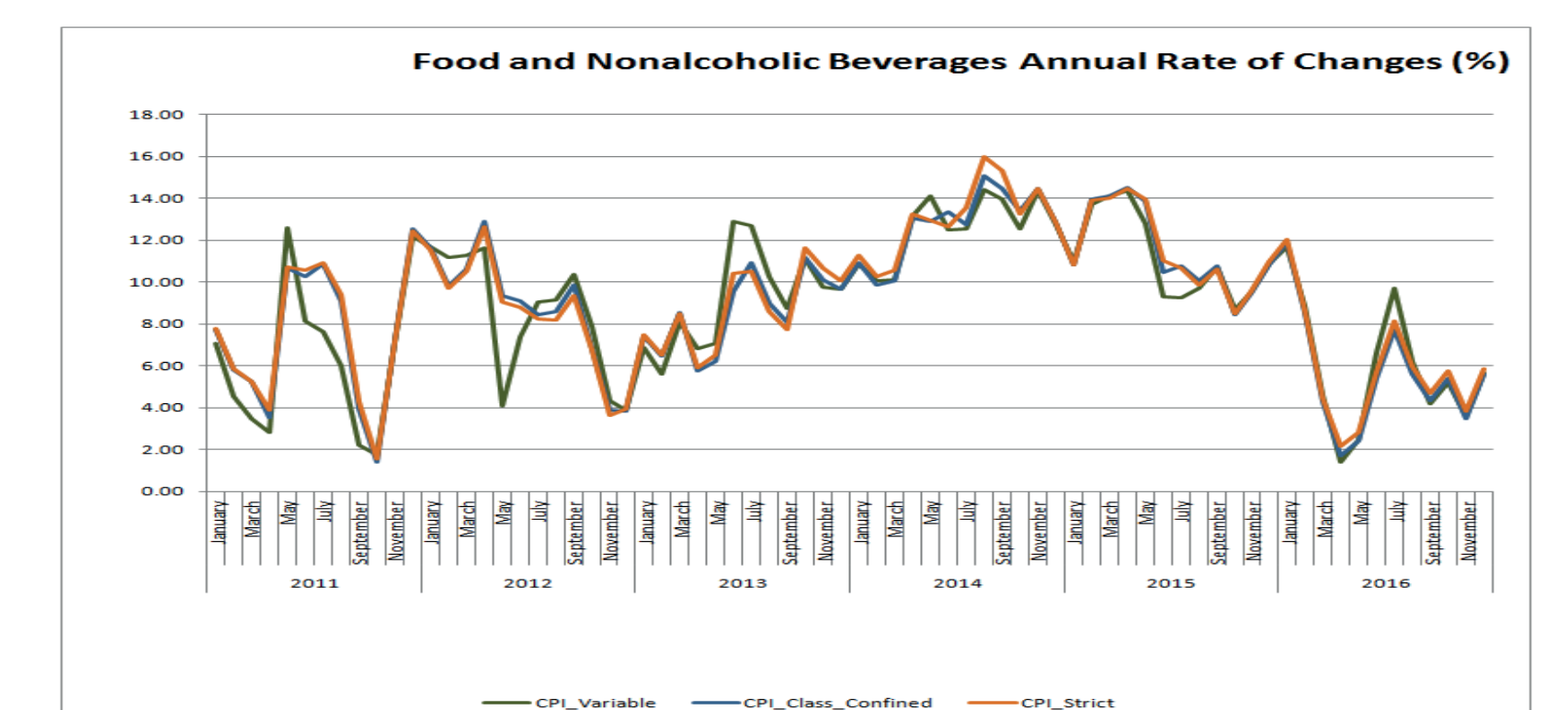
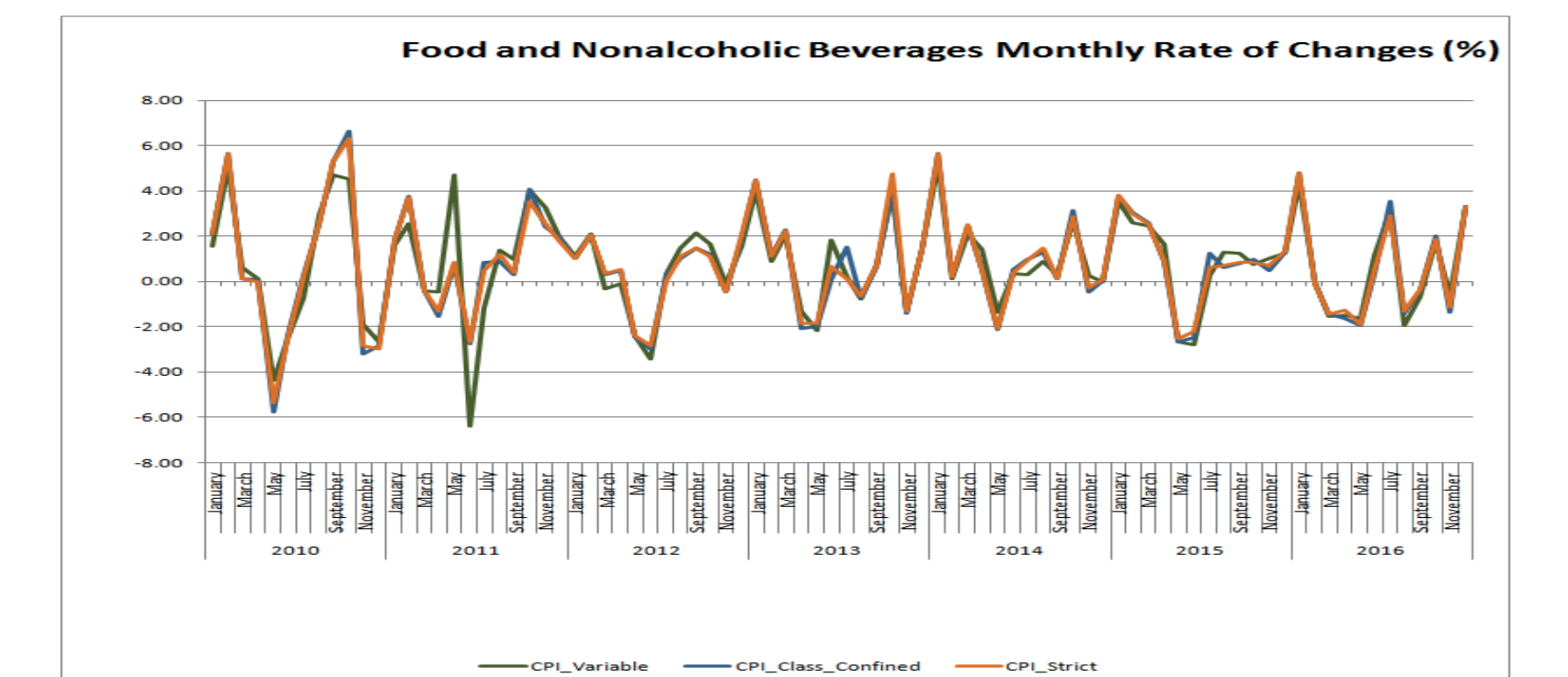
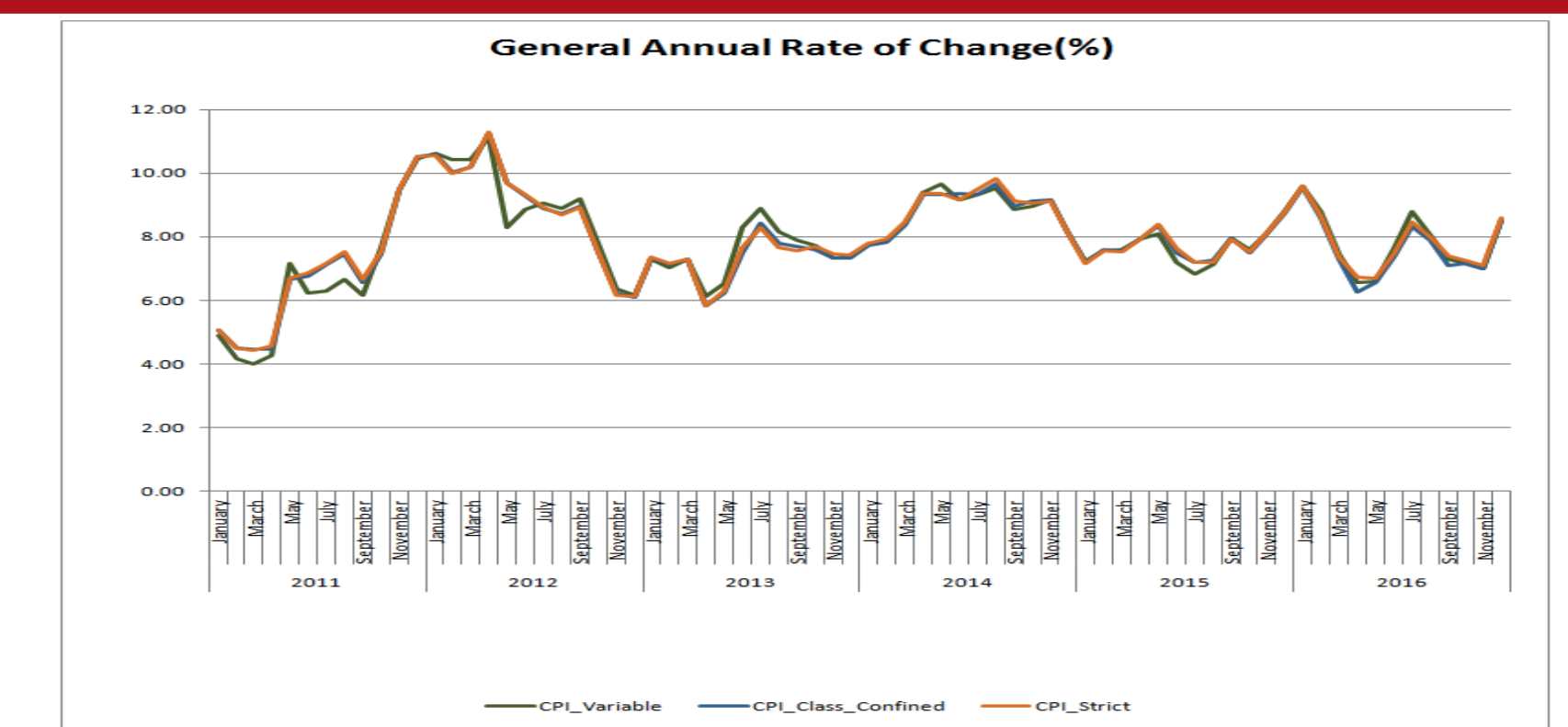
- Index does not change due to change in weights of products because they are fixed during the year.
- Annual change of general CPI shows less volatility by strict weighting system.
- All indices calculated by using same fixed weight principle

**Disadvantages of fixed weighting;**

- Choice of imputation method differs from group by group
- Fixed weights will not be representative of the monthly consumption pattern.
- The missing prices can be estimated during the out of season period. For example, in fresh fruits approximately 50% of prices have to be estimated.
- Number of estimated prices will be more than observed prices for some product in a year (9 months prices have to be estimated while only 3 months can be observed for cherry)

**Advantages of seasonal weighting;**

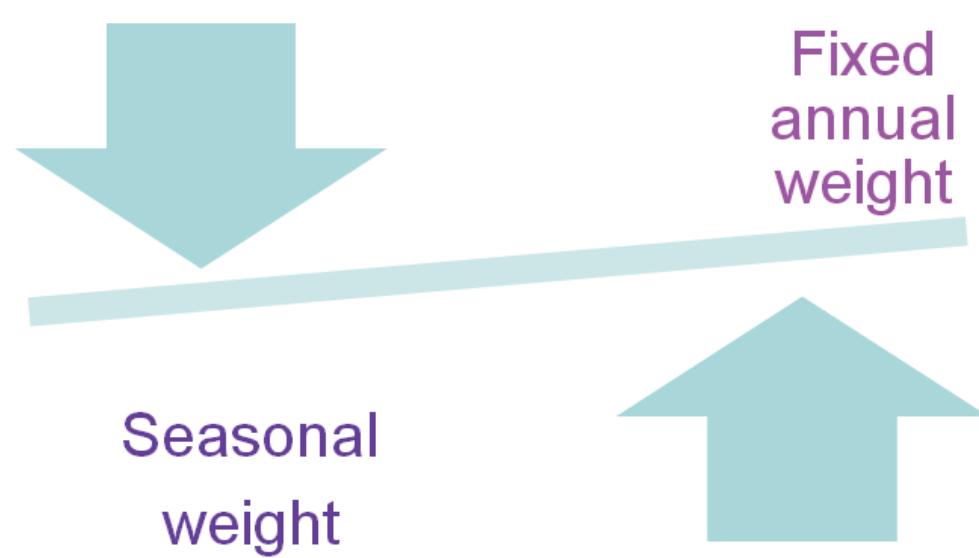
- Class confined weights approach has the advantage of minimizing the practice of price imputation.
- Prices are observed only in months where weights are above zero.



- Has lower volatility than variable weights at annual change of CPI.
- Minimum volatility is shown in fresh fruits, clothing and footwear.

**Disadvantages of seasonal weighting;**

- Even if price does not change, index can change from periods to periods because of changing periodic weight system.
- There is a need for credible data sources which have ability to provide reliable seasonal weights.
- Some product need to be excluded in order to build periodic structure.



**IV. Evaluation**

We studied on the effect of different weights system on annual change of especially fresh fruit and vegetables, food and clothing groups which are shown strongly seasonal pattern. We prepared a seasonal pattern for 2010-2016 in order to decide in which month the prices collected from the outlets for seasonal items. We used this pattern for the weight and price collection structures of seasonal weight system and for decision of estimated prices of fixed annual system.

In our experimental seasonal weight;

- There is different basket and weight structure in each month for variable weight application and different basket and weight structure in each period for class-confined weight application.
- Item weights in a given month or period is a reflection of expenditures associated with the items in that month or period.

In our experimental fixed annual weight;

- Estimated price in the first out-of season month is equal to average price in the previous in-season period.

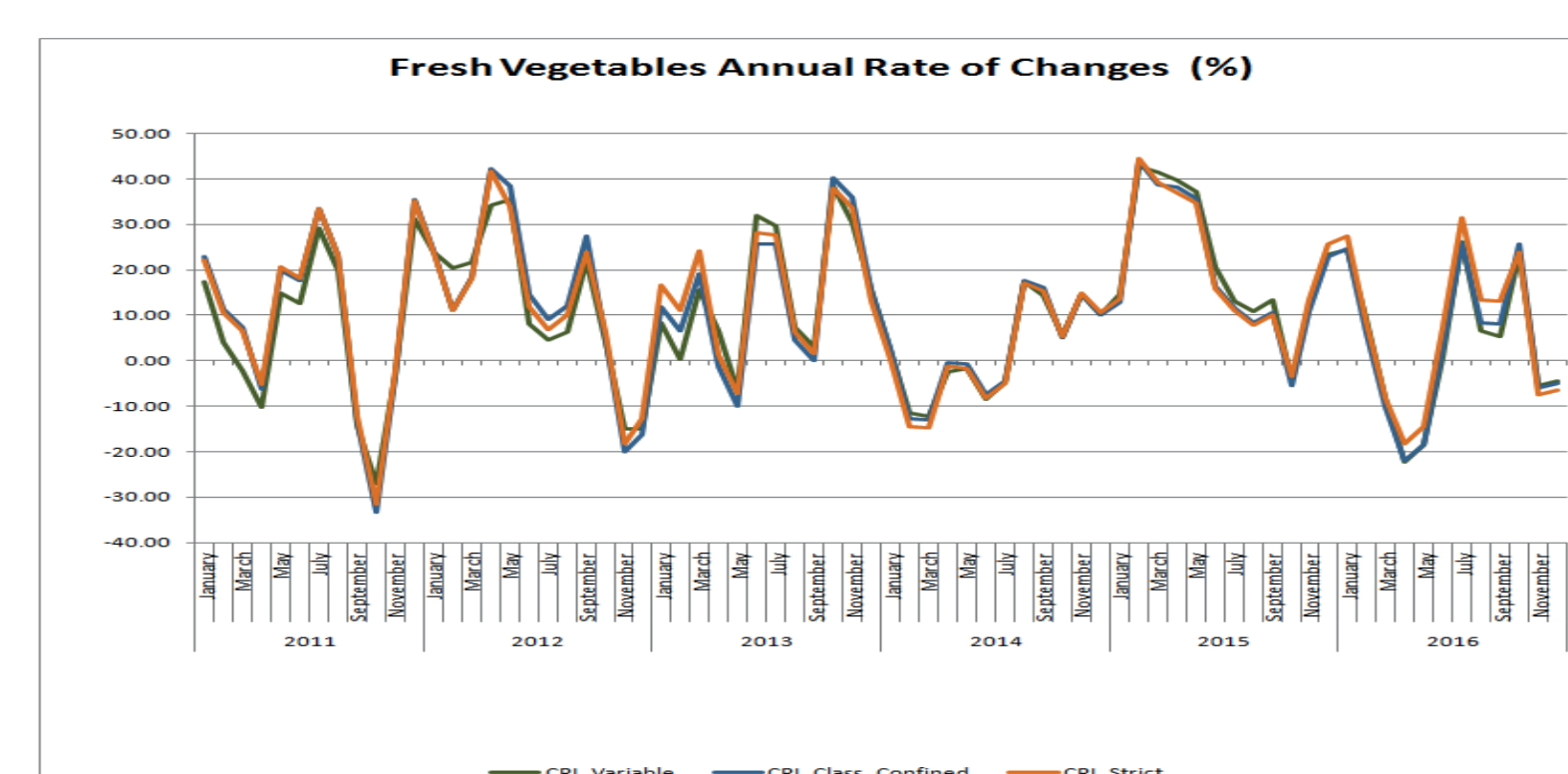
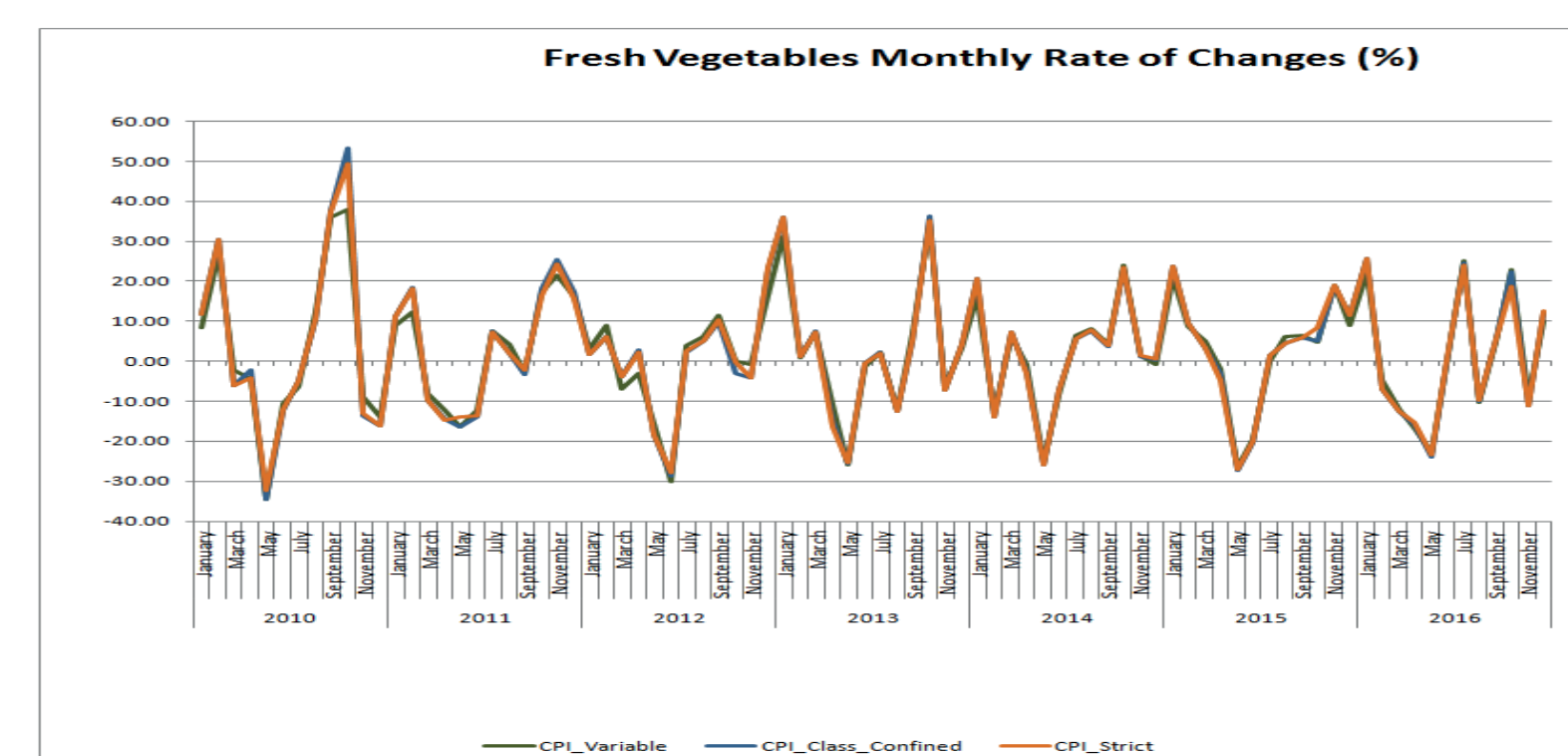
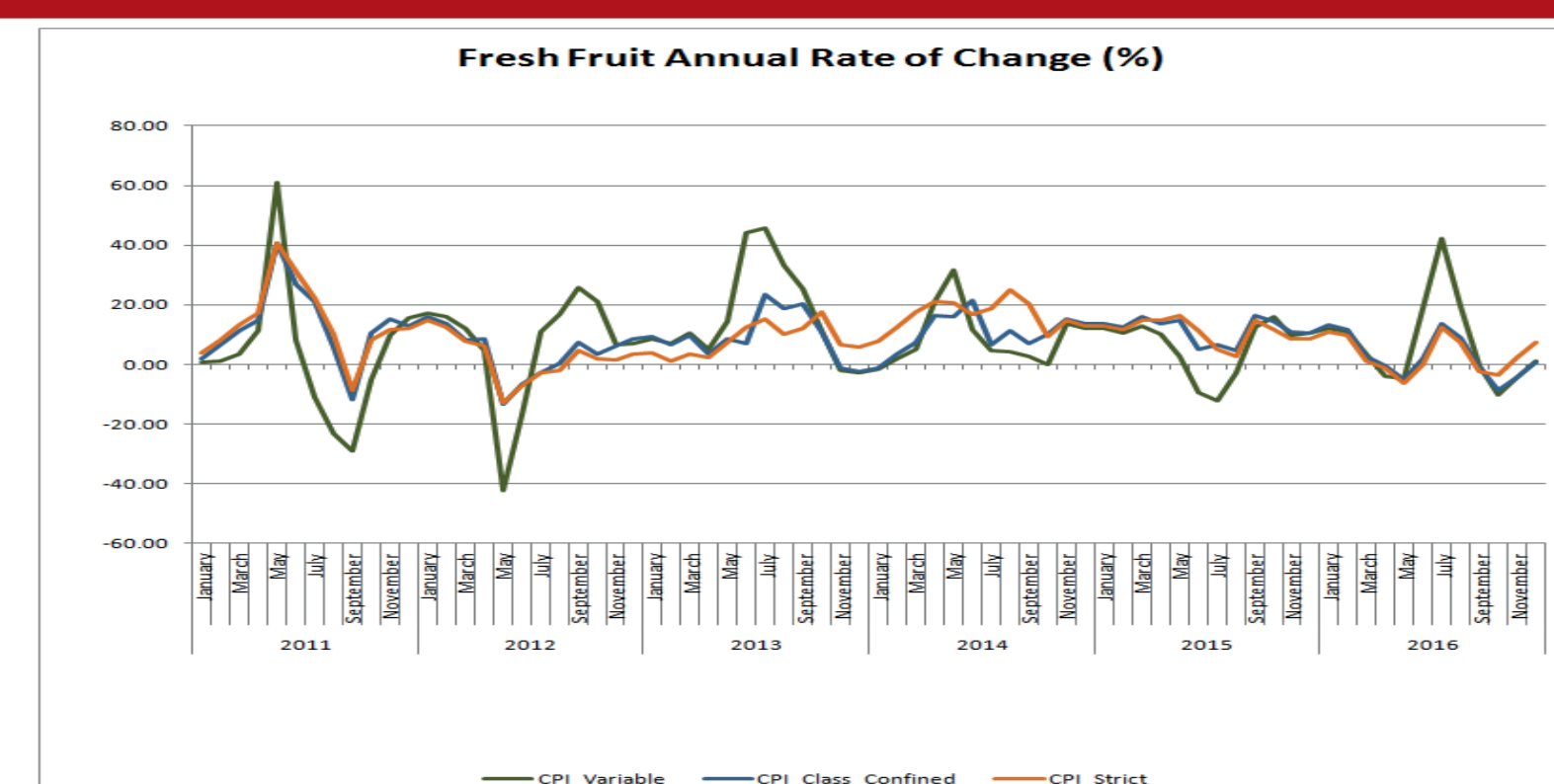
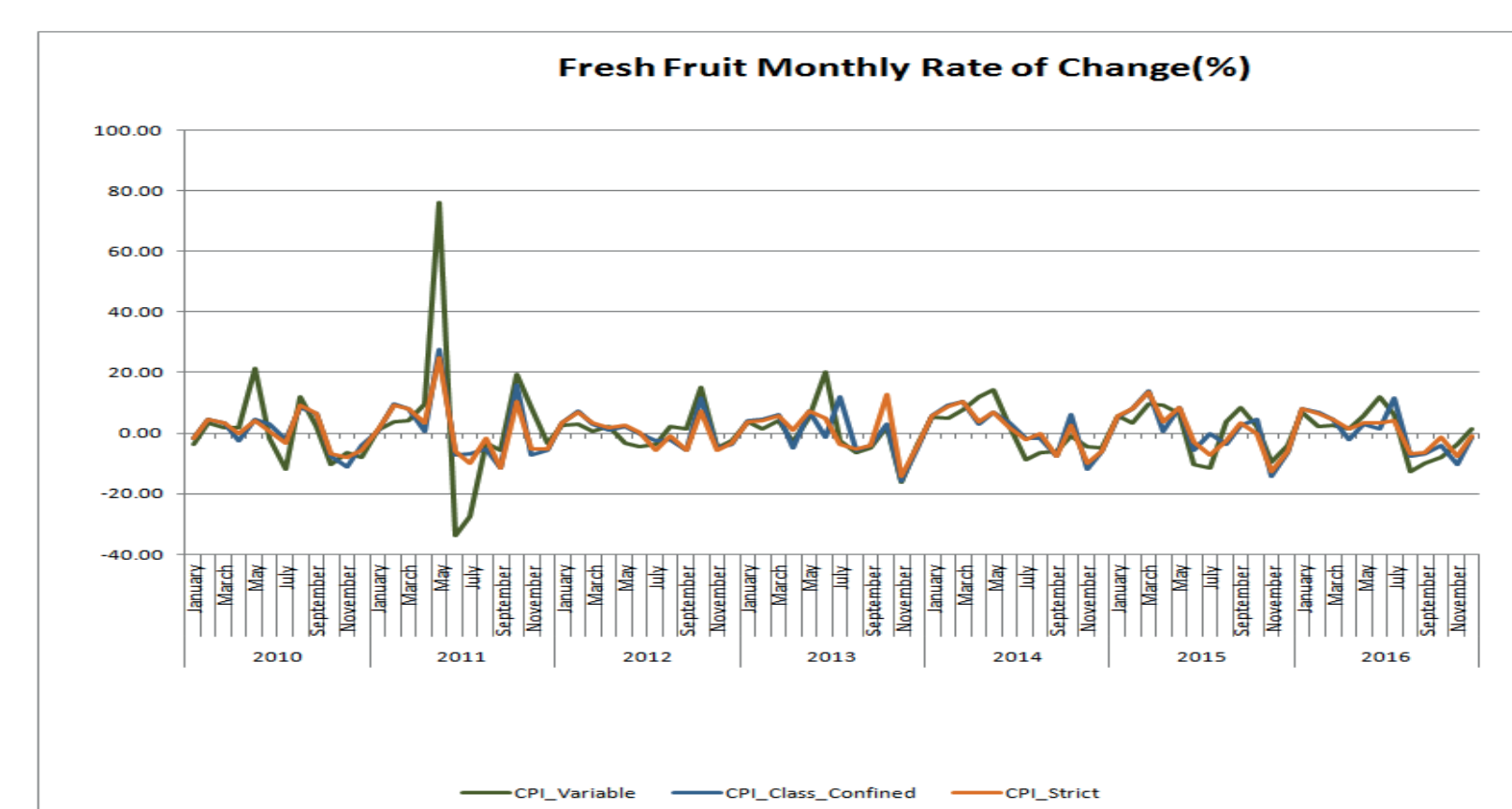
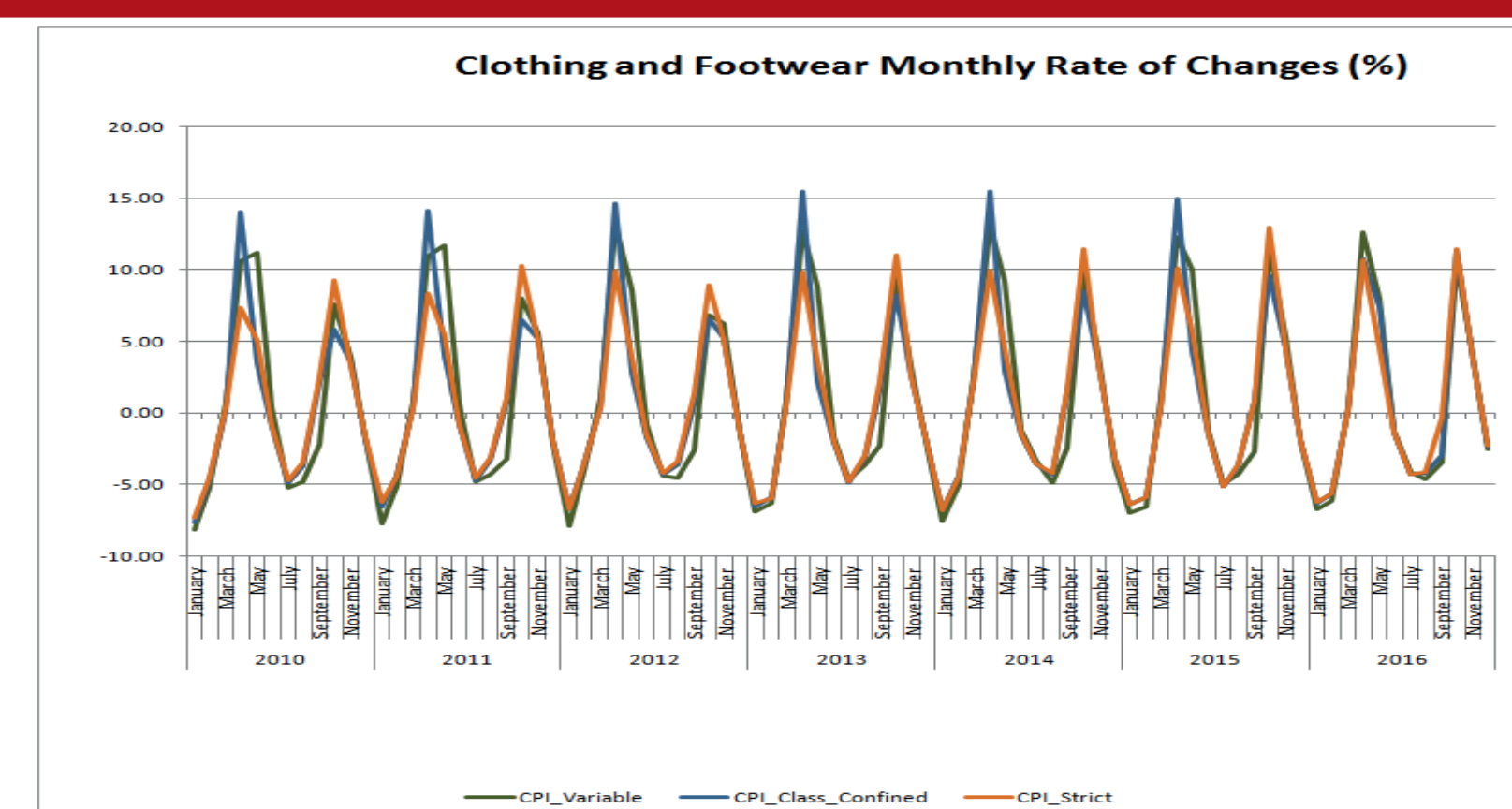
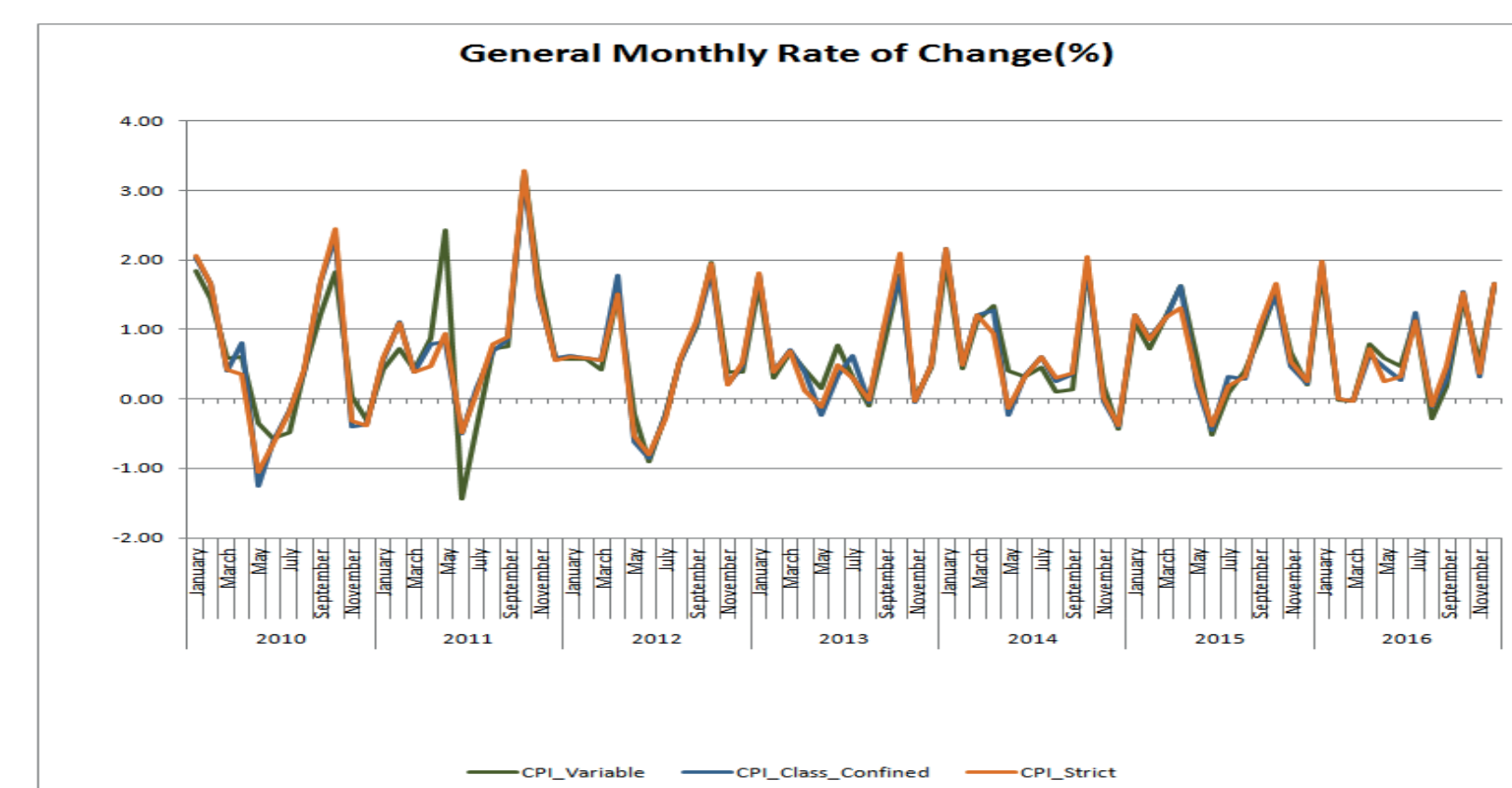
- From second out-of-season month, the estimated prices for out-of-season products will be used.

The method uses for the estimation is the all season method, using only the prices of the products which are available in both previous and current month in the same group (average price change value). In our application counter season and all season estimation give the same results because we use the COICOP 5 level.

In total, 2 indices were compiled, one of them using fixed weights approach and two others using seasonal weights approach.

**V. Results**

Seasonal items create some significant problems in Consumer Price Index (CPI) calculations. Most common approaches for the treatment of seasonal items are fixed and seasonal weights approaches. Both approaches have their own advantages and disadvantages and they need additional and careful analysis before implementation. We undertook pilot studies with historical data between the years 2010-2016 before making a decision on which approach to use. General, food and non-alcoholic beverages, clothing and footwear, fresh fruit and fresh vegetables were analyzed on a monthly and yearly change basis. In addition to graphs, there are tables that illustrates rate of change in coefficient of variation (CV) monthly and yearly.



COICOP	Products	Total Observation	In-season	Out of season
01.161	Fresh Fruit	204	107	97
01.171	Fresh Vegetables	264	207	57
03.121	Men's Clothing	240	210	30
03.122	Women's Clothing	264	242	22
03.123	Children's Clothing	204	190	14
03.2	Footwear	156	140	16

Annual change of CPI with strict weight has the minimum volatility in fresh fruits and vegetables group. On the other hand annual change of CPI with strict weight shows minimum volatility in other seasonal group and general CPI.

Both strict and class confined weights show less volatility than variable weight in annual change of CPI at most of lower levels of index.

All weighting systems have very close volatility in general CPI monthly. However, strict weights method has the least volatility in general CPI annual.

**VI. Conclusion**

It must be recognized that there is no completely satisfactory way of dealing with strong seasonal commodities. They may need special treatment to overcome volatility in the CPI. The confrontation of different approaches for the treatment of strong seasonal items shows that both fixed and seasonal weights indices display the same overall tendency and behavior. However, the class confined and variable weights approaches seem to yield more volatile results than fixed weight approach. Using strict annual weight application shows more predictable results both for monthly and annual rate because of less volatile results and appears as the better choice for measurement of pure price changes.

Most of the European countries especially in the Mediterranean side start to use strict annual weight application for strong seasonal items and EuroStat offer to use this system in the CPI calculations.

**VII. Sources**

UNECE (2009), Practical Guide to Producing Consumer Price Indices

EuroStat (2009), Commission Regulation (EC) No 330/2009 of 22 April 2009