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Documents

Analysing the series for Quarterly Sector Accounts (QSA): Income, expenditure and savings for households and the NPISH sector

Statistics Norway/Division for national accounts

Contents

1 Introduction

This report is a documentation of the project financed jointly by Eurostat and Statistics Norway, and analyse the Norwegian quarterly sector accounts (QSA).

The QSAs were first published in June 2005, with time series data from 2002 and onwards. Only the full set of accounts for the sector "Households and non-profit institutions serving households (NPISH)" are published on a quarterly basis for the time being.

The balancing items, savings and net lending/net borrowing are shown in the accounts for incomes and expenditures for one sector. The saving ratio (the ratio between savings and disposable income) indicates how the sector is being financed.

Some of the most relevant series in the QSAs show clear evidence of seasonality, for example gross value added and total consumption. Most of the other series show seasonality in quite different ways. It seems that the series for income and expenditure do not have identical seasonality.

The main aim of seasonal adjustment is to filter out common seasonal fluctuations and typical calendar effects within the movements of the time series under review. The seasonally-adjusted results do not show "normal" and repeated events, they provide an estimate for what is new in the series (change in the trend, business cycle or irregular component). Seasonally-adjusted data therefore help to reveal the "news" contained in a time series, which is the ultimate goal of seasonal adjustment

Therefore, in order to evaluate the current saving rate in an appropriate way, the seasonality must be removed from its components. The QSA time series are now extensive enough to identify their seasonality.

The main objectives of this work are to provide answers to the following questions:

- What are the main factors that determine the volatility of the saving rate of the household sector in Norway?
- How to evaluate the main characteristics of the time series that define the income and the expenditure of the household sector in Norway?
- There are several approaches to calculate seasonally adjusted data for household saving ratio. How should we evaluate these approaches?
- What kind of qualitative indicators could be used in order to facilitate the validation of seasonally adjusted data?

The following actions will be taken in order to answer these questions:

- A short description on the main series of the QSA. Special attention will be paid to the household savings ratio in order to find reasons for their volatility
- Analysis of seasonality, calendar effects and outliers, with special emphasis on the direct versus indirect approach. The point is to define the variables that should be adjusted directly or indirectly in order to keep consistency between the components and the main aggregates.
- Analysis of revisions of seasonally adjusted data paying special attention to the revisions made to the saving ratio and disposable real income during the year 2008.
- Develop an approach to provide qualitative indicators in order to facilitate the interpretation of the results and the comparison between different methods.

Empirical evidence that justifies the different approaches to estimate the seasonally adjusted data will be calculated and evaluated. This work concludes with a short summary and an interpretation of the results.

2 Households sector

Annex 1 shows the variables and their results for the Norwegian QSA in the period 2002-2008. Separate data for households and non-profit institutions serving households are not available on a quarterly basis. For this reason, our analysis covers the aggregate values of these two sectors. The contributions from non-profit institutions serving households represent less than 5% of the total value of the corresponding variables.

The following table shows the average weights of the variables for income and expenditure for the period of 2005-2008.

These weights have relatively been stable during the whole period of 2002-2008. Both for income and expenditure, we can observe that the first 4 series represent more than 90% of the total.

Table 1. Income and Expenditure. The shares of the componentes for the period 2005-2008

Income	codes	weights	Expenditure	codes	weights
+ Compensation of employees	D1, received	52,7	- Total consumption by households and NPISHs	P3	50,5
+ Output, producers' price	P1	20,6	- Current taxes on income, wealth, etc	D5	23,4
+ Pensions and benefits from general government	D6, received	15,6	- Intermediate consumption	P2	9,4
+ Property income received	D4, received	3,7	- Property income paid	D4, paid	4,5
+ Correction for FISIM		2,1	- Investment in non-financial capital	P5	3,4
+ Benefits from pension funds	D8	1,7	- Contributions to pension funds	D6, paid	2,9
+ Net current transfers to NPISH	D7_S11	1,5	- Consumption of fixed capital	K1	2,9
+ Adjustment for households' pension funds	D8	1,4	- Compensation of employees paid	D1, paid	2,4
+ Subsidies on production	D31	0,8	- Taxes on production	D21	0,2
+ Capital transfers, net	D9	-0,1	- Other current transfers paid, net	D7	0,2

This means that these 8 variables play a crucial role in determining the figures for disposable income, savings and consequently the value of the saving ratio in the whole period.

As a first step, the main variables above have been plotted together with the Q/Q-1 growth rates (see annex 2). Not all the series present a clear seasonal pattern.

Compensation of employees (D1, received) shows no peaks during the whole period. Most of the Norwegian employees receive compensation for vacations in June. Otherwise, employees receive bonus payments, annual premiums and a higher salary due to a reduction in taxes in December. Given these premises it is expected that the series for compensation of employees would show peaks in the second and the fourth quarters. The graph in annex 2 indicates that this is not the case. It shows a constant increase and no peaks are recorded during the whole period. An indication of seasonality is not present. This is probably due the fact that the main indicator used to estimate these values is the compensation of employees paid by companies. Most of the companies record their compensation to the employees not necessarily in the same period that payments are actualised. In practice this means that the seasonality has already been removed in the raw series.

Output, producer's price (P1) shows peaks in the third quarter, especially for the period of 2002-2005. Households' production is primary related with agriculture, fishing and tourism activities and high

season for those activities are the summer months. For the last years seasonally pattern is not clearly identified.

In the case of property income received (D4), the peak observed in every second quarter is explained by dividends (D24, received) which are normally recorded when companies close their accounts. We can clearly observe a downwards move in this series starting from 2005. The reason for this was a sudden level change in tax regulations for dividend incomes in Norway. Stockholders' motivation to receive dividends has decreased during the last three years. It is important to note that the effect of this change is expanded to the primary income, disposable income, savings and consequently to the saving ratio.

Pensions and benefits from general government (D6, received) show a trough by the first quarter which is mainly caused by sickness benefits received by employees during the last months of the year, which consequently shows a level drop in January.

Final consumption expenditure in the households (P3) decreases every first quarter after generally higher expenditure around Christmas / the end of the year. This series show the most clear and stable seasonal pattern of all of those involved in the Norwegian QSA.

Current taxes on income, wealth etc…(D5) have a moderate peak in the second quarter, probably in connection with the payment of the outstanding taxes from the previous year and with the payment of taxes on dividends after 2005.

Intermediate consumption (P2) shows peaks in the second quarter instead of the third quarter such in the case of the output, this can be explained by a lag of one quarter between P2 and P1.

We can conclude this chapter stating that the variables in the Norwegian QSA have a similar seasonal pattern to the rest of the euro area as mentioned in document TF-QSA-MAY08-07B with reference CMFB/TFQSA/2008/154.

However, two important facts will affect the results of the analysis of this document:

- ✓ Series are long enough to run X-12-ARIMA or Tramo-Seats but remain quite short (7 years) and therefore some problems of instability can arise.
- ✓ For different reasons as mentioned above, some of the aggregate series show non-identical seasonal patterns before and after 2005.

The fact that one of the most important series, consumption, clearly shows seasonality is a good reason to adjust the savings ratio, especially, if one keeps in mind that the most important raw series for income (D1, received) has been implicitly adjusted.

2.1 The saving ratio

The analysis of saving rates requires a decomposition into disposable income and final consumption. Indeed, fluctuations in savings rates may be driven by fall/rise in consumption, and /or fall/rise in disposable income.

As a first step, we have plotted the saving ratio together with the Q minus Q-1 differences for the whole period 2002-2008. The first impression is that the saving ratio of the Norwegian households has been quite volatile over this period. During the period of 2002 to 2005 the ratios were clearly positive with an average of around 10%, reaching their biggest level in the second quarter of 2005 (15.5%).

Starting from the second quarter of 2005 we observe a strong level change. During the last three years the ratios move between negative and positive values quite close to zero.

One cannot identify a clear seasonal pattern during this period. We can observe however, that the ratios systematically increase during the first quarters and decrease during the third quarters. The first case reflects a decrease in consumption after higher expenditure by the end of the year. The second one is reflecting an increase in the disposable income (and not reflected in the savings) probably motivated by the dividends paid in the second quarter.

A simple graph of the disposable income against the final consumption of households summarizes most of the conclusions mentioned above. We can observe that both series move in a similar way during 2002- 2005 but the disposable income shows a higher level than consumption systematically. Seasonality is clearly identified for consumption but it is not that clear for disposable income.

Figure 1. Savings ratio

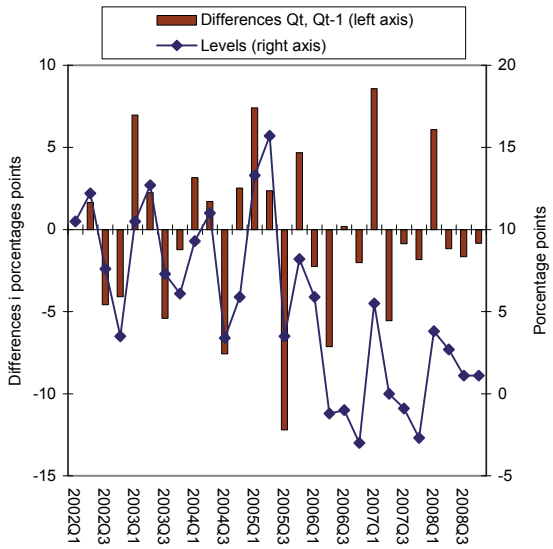
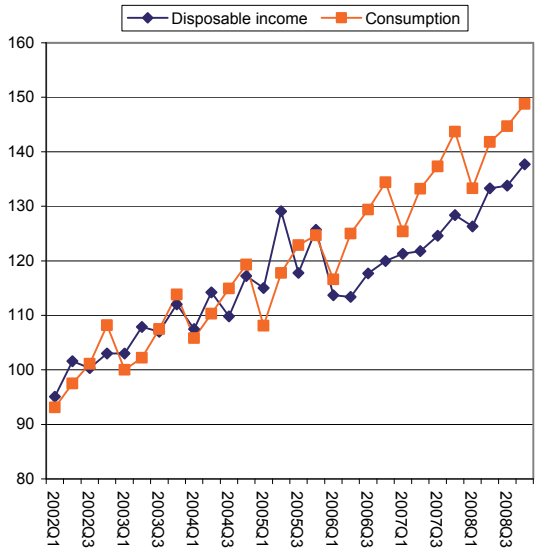


Figure 2.



The trend seem to be quite similar after 2005. However consumption keeps the seasonal pattern but this is not the case for disposable income.

We can conclude stating that the volatility of the savings ratio in households in Norway is driven by the disposable income. The final consumption of households shows a continuous increase except from a trough in the each first quarter of the whole period.

2.2 Methodological options

The graphical analysis and previous studies have shown that most of the variables involved to estimate the savings ratio have seasonal pattern. However, some of the most relevant series do not show seasonality or they show moving seasonality. This implies that main series such as disposable income, saving and consequently the savings ratio do not have a clear seasonal pattern.

In order to seasonally adjust the savings ratio, several options can be considered:

A: All series included in the QSA are seasonally adjusted. The indirect approach is used for the main aggregates. This means that consistency is maintained for aggregation and definitions in the tables for the seasonally-adjusted figures.

B: Disposable income and saving are directly adjusted and then the savings ratio is calculated.

C: The savings ratio is adjusted by estimating seasonal factors directly from the raw series.

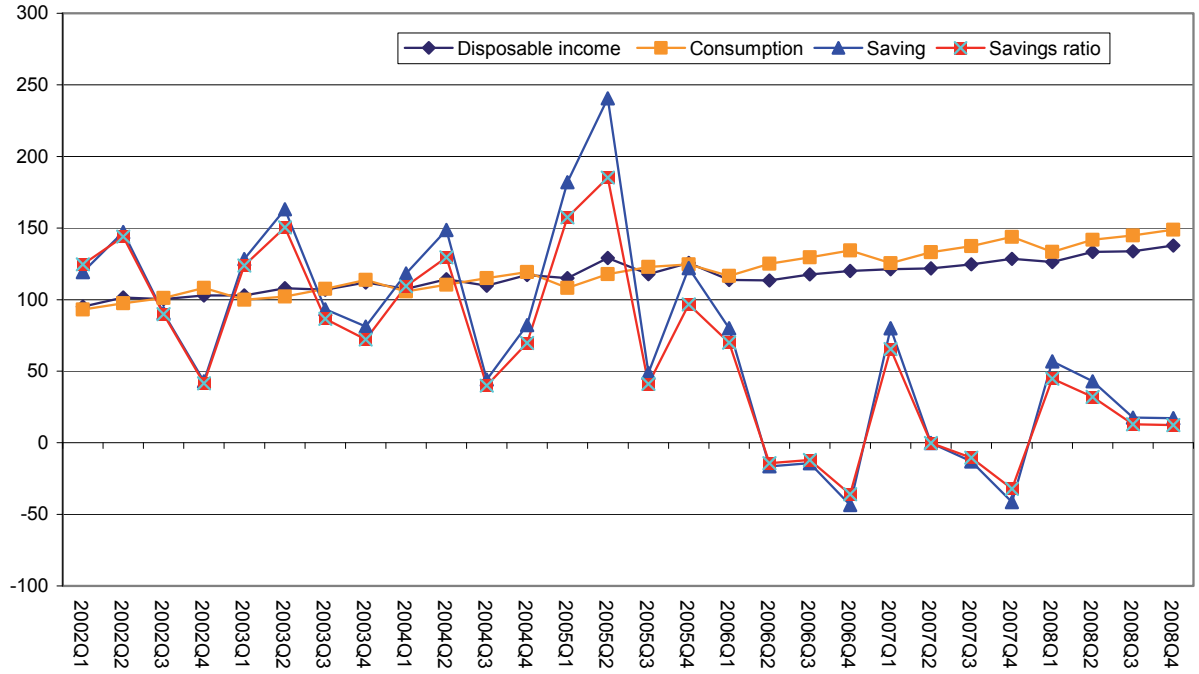
The options A and B can be considered as two different options of the indirect approach in opposition to C that is the only direct one. Whether it is more appropriate to use direct or indirect seasonal adjustment is still an open question. Neither theoretical nor empirical evidence uniformly favours one approach over the other.

In any case, there are two reasons for stating that option A (indirect approach) should be chosen.

- The characteristics of the seasonal pattern in the time series component differ in a significant way.
- The demand for consistent and coherent outputs, especially in the case of QSA where they are additively related.

For an informed choice between A, B and C, we have to consider some descriptive statistics on the quality of the approach as well, e.g. the smoothness of the results and measures of revisions.

Figure 3. The main components. 2002=100



In order to seasonally adjust all the components, ESS guidelines on seasonal adjustment have been considered. First, series have to be tested on general default options: multiplicative or additive decomposition, calendar effects, outlier detection. Concerning the seasonal adjustment method, X12-ARIMA is the reference option in Statistics Norway. Tramo/Seats is under evaluation at the moment like a complementary option to lead to alternative estimates but still not in use.

We have plotted the series involved in the above mentioned options. It is important to observe that the seasonal factors for the saving and for the savings ratio should be almost identical.

2.3 General options and seasonal adjustment with X12-ARIMA

In the second part of this document, under the chapter on qualitative indicators, we show a table containing the options that have been used in order to adjust each series. As most of the series are not ratios but series that show levels, a multiplicative model has been used by default. The only exceptions are the series with negative values and the series with flat values

during the year. In that case an additive model has been used. Following series have been adjusted with the additive model.

Table 2.

	Method	Properties	Alternative seasonal factors
Taxes on production	adt	flat annual values	Output / Intermediate consumption
Subsidies on production	adt	flat annual values	Output / Intermediate consumption
Contributions to pensions funds	adt	flat annual values	Benefits from pension funds
Other current transfers paid, net	adt	not level change	Benefits from pension funds
Saving	adt	negative values	none
Capital transfers, net	adt	negative values	none
Net lending	adt	negative values	none
Saving ratio (per cent)	adt	negative values	none

A common factor for these series is that they don't show seasonal pattern. Their contribution to estimate of the main aggregates are quiet irrelevant. Saving, net lending and savings ratio are also included showing the choice in the case when they are directly adjusted (options B and C in the previous chapter). In the case of the alternative A, (indirectly adjusted) we have used the alternative seasonal factors of the series indicated in the table.

Given the length and the frequency of the series, no calendar effects have been identified. Also due to the length of series, no Easter or leap year effect have been removed. The only exception is the final household consumption. This one has been adjusted using seasonal factors from the monthly index of household consumption of goods. A short explanation on the method and routines used for consumption will be presented below.

No outlier has been previously corrected. However, one regression variable for the level shift in 2006Q1 has been included in the regARIMA model for the following series when directly adjusted: property income, primary income, disposable income, saving and savings ratio. The effects of the level shift in the amount due to dividends have to be removed in order to aid ARIMA model identification.

For the ARIMA model identification, X12-ARIMA has been first launched using default options. The model selection is based on a set of predefined models. It is worth mentioning that X12-ARIMA found a suitable forecast for most of the series. However none of the models were automatically chosen for main series like saving, savings ratio and net lending due to high forecast errors.

Due to the limited span of the series, higher forecast errors should be expected. The estimation of the models is not so problematic due to the low significance of the irregular component as we will show later.

Table 3. ARIMA models estimated with X12 and Average Absolute Percentage Error (Last 3 years)

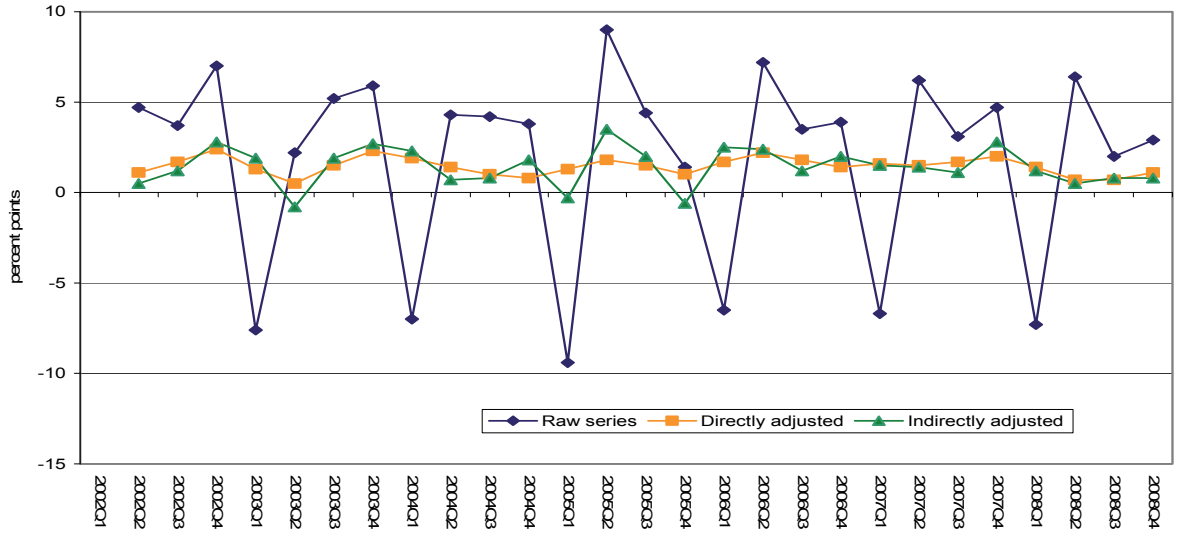
Income	Model	APPE	Expenditure	Model	APPE
+ Compensation of employees	(0 1 1) (0 1 1)	2,1	- Total consumption by households and NPISHs	(2 1 0) (0 1 1)	0,8
+ Output, producers' price	(0 1 1) (0 1 1)	2,5	- Current taxes on income, wealth, etc.	(0 1 1) (0 1 1)	1,7
+ Pensions and benefits from general government.	(0 1 1) (0 1 1)	1,4	- Intermediate consumption	(0 1 1) (0 1 1)	1,9
+ Property income received.	(0 1 1) (0 1 1)	11,9	- Property income paid	(0 1 1) (0 1 1)	8,4
+ Correction for FISIM	(0 1 1) (0 1 1)	1,6	- Investment in non-financial capital	(0 1 1) (0 1 1)	7,9
+ Benefits from pension funds	(2 1 0) (0 1 1)	1,2	- Contributions to pension funds	(2 1 0) (0 1 1)	0,5
+ Net current transfers to NPISH	(0 1 1) (0 1 1)	1,5	- Consumption of fixed capital	(0 1 1) (0 1 1)	0,7
+ Adjustment for households' pension funds	None		- Compensation of employees paid	(0 1 1) (0 1 1)	2,1
+ Subsidies on production	(0 1 1) (0 1 1)	0,3	- Taxes on production	(0 1 1) (0 1 1)	0,7
+ Capital transfers, net.	(0 1 1) (0 1 1)	11,7	- Other current transfers paid, net	(0 1 1) (0 1 1)	2,7
The aggregate series					
Gross value added	(0 1 1) (0 1 1)	1,3	Sparing	none	
Mixed Income	(0 1 1) (0 1 1)	3,1	Net lending	none	
Primary Income	(0 1 1) (0 1 1)	1,8	Savings ratio	none	
Disposable income	(0 1 1) (0 1 1)	0,2			

As expected, short seasonal filters have been used (3x3 moving average used in X12-ARIMA section 1 of each iteration, 3x5 moving average in section 2 of iterations B and C). The choice between these two short filters has been made automatically.

The options for models and filters for the aggregated series are only valid in the case of directly adjusted series.

As mentioned above, the final total consumption by households has been indirectly adjusted. We have used the monthly series of the index of household consumption of goods. The seasonal factors have been estimated to coicop-3 digit level consumption groups. We can therefore state that the series of total consumption have been properly adjusted for trading day and moving holidays (Easter) since these effects are clearly identifiable in the monthly expenditure of consumption groups.

Figure 4. Total consumption, change from previous quarter



As noticed the graph 4 shows, the results of the two methods (directly and indirectly adjusted) are quite similar, especially during the last 3 years. We have chosen to publish the indirectly adjusted series to be consistent with QNA since the levels of the total consumption figures are identical in QNA and QSA.

2.4 Results of savings ratio

Annex 3 shows the monitoring and quality assessment of X12-ARIMA for the most important series.

The values of M1-M6 statistics reflect attributes of the irregular component. The values of M7-M11 measure the quality of the seasonal component. The composite Q-value denotes the quality for the seasonal adjusted data. All the measures above are in the range from 0 to 3 with an acceptance region 0 to 1. More details on M and Q statistics can be found in the reference manual for X12-ARIMA.

In the second part of this document we present a chart where all the series have been evaluated keeping in mind, among other things, these indicators.

In this chapter we are going to pay attention to the savings ratio with special emphasis on analyzing the three different options mentioned above.

The smoothness and the size of the revisions between consecutive releases were considered in order to choose between these alternatives.

The following graph shows the monitoring and quality assessment for the Norwegian savings ratio for the period 2002-2008 when directly adjusted. We can state (M7-M11 values) that a seasonal pattern can not be identified . The values of M1-M6 also confirm that the series of the adjusted ratio will be dominated by the irregular component.

Annex 3 shows the corresponding results for saving and for disposable income and we can observe that they are quite similar to those of the savings ratio.
These preliminary conclusions indicate that options B and C mentioned above should be rejected and in consequence the alternative A (indirectly adjusted) must be chosen.

X12-ARIMA produces “seasonal” adjusted series although seasonality is not present. In that case either the raw or the trend series are used as a proxy for the seasonal adjusted.

Figure 5. Savings ratio, quality assessment

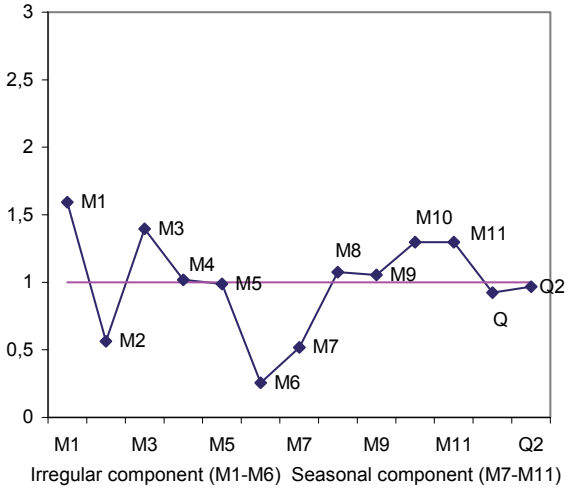
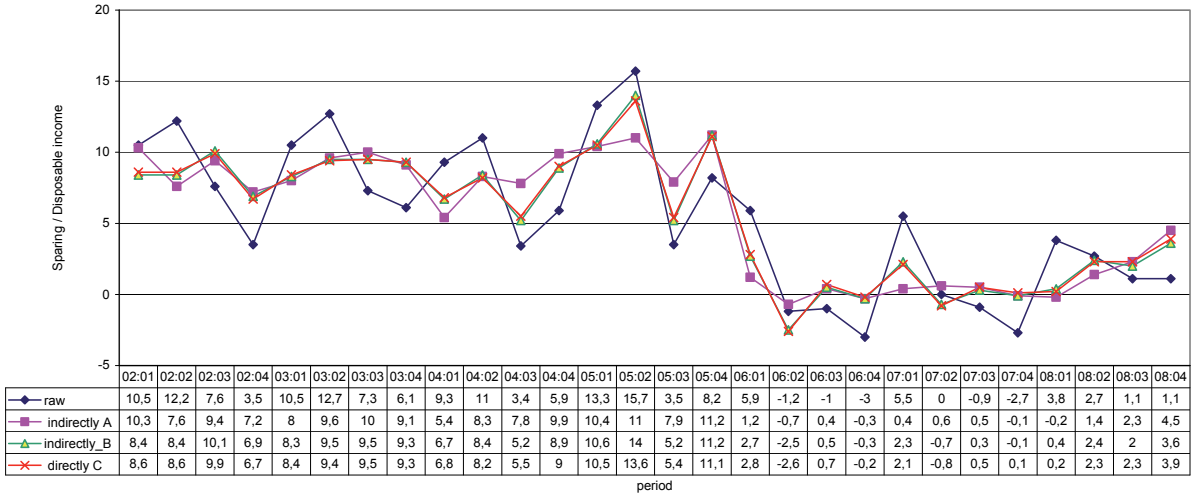


Table 4.

Automatic model chosen	none
Manually model chosen	aditive (0 1 1) (0 1 1)
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	3,36
I/C Ratio	1,28
Stable Seasonal F, B1 Table	8,08
Stable Seasonal F, D8 Table	15,14
Identifiable seasonality	no
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,52
Average Absolute revision of changes in Seasonal Adj,	0,86

The following graph shows the results of the different options.

Figure 6. Savings ratio, seasonal adjusted



	02:01	02:02	02:03	02:04	03:01	03:02	03:03	03:04	04:01	04:02	04:03	04:04	05:01	05:02	05:03	05:04	06:01	06:02	06:03	06:04	07:01	07:02	07:03	07:04	08:01	08:02	08:03	08:04
raw	10,5	12,2	7,6	3,5	10,5	12,7	7,3	6,1	9,3	11	3,4	5,9	13,3	15,7	3,5	8,2	5,9	-1,2	-1	-3	5,5	0	-0,9	-2,7	3,8	2,7	1,1	1,1
indirectly A	10,3	7,6	9,4	7,2	8	9,6	10	9,1	5,4	8,3	7,8	9,9	10,4	11	7,9	11,2	1,2	-0,7	0,4	-0,3	0,4	0,6	0,5	-0,1	-0,2	1,4	2,3	4,5
indirectly_B	8,4	8,4	10,1	6,9	8,3	9,5	9,5	9,3	6,7	8,4	5,2	8,9	10,6	14	5,2	11,2	2,7	-2,5	0,5	-0,3	2,3	-0,7	0,3	-0,1	0,4	2,4	2	3,6
directly C	8,6	8,6	9,9	6,7	8,4	9,4	9,5	9,3	6,8	8,2	5,5	9	10,5	13,6	5,4	11,1	2,8	-2,6	0,7	-0,2	2,1	-0,8	0,5	0,1	0,2	2,3	2,3	3,9

period

It is worth mentioning that results for option C and B are almost identical i.e.: no difference if we directly adjust the ratio or if we estimate the ratio via disposable income and saving directly adjusted.

Concerning the option A, all the variables for income and for expenditure have been separately adjusted. The results indicate that the difference between A and the other two options is quite significant in some periods.

However, we can practically observe that for the whole period, the three options adjust the ratio in the same direction i.e.: in the tree cases the adjusted ratio is bigger or smaller than the unadjusted one.

It is important to observe how the adjusted ratio, compared with the raw one, is systematically smaller in the first quarter but clearly bigger in the fourth. This is explained having in mind the seasonal pattern of the series for household consumption. It shows a fall in the first quarter after a strong increase in the fourth. When these effects for consumption are corrected, the series for saving (and consequently the ratio) will be adjusted in the opposite way.

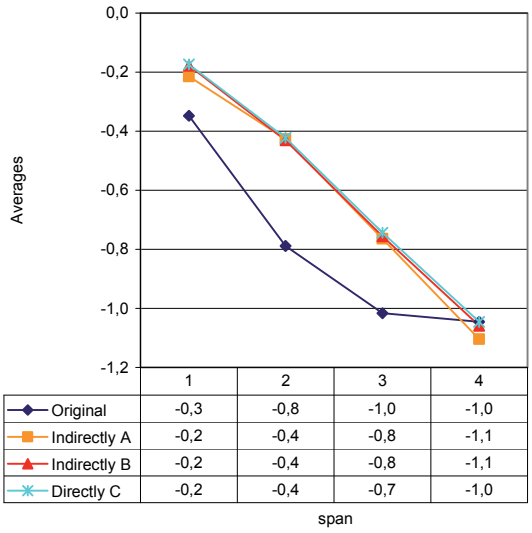
2.5 Smoothness of the ratio

From an economic point of view, smooth changes over the entire period are more plausible than erratic movements generally explained by one-off events recorded in one of the variables. Although sudden changes cannot be excluded, we think that the standard deviation over the whole business cycle can still be used as an indicator of reliability.

To measure smoothness of the three options for estimating the ratio, the average of the differences over the 4 quarters and their standard deviations have been calculated. The results are displayed below.

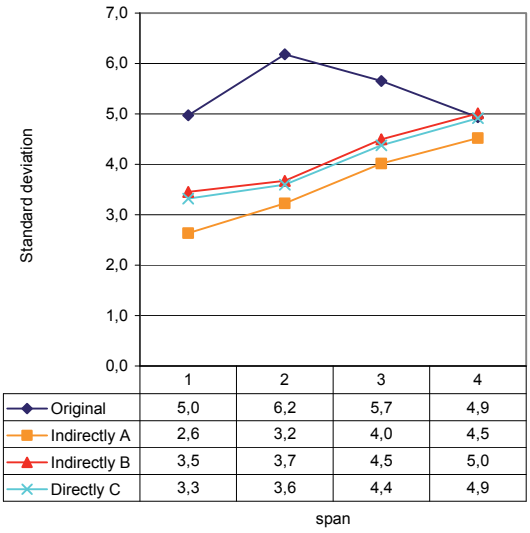
As shown in the first of the two graphs, the differences are almost identical for the three options and for the 4 quarters. As expected the differences for the adjusted ratios are substantially smaller than the differences for the original series for span 1, 2 and 3, however they are identical for span 4.

Figure 7. Savings ratio of original and seasonally adjusted: Average differences with regard to sign over indicate span



	1	2	3	4
Original	-0,3	-0,8	-1,0	-1,0
Indirectly A	-0,2	-0,4	-0,8	-1,1
Indirectly B	-0,2	-0,4	-0,8	-1,1
Directly C	-0,2	-0,4	-0,7	-1,0

Figure 8. Standard deviation of the differences



	1	2	3	4
Original	5,0	6,2	5,7	4,9
Indirectly A	2,6	3,2	4,0	4,5
Indirectly B	3,5	3,7	4,5	5,0
Directly C	3,3	3,6	4,4	4,9

Concerning the standard deviations of the differences, as expected, the adjusted ratio leads to smoother results for all the three options, option A being the one which leads to smoother results.

2.6 Revision Analysis

The size of revisions over consecutive releases is a relevant indicator to measure the reliability of seasonal adjusted series. X12-ARIMA sliding spans analysis is not possible in this case because the period is short. In the table 4 above with the X12-ARIMA quality assessment, the average absolute revision for the seasonally adjusted (0.5) and for changes in the seasonal adjusted (0.9) are displayed. However, these indicators should be interpreted with caution since they indicate percentages of a percentage and not of the level. These indicators are estimated only in the case when the ratio is directly adjusted but not in the other two options.

In order to compare the revisions of the options mentioned above, we have seasonally adjusted the data on the basis of the 2007Q4, 2008Q1, 2008Q2, 2008Q3 and 2008Q4. The ratios for the whole span were therefore estimated according to the options A, B and C for each release. With the purpose to distinguish the revision linked to seasonal adjustment from the revision of raw data, we have truncated the raw series to simulate five consecutive releases. Thus, these five releases only differ in the last figure of each release. The results are displayed below.

Table 5. Revision of the adjusted savings ratio estimated after 5 release

Indirectly A					Indirectly B					Directly C				
07Q4	08Q1	08Q2	08Q3	08Q4	07Q4	08Q1	08Q2	08Q3	08Q4	07Q4	08Q1	08Q2	08Q3	08Q4
0,2					-0,2					0,2				
-0,2	0,8				0,0	0,4				0,4	0,1			
-0,4	0,2	1,0			-0,2	0,4	2,5			0,1	0,1	2,3		
-0,5	0,2	1,2	3,1		-0,1	0,4	2,4	2,0		0,2	0,2	2,3	2,2	
-0,1	-0,2	1,4	2,3	4,5	-0,1	0,4	2,4	2,0	3,6	0,1	0,2	2,3	2,3	3,9

We can observe considerable revisions for option A and practically no revisions for B and C. We can also observe that the ratios estimated via options B and C are quite similar, regardless of the period of release. The results for option A are significantly different than the other two and more volatile.

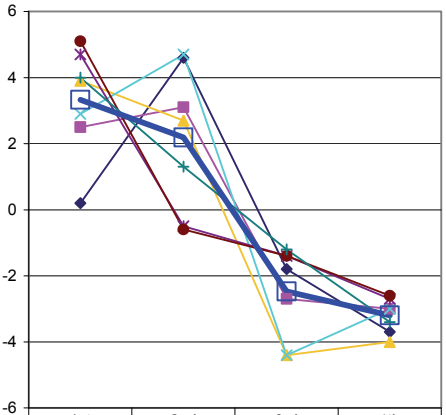
These results illustrate one of the typical conflicts in order to choose methods and routines for estimating seasonally adjusted data.

We know that the results of options B and C are the consequences of adjusting the savings ratio directly (C) or adjusting the disposable income and saving and than calculating the savings ratio (B).

As we have seen before, none of these three series show clear seasonal pattern. Consequently, the seasonal factors estimated by X12-ARIMA are closed to zero (or 100 in the multiplicative case) in such a way that the adjusted data are closed to the row and therefore quite stables in time

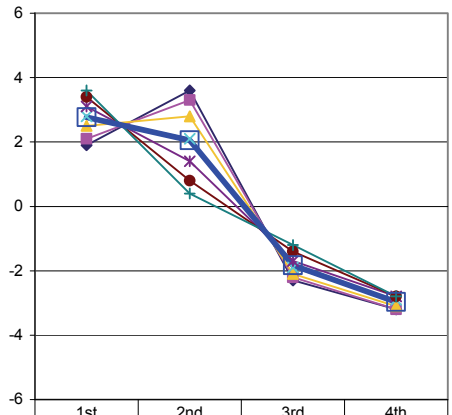
The situation is different for the option A, where each one of the series included in the QSA is separately adjusted. Some of the series show clear seasonality. Due to the limited time span of the series, the factors are exposed to major revisions.

Figure 9. Savings ratio: Seasonal factors, indirect approach (A)



	1st	2nd	3rd	4th
2002	0,2	4,6	-1,8	-3,7
2003	2,5	3,1	-2,7	-3
2004	3,9	2,7	-4,4	-4
2005	2,9	4,7	-4,4	-3
2006	4,7	-0,5	-1,4	-2,7
2007	5,1	-0,6	-1,4	-2,6
2008	4	1,3	-1,2	-3,4
AVGE	3,328571429	2,185714286	-2,471428571	-3,2

Figure 10. Savings ratio: Seasonal factors, directly approach (C)



	1st	2nd	3rd	4th
2002	1,9	3,6	-2,3	-3,2
2003	2,1	3,3	-2,2	-3,2
2004	2,5	2,8	-2,1	-3,1
2005	2,8	2,1	-1,9	-2,9
2006	3,1	1,4	-1,7	-2,8
2007	3,4	0,8	-1,4	-2,8
2008	3,6	0,4	-1,2	-2,8
AVGE	2,771428571	2,057142857	-1,828571429	-2,971428571

The results for the seasonal factors are displayed above for option A and C. The tables show the level and the stability of the seasonal factors for the ratio during the period 2002-2008. We have already mentioned that the additive decomposition must be used. This means that the original savings ratio is adjusted by subtracting the positive factors or by adding the negative ones. Factors close to zero are neutral.

As shown in the tables, the following conclusions can be made:

- ✓ The direct approach leads to seasonal factors more stable through the years.
- ✓ Both approaches show the same tendency for the estimated seasonal factors. The averages of the seasonal factors for each quarter are quite similar for both options.
- ✓ Both approaches adjust the ratio in the same direction: pushing it downwards in the first and second quarters and pulling it up in the third and the fourth. This is constant for the whole period with only the exception of the indirect approach in Q2 of the years 2006 and 2007.
- ✓ In both cases, the 2nd quarter are exposed to larger revisions.

2.7 Preliminary conclusions

In Table 1, we have identified a list with all the variables included in the Norwegian QSA in order to assure that seasonally adjusted data would meet core user needs. This extended set of SA data would provide a basic breakdown of the household saving rate.

In order to produce consistent SA for key indicators and components, we decided to test direct versus indirect approach using X12-ARIMA method. The analysis has paid major attention to the savings ratio for the period 2002-2008.

There are two important factors that influence the results of this analysis: the limited time span of the series and the instability of some of them. In that context we can observe how the savings ratio fluctuates around 10% for the period 2002-2006 and around 0, including negative values, for the last three years. Obviously this creates serious difficulties to estimate a model with moderate forecasting errors for the savings ratio.

In the series analysed, there is clearly a trade-off between the smoothness of seasonally adjusted data and the stability of the seasonal factors; the indirect approach produces smoother seasonal factors but more volatile seasonally adjusted series and the opposite can be said for the direct approach.

It is worth to mention the paradox in X12 ARIMA results. The X12-ARIMA diagnostics indicate that series such as the saving and the saving ratio do not have seasonality. However X12-ARIMA directly adjustment produces seasonal factors that seems to be consistent and stable during the whole period.

After evaluating all the results, we have reached the following conclusions:

- ✓ The X-12-ARIMA plus its well-documented and stable interfaces have been used for QSA seasonal adjustment.

- ✓ For some of the most important indicators (output, consumption), a detailed pre-treatment has been done. Pure automatic pre-treatment has been used for the remainder of the series.

- ✓ All series included in the QSA have been seasonally adjusted. The indirect approach has been used for the main aggregates. This means that consistency is maintained for aggregation and definitions in the released tables for the seasonally-adjusted figures. By a deliberate choice, annual data are set to be identical for unadjusted and adjusted data. The concurrent approach is used. This means that the model filters outliers and regression parameters will be re-identified. The respective parameters and factors are re-estimated every time new or revised data become available.

- ✓ The revision period for the seasonally-adjusted data covers the whole time series, irrespective of the revision period for the unadjusted data.

- ✓ In order to ensure that seasonally-adjusted data are of good quality, they are validated using a wide range of quality measures. Some of these indicators will now be provided to the users. One composite indicator has been assigned to each series in such a way that the users can evaluate the stability of the results.

The corresponding tables for new release of raw and seasonally adjusted data are provided in the annex 1. Graphic analysis of the raw series of components is included in the annex 2. Information on X12-ARIMA quality measures for seasonal adjustment is provided in the annex 3.

3 Dissemination of quality of seasonal adjustment

In the last section of this document we will pay attention to validation of the seasonal adjustment. Based on the results previously analyzed, we propose an approach for the dissemination of the quality of the seasonal adjustment. A central part of the approach is the provision of a joint qualitative indicator which will be helpful for users which lacks experience in evaluating SA.

3.1 Why qualitative indicators?

Seasonal adjustment is a complex statistical data treatment which needs accurate monitoring before the results are accepted and disseminated. In order to ensure that seasonally adjusted data are of good quality, they have to be validated using a wide range of quality measures.

It is important to keep in mind that users are more interested in the quality of the seasonal adjusted data than the quality of the seasonal factors. This means that a good evaluation have to take care of both the seasonal factors and the characteristics of the irregular component.

Often, there is not theoretical superiority of one method/option over the other. In that context the comparison must be done using empirical criteria. The smoothness of the series and the size of revisions between consecutive releases are probably the most relevant criteria for the users.

According to the above, the challenge is to select some indicators showing the stability of the seasonal factors and the irregular component.

A general principle for the National statistical institutes (NSI's) is openness about the quality of the published series. A possibility is to publish all the metadata that the elected method (X12-ARIMA, TRAMO/SEATS) produces. The problem generally is that these methods produce quite a lot of data and a large share of it are not easily interpreted among users.

3.2 Some suggestions

Internal discussions and analysis in Statistics Norway have concluded that the indicators of quality of a statistical area should be provided in a table.

One additional conclusion after these discussions is the necessity of estimating a joint indicator for each series based on the indicators included in the quality table. This joint indicator must be provided in text format (not numeric) and operate with for example on 3 levels of quality (A/B/C).

3.3 Interpretation of the indicators

Below, we give an explanation of how the proposed indicators are estimated and how they should be interpreted. It is worth to mention that we only propose indicators based on X12 Arima output and/or indicators specifically estimated for the series indirectly adjusted.

Generally, all the different indicators are easily interpreted when a series shows clear seasonal pattern and the irregular component is irrelevant. In other cases the indicators may be ambiguous or may even show contradictory results, hence it is harder to conclude about the quality of the SA. The proposed table with the indicators should include the followings indicators for each series:

- ✓ Decomposition method (multiplicative or additive)
- ✓ Model selection (automatic or manual)
- ✓ Analysis of Variance – ANOVA-

- ✓ Stability of Trend and Adjusted Series – STAR-
- ✓ Average absolute revision of the seasonal adjusted series-ASA-
- ✓ Average absolute revision of the month-to-month (or quarter-to-quarter) changes in the seasonally adjusted series?
- ✓ The relative contribution of the irregular component to the stationary portion of the variance (M2).
- ✓ The amount of moving seasonality present relative to the amount of stable (M7)
- ✓ Q-statistics: a weighted average of the M1-M11 statistics from X12-ARIMA
- ✓ Trading and moving holiday effects
- ✓ Joint indicator

In the next section, each of the columns in the quality table is explained. It is worth mentioning that these explanations are especially relevant for common users of SA figures and therefore they can seem trivial for experts in the mutter.

3.4 Decomposition method

This indicator shows whether the series are directly or indirectly adjusted. In the case of directly adjusted series (the majority) the method of decomposition is indicated. There are generally two current methods in this column: Multiplicative (MULT) or Additive (ADD) decomposition. The choice of multiplicative decomposition implies that the seasonal components change proportionally with the level of the series. Additive decomposition is generally chosen for series with plane trend or/and series with zero or/and negative values.

3.5 Model selection

Here it is specified whether the model used for forecasting the series has been chosen automatically by X12ARIMA or has been selected manually. X12ARIMA automatically identifies one model if the average of the forecast errors is less than a previously established value. If all the models are refused one of them is manually selected (i.e. a default option). Under these premises the automatic selection must be synonymous with better quality of the results. The number of parameters in the model must be included. The model (0, 1, 1) (0, 1, 1), often referred to as the airline model is generally the best one. This model has only 2 parameters and is easy to interpret.

3.6 Analysis of Variance –ANOVA

The analysis of variance (ANOVA) compares the variation in the trend component with the variation in the seasonally adjusted series. The variation of the seasonally adjusted series consists of variations of the trend and the irregular components. ANOVA indicates how much of the variation in the seasonally adjusted series is primarily attributable to variation in the trend component. The statistic can take values between 0 and 1 and it can be interpreted as a percentage:

$$ANOVA = \frac{\sum_{t=2}^{n} \left(DTC_t - DTC_{t-1}\right)^2}{\sum_{t=2}^{n} \left(DSA_t - DSA_{t-1}\right)^2}$$

Where: DTC_t = trend data for time t; DSA_t = seasonally adjusted data for time t

Values of ANOVA close to 1 mean small differences between trend and seasonally adjusted series. In this case, the series are expected to be stable in the sense that they are not influenced by the irregular component. Values of ANOVA close to 0 means that movements in the seasonally adjusted series are to a large extent caused by the irregular component.

It is worth to mention that ANOVA reflects the relation between to variances. This means that ANOVA doesn't give any information about the two series itself. However, the measure can be a good reference for the results of the other indicators.

3.7 Stability of Trend and Adjusted Series –STAR

The STAR indicates the average absolute percentage change of the irregular component of the series.

The STAR statistic is applicable only to the multiplicative decomposition. The expected revision in percentage points of the most recent estimate when a new data point is added is approximately half the value of the STAR value.

The formula fort the Stability of Trend and Adjusted Series Rating is as follows:

$$STAR = \frac{1}{N-1}\sum_{t=2}^{N}\left|\frac{DIR_t - DIR_{t-1}}{DIR_{t-1}}\right|$$

Where DIR_t = irregular component for time t, and N = number of observations.

Values of STAR close to zero mean little noise in the series. As a rule of thumb, we can state that STAR should be less than 1 per cent for quarterly series and less than 2 per cent for monthly series.

3.8 Average absolute revision of Seasonally Adjusted series – ASA

ASA measures the average of the revisions in absolute value of the level of the seasonally adjusted data. The indicator is based on empirical simulations.

$$ASA = \frac{1}{N}\sum_{t=1}^{N} R_t \qquad\qquad R_t = \frac{A_{t|T} - A_{t|t}}{A_{t|t}}$$

For a given series y_t where $t=1,\ldots\ldots,T$, we define $A_{t|n}$ to be the SA of y_t calculated from the series $y_{1,}y_{2,\ldots.}y_{n,}$ where $t \leq n \leq T$. The concurrent seasonal adjustment of observation t is $A_{t|t}$ and the most recent or "final" adjustment for observation t is $A_{t|T}$.

When the series are sufficiently long, the values for ASA and STAR/2 should be quite similar. ASA can also be used as a background to estimate one confidence interval for SA data.

3.9 Average absolute revision of the Q to Q changes in Seasonally adjusted series – ACH

ACH measures the average of the changes in the seasonally adjusted data without regarding the sign of the revision. Concerning SA data the stability in the changes is more relevant than the stability in the levels.

$$ACH = \frac{1}{N}\sum_{t=1}^{N} R_t \qquad\qquad R_t = \frac{c_{t|T} - c_{t|t}}{c_{t|t}}$$

For a given series y_t where $t=1,\ldots\ldots,T$, we define $C_{t|n}$ to be the change (percentage change from the previous period) in the SA for y_t calculated from the series $y_{1,}y_{2,\ldots.}y_{n,}$ where $t \leq n \leq T$. The concurrent change of the SJ for observation t is $C_{t|t}$ and the most recent change or "final" change of the SA for observation t is $C_{t|T.}$

In the same way as for ASA we can use ACH for estimating a confidence interval for the changes in the SA data.

Both ASA (for SA data) and ACH (for changes in the SA data) are useful indicators for the users.

3.10 The contribution of the irregular component to the stationary portion of the variance (M2)

This is one of the most relevant statistics from X12-Arima in order to evaluate the characteristics of the irregular component. It measures the relative contribution of the irregular component to the stationary portion of the variance (from Table F2.F). Values are in the range from 0 to 3 with an acceptance region 0 to 1.

3.11 The amount of moving seasonality present relative to the amount of stable seasonality (M7)

M7 is another of the standard indicators of X12-ARIMA. It is maybe the best of the individual indicators to evaluate the seasonal component. It measures the amount of moving seasonality present relative to the amount of stable seasonality (From table F2.I). The formula is given by:

$$M7 = \sqrt{\frac{1}{2}\left(\frac{7}{F_S} + \frac{3F_M}{F_S}\right)}$$

where F_S is the relative contribution of stable and F_M the moving seasonality. The values and the acceptance region is also 0 to 3 and 0 to 1.

Q-Statistics

This is decicively the most important of all the indicators presented in this document. Since each of the M statistics by itself is normally not useful for determining if the seasonal adjustment is successful, a weighted average of M1-M11 was created, denoted Q, to give one quality indicator. The weights show the importance of the M statistics assigned by the developers of X12-ARIMA.

The tables below show examples for M and Q statistics for two series with different characteristics, i.e. consumption and the saving ratio. The former clearly shows seasonality, for the second that is not the case. The tables also show the weight of each of the M statistics in the estimate of Q.

The time series for consumption has a Q-value significantly smaller than 1 and all the M-tests confirm it. However the savings ratio has a Q- value close but smaller than 1 although almost all M- statistics are greater than1. It is the value and the weight of M7 that causes the Q-value to be lower thanf 1.

Figure 11. Consumption

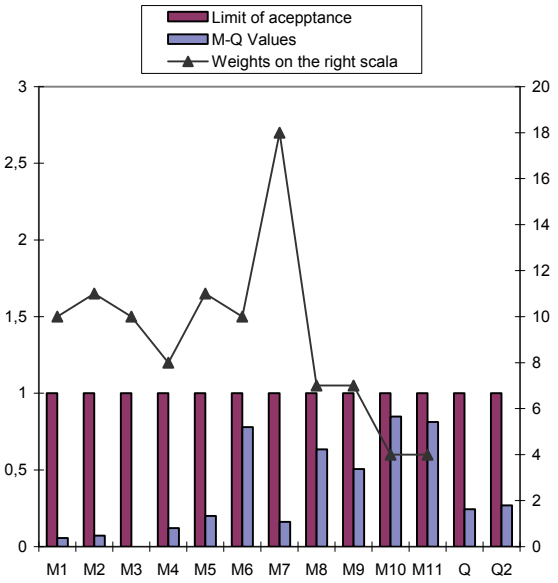
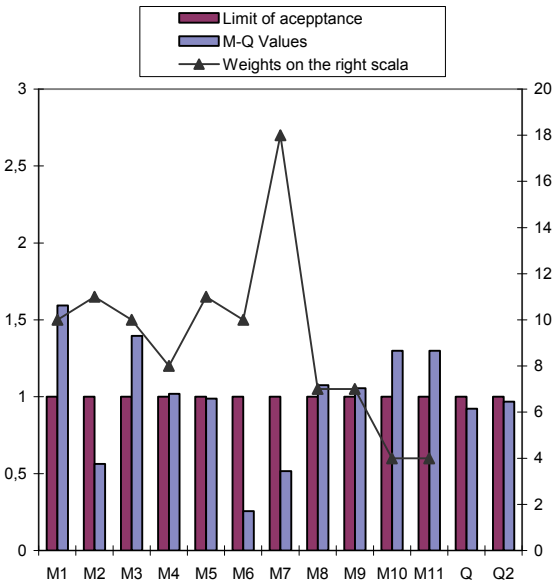


Figure 12. Savings ratio



3.12 Trading day – TD

This test indicates if the series have been adjusted for tradingsday effects. For quarterly series, this effect is rarely significant. It is worth to mention that this test takes in consideration the number of the different days of the week and not the rest of the holidays.

3.13 Moving holidays (Easter)

The objective of the test is to identify whether the values of the series in the 1st and the 2nd quarter are influenced by the time of Easter. Easter has usually negative or positive effects on the activities related to production and consumption. The time of Easter is especially relevant for Norway where the associated holidays are longer than in most countries in Europe.
The experience says that in practice it is quite complicated to identify and to remove these effects exactly. Therefore, it is important to inform the users that series influenced by Easter holidays are probably exposed to bigger revisions of the 1st and the 2nd quarter.

Due to the limited span of the series for households QSA, it is not possible to conclude whether the Easter effects are significant.

It is important to keep in mind that the calendar effects (tradingsday, Easter) must be removed in order to make meaningful comparison of one quarter with the same quarter in the previous year.

3.14 Joint indicator for quality measures for seasonal adjustment: Ranking

Users request that the NSIs produce a joint indicator resuming the quality of the seasonal adjusted data. Such an indicator must be based on the priority that the NSIs pay to the tests included in the table of quality i.e. the indicators mentioned above.

A possible alternative is to disseminate a joint indicator in the form of a code with letters (A/B/C) followed by a short explanation on the limits required to the different indicators.

A possible solution based on the ranking of some of the X12-ARIMA statistics for the QSA of Norwegian households is presented below. The sliding spans analysis is not included because the series are too short. M2 and M7 have been selected the best indicators for the quality of the irregular and the seasonal components respectively. The ASA and ACH statistics are two robust indicators measuring revisions in the SA series.

The quality "D" is generally not in use, except in the case when the raw series are used as proxy for the seasonal adjusted.

Table 6. Approach to decide the quality

Quality group	Q-value	M2 and M7 statistics	ASA and ACH
A	<= 0,5	< =0,5	< = 1 %
B	0,5 - 1	0, 5 <=1	1 < = 5 %
C	> 1	or > 1	or > 5%
D	Series is not adjusted		

Proposal to define the quality groups	
A	Series have been adjusted with very god results. Revisions for level and changes in the SA figures are not relevant. Both the seasonal and the irregular components are stable and predictable. A-limits for all the indicators must be performed
B	Series have been adjusted with relatively good results. Level and changes in the SA for the last periods are exposed for major revision. Some relevant but random movements in the irregular component can be expected. At least one of the tests differs from A.
C	Series have been adjusted with doubtful results. In many cases changes in the SA are similar to those in the raw series. In another cases significant variations in the SA for the most recent figures must be expected. The results should be interpreted Carefully. At least one of the test overcomes the limits for B.
D	Series do not have seasonal pattern. it is not adjusted. Either the raw or the trend series are used as proxy for the SA.

4 The results for the QSA

The results for the series involved in the Norwegian QSA are presented in the table below.

The choice taken regarding direct and indirect adjustment in the column for method reflects the option that is actually in use in Statistics Norway. All the values in the table are calculated by direct adjustment of the series.

For the majority of the series, ANOVA indicates that the changes in the seasonally adjusted series is primarily attributable to changes in the trend component. This is expected for quarterly series aggregated to national level.

Another important aspect is to observe that STAR/2 and ASA have a similar value. This indicates that STAR is a good indicator as reference for the revisions that are expected when new observations are available. It is important to remember that these revisions are those linked to seasonal adjustment and not to the changes in the raw data.

Just as we had suggested in the previous chapters, we can observe that some of the most relevant individual series deserve the quality A. This is the case for Output, Intermediate Consumption, Pensions and Benefits from General Government, Taxes and Final total Consumption. However, all the aggregated main series, included the savings ratio, are found in the categories B or C.

Annex 1 shows that besides the variables involved to estimate the savings ratio in current prices, SA data for saving and disposable income in constant prices are also provided.

There are of course several alternatives for SA series in constant prices. We have chosen to adjust these two series using identical seasonal factors as those estimated for the correspondent series in current prices. A separate analysis for the series for IPC indicates clearly that prices are generally not exposed to either calendar or seasonal effects. This is the case for aggregate price index used to deflate the series for saving and disposable income.

Finally, some comments concerning all of the results presented in this document:

- ✓ The validity of the results are conditioned on the short span of the analyzed series.
- ✓ The results presented in the last table give us a measure on the smoothness (ANOVA) and the stability (ASA, ACHA) of the series, but we can not deduce the degree and the sign of the seasonality.
- ✓ The selected approach is only one among many possible variants. Both X12-ARIMA and TRAMO/SEATS produce quality diagnostics that allows for several alternatives. The challenge is to choose a small number of indicators containing the most relevant information.
- ✓ The analysis in this document has been based on all the variables for income and expenditure of the QSA. Other possible combinations of the variables can lead to better results and therefore should be tested in the future.

Table 7[1].

Series	Method	ARIMA MODEL	ANOVA	STAR	ASA	ACH	M2	M7	Q-VALUE	Joint indi-kator
+ output, producers' price	MULT	(0 1 1) (0 1 1)	0,7	0,7	0,2	0,3	0,2	0,3	0,5	A
- intermediate comsumption	MULT	(0 1 1) (0 1 1)	0,9	0,7	0,4	0,5	0,1	0,3	0,4	A
= gross value added	INDIRECT	(0 1 1) (0 1 1)	0,5	0,7	0,3	0,3	0,1	0,1	0,2	A
- consumption of fixed capital	MULT	(0 1 1) (0 1 1)	0,9	0,1	0,1	0,1	0,2	0,4	0,3	A
- compensation of employees paid	MULT	(0 1 1) (0 1 1)	0,8	0,7	0,2	0,3	0,1	0,6	0,6	B
- taxes on production	ADT	(0 1 1) (0 1 1)	0,8	1,6	0,4	0,3	0,1	0,4	0,3	B
+ subsidies on production	ADT	(0 1 1) (0 1 1)	0,8	1,6	0,3	0,3	0,9	0,4	0,3	A
= mixed income	INDIRECT	(0 1 1) (0 1 1)	0,8	1,6	0,6	0,8	0,1	0,1	0,1	B
- compensation of employees	MULT	(0 1 1) (0 1 1)	0,9	0,1	0,2	0,1	0,8	3,0	1,4	C
+ property income received	MULT	(0 2 2) (0 1 1)	0,9	5,3	1,2	1,7	0,1	0,1	0,1	B
(amount due to dividends)	MULT	(0 1 1) (0 1 1)	0,9	2,2	1,2	1,5	0,0	0,5	0,1	A
+ property income paid	MULT	(0 1 1) (0 1 1)	0,9	1,1	0,9	1,3	0,0	2,4	1,2	C
+ correction for fisim	MULT	(0 1 1) (0 1 1)	0,3	0,4	0,2	0,3	0,3	0,2	0,2	A
= primary income	INDIRECT	(0 1 1) (0 1 1)	0,8	0,8	0,4	0,6	3,0	1,2	1,3	C
+ pension and benefits from general governement	MULT	(0 1 1) (0 1 1)	0,4	0,3	0,1	0,3	0,8	0,4	0,7	B
+ benefits from pension funds	MULT	(0 1 1) (0 1 1)	0,9	0,4	0,3	0,4	0,1	0,3	0,3	A
+ net current transfers to npish	MULT	(0 1 1) (0 1 1)	0,8	0,5	0,4	0,5	0,3	0,5	0,6	B
- current taxes on income, wealth, ETC	MULT	(0 1 1) (0 1 1)	0,9	0,2	0,1	0,1	0,1	0,2	0,2	A
- contributions to pension funds	ADT	(0 1 1) (0 1 1)	0,8	0,5	0,1	0,2	0,3	1,2	0,7	B
- other current transfers paid, net	ADT	(0 1 1) (0 1 1)	0,1	3,5	2,0	2,1	0,1	0,3	0,6	B
= disposible income	INDIRECT	(0 1 1) (0 1 1)	0,7	1,2	0,4	0,4	0,3	1,3	0,8	B
+ adjustments for households' pension funds	MULT	(0 1 1) (0 1 1)	0,9	0,9	0,2	0,4	0,1	0,4	0,3	A
- total consumptions konsum	INDIRECT	(2 1 0) (0 1 1)	0,8	0,5	0,3	0,3	0,1	0,2	0,2	A
= saving	INDIRECT	none	0,6	1,2	0,3	0,6	0,7	0,6	1,0	C
+ capital transfers, net	ADT	(0 1 1) (0 1 1)	0,6	10,2	6,7	8,2	0,1	0,9	0,5	C
- Investment in non-financial capital	MULT	(0 1 1) (0 1 1)	0,7	3,0	6,7	8,2	0,2	0,7	0,5	C
= net lending	INDIRECT	none	0,6	3,0	6,3	8,2	0,6	0,6	0,9	C
memo										
saving ratio (per cent)	INDIRECT	none	0,6	1,2	0,5	0,9	0,6	0,5	0,9	B
disposable income excluding dividens	INDIRECT	(0 1 1) (0 1 1)	0,5	1,3	0,1	0,1	0,4	0,4	0,5	B
disposible real income in 2000 prices	INDIRECT	(0 1 2) (0 1 1)	0,5	1,3	0,4	0,4	0,3	1,3	0,8	B
saving in 2000 prices	INDIRECT	none	0,6	1,2	0,3	0,6	0,7	0,6	1,0	C

[1] In the case of additive decomposition the results for STAR have been estimated by alternative methods.

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5 ANNEX 1: Tables

Table 1. Households and NPISH. Income, expenditure and saving. Current prices. Million kroner

	codes	2007	2008	08:1	08:2	08:3	08:4
Output, producers' price	P1	372786	397649	94773	98158	101990	102727
- Intermediate consumption	P2	178299	196616	46260	51108	47987	51261
= Gross value added	B1G	194487	201033	48513	47050	54003	51467
- Consumption of fixed capital	K1	55160	59951	14617	14869	15151	15315
- Compensation of employees paid	D1, paid	45669	49202	11535	12331	12650	12686
- Taxes on production	D21	4468	4423	1106	1106	1106	1106
+ Subsidies on production	D31	13941	14804	3701	3701	3701	3701
= Mixed income	B3G	103131	102261	24956	22446	28798	26062
+ Compensation of employees	D1, received	963620	1050193	252163	264259	265845	267927
+ Property income received	D4, received	77516	96972	22490	27518	23772	23193
Amount due to dividends	D42	17652	16893	3525	7050	2397	3921
- Property income paid	D4, paid	97564	130603	30201	32294	34527	33581
+ Correction for FISIM		40828	48690	10580	11534	11519	15057
= Primary income	B5G	1087531	1167513	279987	293463	295406	298657
+ Pensions and benefits from general government.	D6, received	278422	297354	69379	73635	75490	78851
+ Benefits from pension funds	D8	29945	34049	8442	8567	8476	8565
+ Net current transfers to NPISH	D7_S11	27815	30056	7361	7607	7502	7586
- Current taxes on income, wealth, etc	D5	444198	477514	114975	119216	122008	121314
- Contributions to pension funds	D6, paid	56600	63464	15862	15867	15868	15868
- Other current transfers paid, net	D7	4024	4111	338	1239	1193	1340
= Disposable income	B6G	918891	983883	233994	246949	247803	255137
+ Adjustment for households' pension funds	D8	26636	29415	7476	7254	7424	7261
- Total consumption by households and NPISHs	P3	941593	992349	232607	247522	252508	259712
= Saving, net	B8N	3934	20949	8863	6681	2720	2685
+ Capital transfers, net	D9	-2576	-1973	-493	-493	-493	-493
- Investment in non-financial capital	P5	65585	59386	16528	15852	14010	12996
= Net lending (+) / net borrowing (-)	B9	-64227	-40410	-8158	-9665	-11783	-10804
MEMO							
Savings ratio (per cent)		0,4	2,1	3,8	2,7	1,1	1,1
Savings ratio excluding dividends (per cent)		-1,5	0,4	2,3	-0,2	0,1	-0,5
Disposable income excluding dividends		901239	966990	230469	239899	245406	251216
Disposable real income in 2000 prices		824429	849842	202115	213305	214043	220378
Disposable income excl dividends in 2000 prices		808591	835250	199071	207216	211973	216991

Table 2. Households and NPISH. Income, expenditure and saving. Current prices. Percentage change from the same period in the previous y

	codes	2007	2008	08:1	08:2	08:3	08:4
Output, producers' price	P1	7,4	6,7	5,4	8	7,6	5,7
- Intermediate consumption	P2	10,7	10,3	9,2	11,2	10,2	10,5
= Gross value added	B1G	4,5	3,4	2	4,8	5,4	1,3
- Consumption of fixed capital	K1	8,6	8,7	9,2	8,6	9	8
- Compensation of employees paid	D1, paid	8,8	7,7	5,6	8,7	9,2	7,3
- Taxes on production	D21	17,2	-1	-1	-1	-1	-1
+ Subsidies on production	D31	-3,7	6,2	6,2	6,2	6,2	6,2
= Mixed income	B3G	-0,9	-0,8	-2,6	1	2,5	-4,1
+ Compensation of employees	D1, received	10,4	9	7,8	11,6	9,4	7,3
+ Property income received	D4, received	53,1	25,1	31,8	27,5	29,7	12,9
Amount due to dividends	D42	133,7	-4,3	-0,1	-0,2	-9,5	-11,2
- Property income paid	D4, paid	48,7	33,9	44,4	41,5	35,8	18,3
+ Correction for FISIM		25,3	19,3	10,4	13,5	13	38,2
= Primary income	B5G	9,3	7,4	5,5	9,5	7,7	6,7
+ Pensions and benefits from general government.	D6, received	4,3	6,8	5,3	6,7	6,8	8,3
+ Benefits from pension funds	D8	7,2	13,7	12,1	15,7	13,8	13,2
+ Net current transfers to NPISH	D7_S11	7,9	8,1	7,4	7,8	8,5	8,5
- Current taxes on income, wealth, etc	D5	10,8	7,5	8	7,9	7,8	6,3
- Contributions to pension funds	D6, paid	14	12,1	12,1	12,1	12,1	12,1
- Other current transfers paid, net	D7	11,9	2,2	-0,5	-0,1	3,2	4,1
= Disposable income	B6G	6,7	7,1	4,1	9,5	7,4	7,3
+ Adjustment for households' pension funds	D8	22,7	10,4	13,4	7	10,5	10,9
- Total consumption by households and NPISHs	P3	6,8	5,4	6,3	6,5	5,4	3,5
= Saving, net	B8N	..	..	..	..	..	..
+ Capital transfers, net	D9	..	..	..	..	..	..
- Investment in non-financial capital	P5	16,6	-9,5	-0,1	-5	-9	-23,4
= Net lending (+) / net borrowing (-)	B9	..	..	..	..	..	..
MEMO							
Savings ratio excluding dividends (per cent)		5,6	7,3	4,2	9,8	7,6	7,6
Disposable income excluding dividends		5,9	3,1	1,0	6,2	2,8	2,4
Disposable real income in 2000 prices		4,8	3,3	1,0	6,5	2,9	2,8
Disposable income excl dividends in 2000 prices		..	..	..	..	..	..

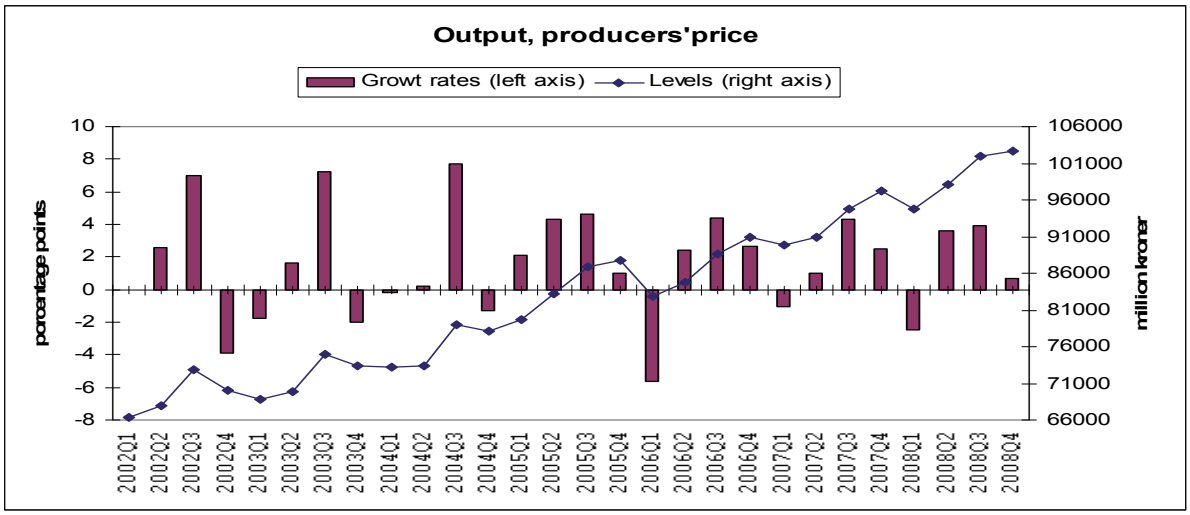
Table 3. Households and NPISH. Income, expenditure and saving. Seasonally adjusted.
Current prices. Million kroner

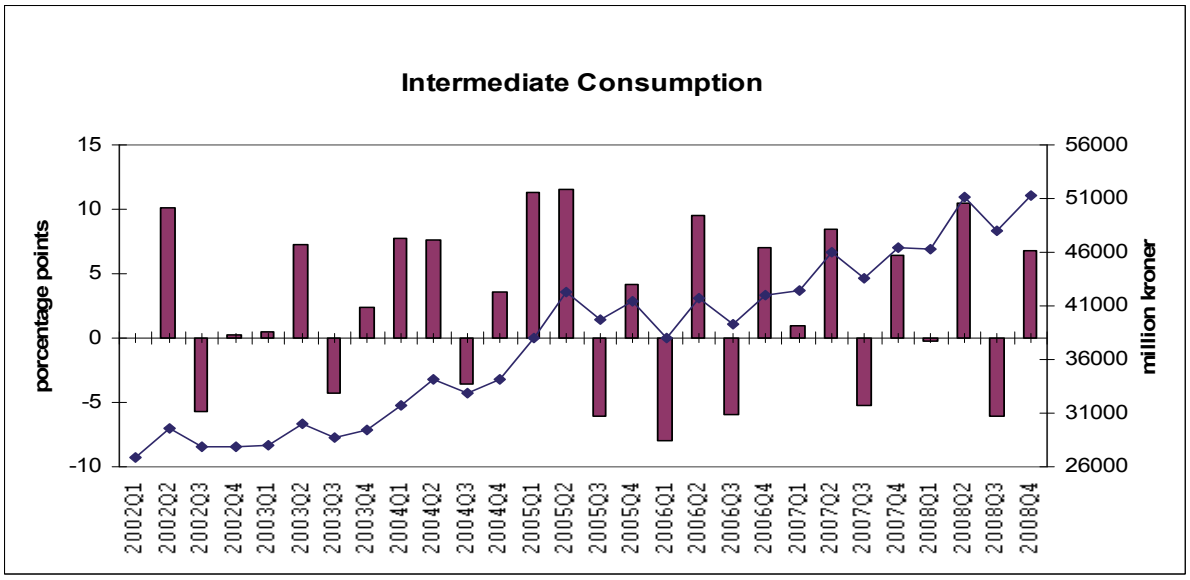
	2007	2008	08:1	08:2	08:3	08:4
Output, producers' price	372786	397649	96720	99225	100458	101165
- Intermediate consumption	178299	196616	47022	48525	49873	51086
= Gross value added	194487	201033	49697	50700	50586	50079
- Consumption of fixed capital	55160	59951	14556	14847	15167	15386
- Compensation of employees paid	45669	49202	11952	12186	12461	12604
- Taxes on production	4468	4423	1093	1091	1104	1176
+ Subsidies on production	13941	14804	3641	3682	3686	3686
= Mixed income	103131	102261	25738	26258	25539	24599
+ Compensation of employees	963620	1050193	255419	260287	265748	268670
+ Property income received	77516	96972	22123	22939	25467	26391
Amount due to dividends	17652	16893	4228	3986	3668	3641
- Property income paid	97564	130603	30357	32264	34465	33481
+ Correction for FISIM	40828	48690	10350	11274	11724	15490
= Primary income	1087531	1167513	283274	288493	294014	301670
+ Pensions and benefits from general government.	278422	297354	72028	73548	74937	76717
+ Benefits from pension funds	29945	34049	8131	8462	8737	8777
+ Net current transfers to NPISH	27815	30056	7280	7452	7603	7733
- Current taxes on income, wealth, etc	444198	477514	116287	118436	120792	121956
- Contributions to pension funds	56600	63464	15299	15687	16123	16568
- Other current transfers paid, net	4024	4111	1122	1030	1206	1241
= Disposable income	918891	983883	238004	242802	247169	255132
+ Adjustment for households' pension funds	26636	29415	7084	7227	7037	6924
- Total consumption by households and NPISHs	941593	992349	245519	246642	248526	250562
= Saving, net	3934	20949	-431	3387	5681	11493
+ Capital transfers, net	-2576	-1973	-509	-493	-510	-591
- Investment in non-financial capital	65585	59386	16247	15606	14807	12775
= Net lending (+) / net borrowing (-)	-64227	-40410	-17187	-12712	-9636	-1873
MEMO						
Savings ratio (per cent)	0.4	2.1	-0.2	1.4	2.3	4.5
Savings ratio excluding dividends (per cent)	-1.5	0.4	-2.0	-0.3	0.8	3.1
Disposable income excluding dividends	901239	966990	233776	238816	243502	251491
Disposable real income in 2000 prices	824429	849842	208891	211268	212681	216363
Disposable income excl dividends in 2000 prices	808008	835880	205205	207825	209550	213301
Savings in 2000 prices, net	3530	18095	-376	2929	4857	9685

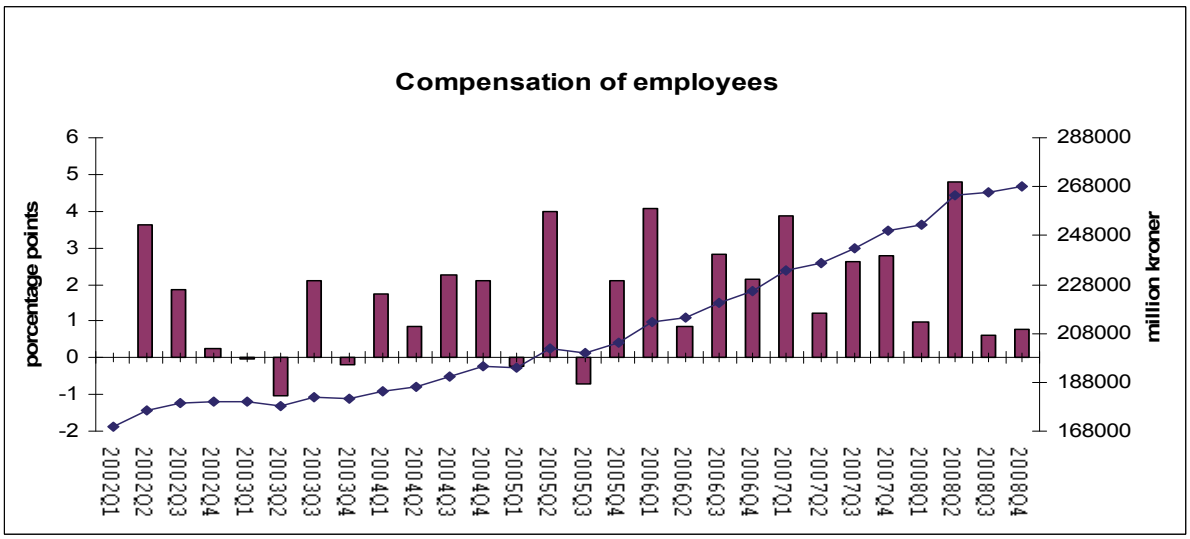
Table 4. Households and NPISH. Income, expenditure and saving. Seasonally adjusted.
Current prices. Percentage change from the previous period

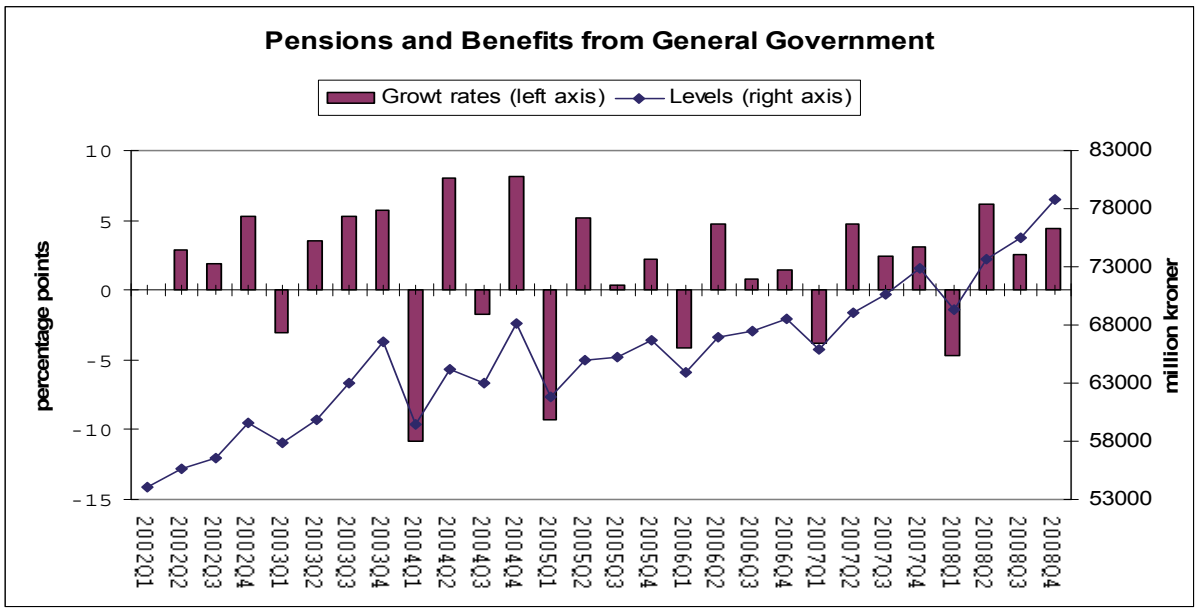
	2007	2008	08:1	08:2	08:3	08:4
Output, producers' price	7,4	6,7	1,1	2,6	1,2	0,7
- Intermediate consumption	10,7	10,3	1,3	3,2	2,8	2,4
= Gross value added	4,5	3,4	0,8	2	-0,2	-1
- Consumption of fixed capital	8,6	8,7	2,2	2	2,2	1,4
- Compensation of employees paid	8,8	7,7	2	2	2,3	1,1
- Taxes on production	17,2	-1	-3,2	-0,1	1,2	6,5
+ Subsidies on production	-3,7	6,2	3,5	1,1	0,1	0
= Mixed income	-0,9	-0,8	0,1	2	-2,7	-3,7
+ Compensation of employees	10,4	9	2	1,9	2,1	1,1
+ Property income received	53,1	25,1	4,5	3,7	11	3,6
Amount due to dividends	133,7	-4,3	-13,4	-5,7	-8	-0,7
- Property income paid	48,7	33,9	7,3	6,3	6,8	-2,9
+ Correction for FISIM	25,3	19,3	-7,6	8,9	4	32,1
= Primary income	9,3	7,4	1,1	1,8	1,9	2,6
+ Pensions and benefits from general government.	4,3	6,8	1,7	2,1	1,9	2,4
+ Benefits from pension funds	7,2	13,7	4,5	4,1	3,3	0,5
+ Net current transfers to NPISH	7,9	8,1	2,3	2,4	2	1,7
- Current taxes on income, wealth, etc	10,8	7,5	1,4	1,8	2	1
- Contributions to pension funds	14	12,1	3,7	2,5	2,8	2,8
- Other current transfers paid, net	11,9	2,2	7,8	-8,2	17	2,9
= Disposable income	6,7	7,1	1,1	2	1,8	3,2
+ Adjustment for households' pension funds	22,7	10,4	0,8	2	-2,6	-1,6
- Total consumption by households and NPISHs	6,8	5,4	1,2	0,5	0,8	0,8
= Saving, net	..	..	..	..	..	..
+ Capital transfers, net	..	..	..	..	..	..
- Investment in non-financial capital	16,6	-9,5	-1,8	-3,9	-5,1	-13,7
= Net lending (+) / net borrowing (-)	..	..	..	..	..	..
MEMO						
Disposable income excluding dividends	5,6	7,3	1,4	2,2	2	3,3
Disposable real income in 2000 prices	5,9	3,1	-0,1	1,1	0,7	1,7
Disposable income excl dividends in 2000 prices	4,8	3,3	0,2	1,3	0,8	1,8

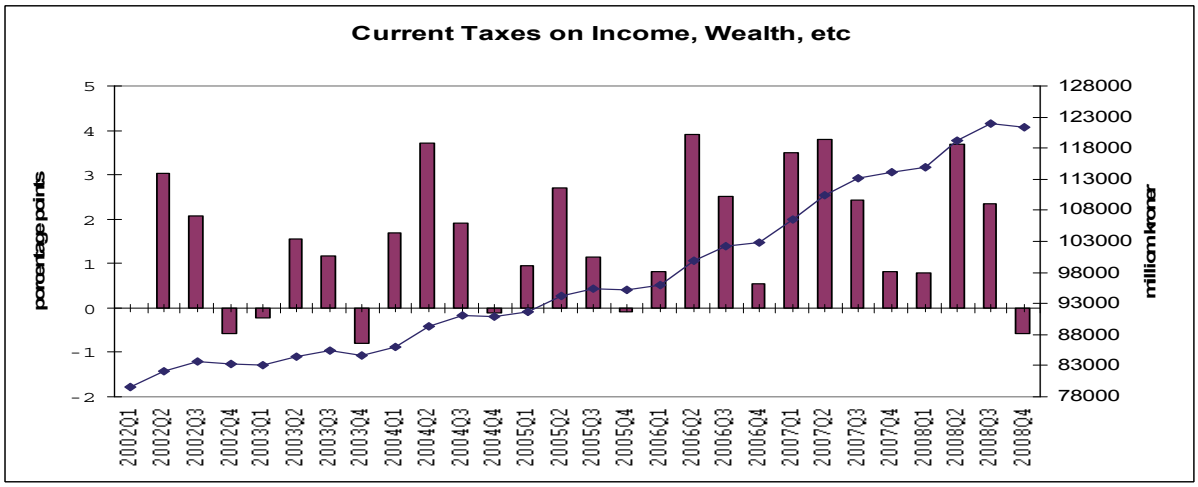
6 ANNEX 2: Raw series of components

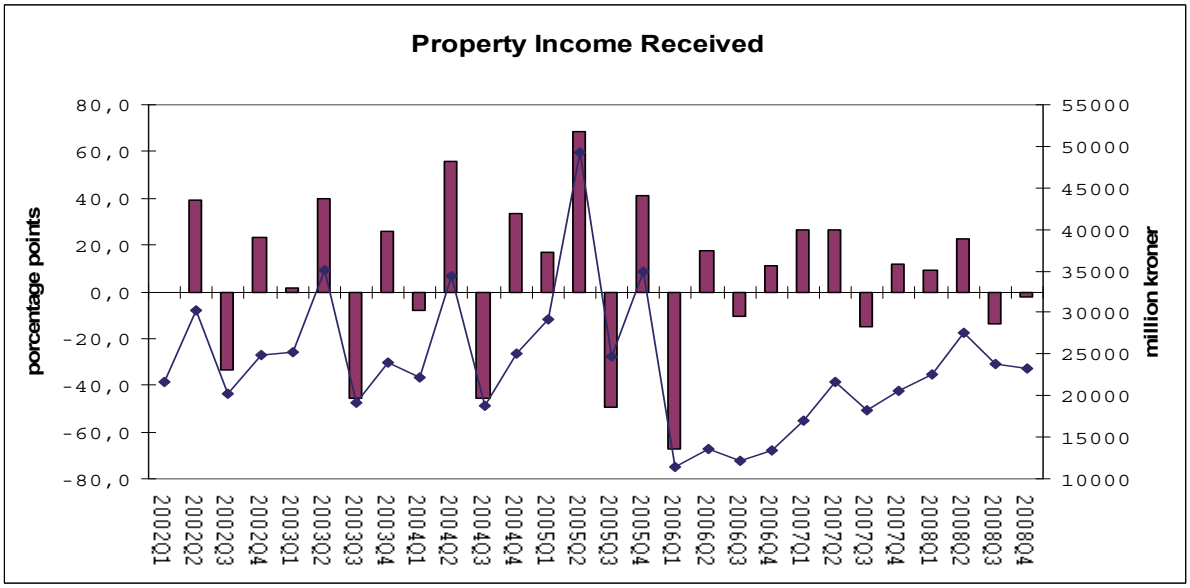


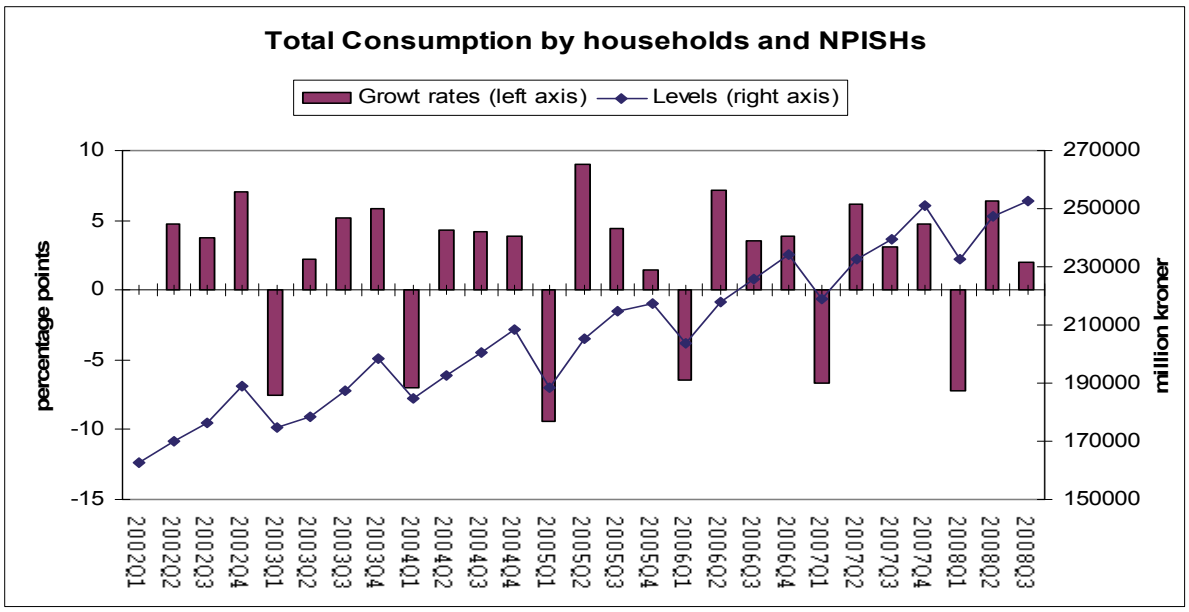


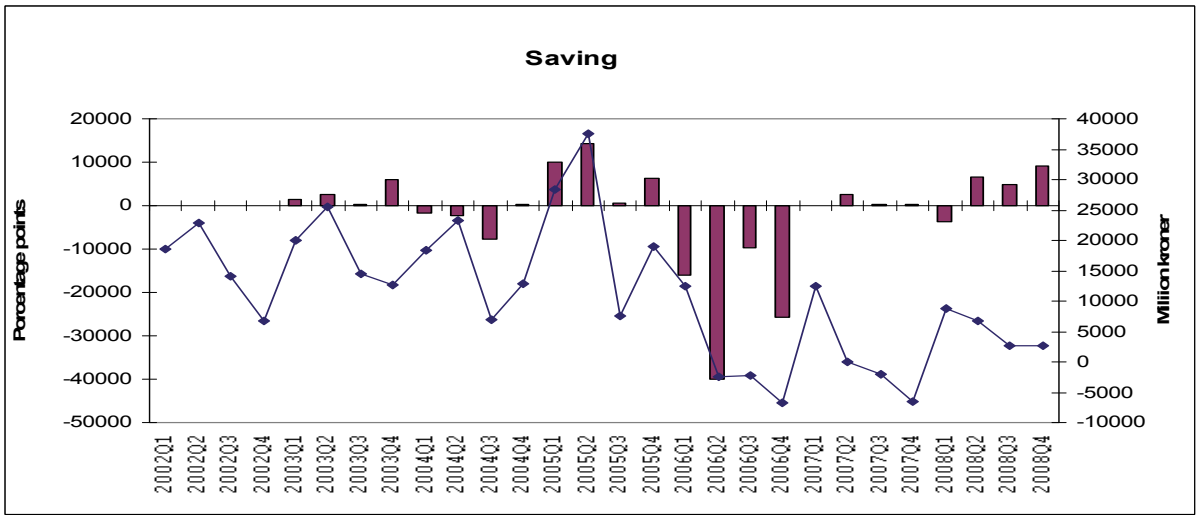


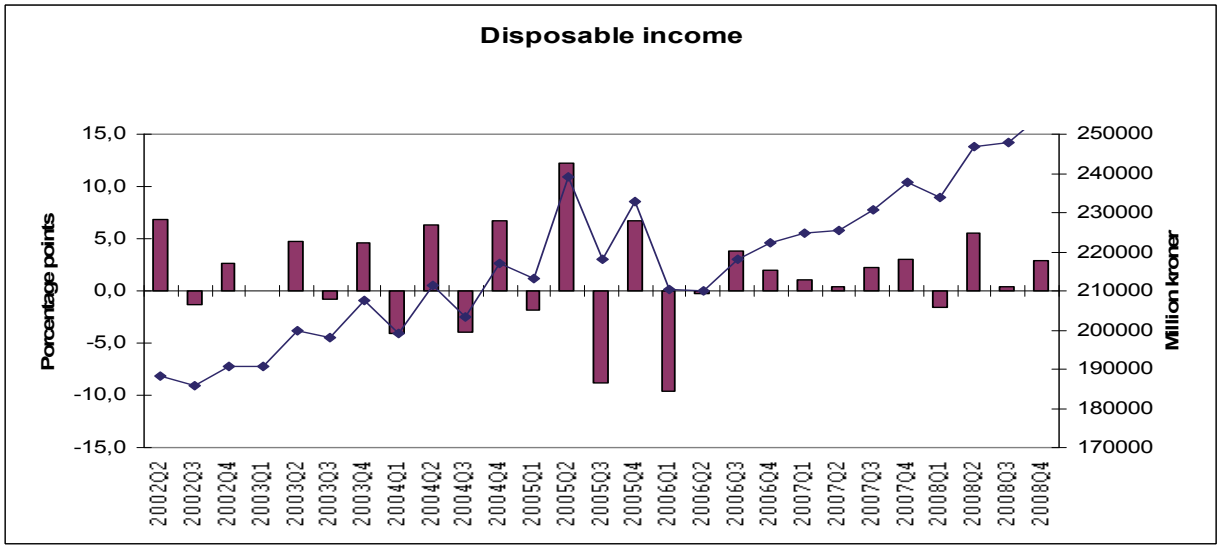

Pensions and Benefits from General Government
Growt rates (left axis)
Levels (right axis)
percentage points
million kroner
10
5
0
-5
-10
-15
83000
78000
73000
68000
63000
58000
53000
2002Q1
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4


Current Taxes on Income, Wealth, etc
porcentage points
millionkroner
5
4
3
2
1
0
-1
-2
128000
123000
118000
113000
108000
103000
98000
93000
88000
83000
78000
2002Q1
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4

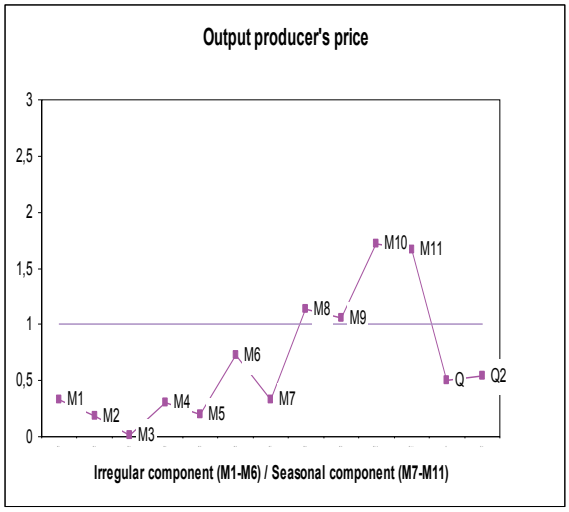

Property Income Received
porcentage points
million kroner
80,0
60,0
40,0
20,0
0,0
-20,0
-40,0
-60,0
-80,0
55000
50000
45000
40000
35000
30000
25000
20000
15000
10000
2002Q1
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4


Total Consumption by households and NPISHs
Growt rates (left axis)
Levels (right axis)
percentage points
million kroner
10
5
0
-5
-10
-15
270000
250000
230000
210000
190000
170000
150000
2002Q1
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3

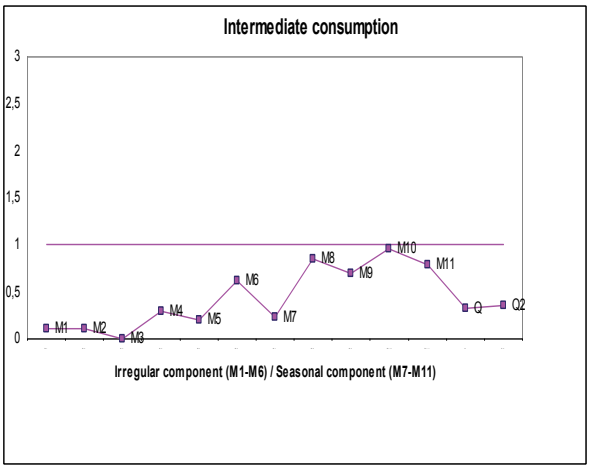

Saving
Porcentage points
Million kroner
20000
10000
0
-10000
-20000
-30000
-40000
-50000
40000
35000
30000
25000
20000
15000
10000
5000
0
-5000
-10000
2002Q1
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4


Disposable income
Porcentage points
Million kroner
15,0
10,0
5,0
0,0
-5,0
-10,0
-15,0
250000
240000
230000
220000
210000
200000
190000
180000
170000
2002Q2
2002Q3
2002Q4
2003Q1
2003Q2
2003Q3
2003Q4
2004Q1
2004Q2
2004Q3
2004Q4
2005Q1
2005Q2
2005Q3
2005Q4
2006Q1
2006Q2
2006Q3
2006Q4
2007Q1
2007Q2
2007Q3
2007Q4
2008Q1
2008Q2
2008Q3
2008Q4

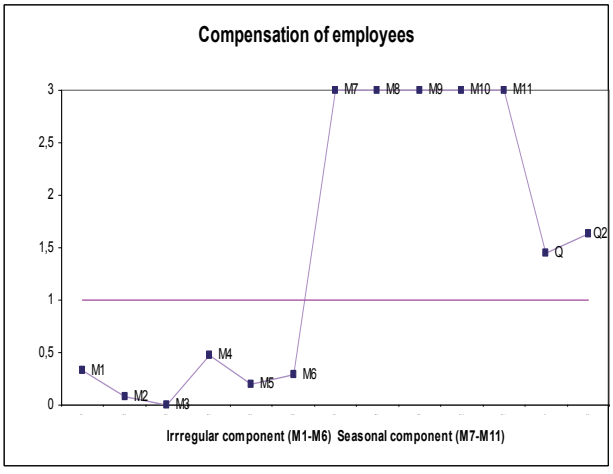
7 ANNEX 3: Information on diagnostics



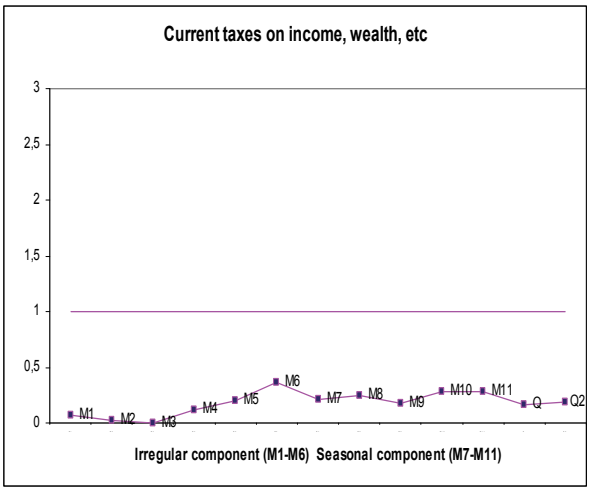
Output	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	2,18
I/C Ratio	0,35
Stable Seasonal F, B1 Table	19,08
Stable Seasonal F, D8 Table	34,53
Moving Seasonal F, D8 Table	0,16
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,21
Average Absolute revision of changes in Seasonal Adj,	0,29



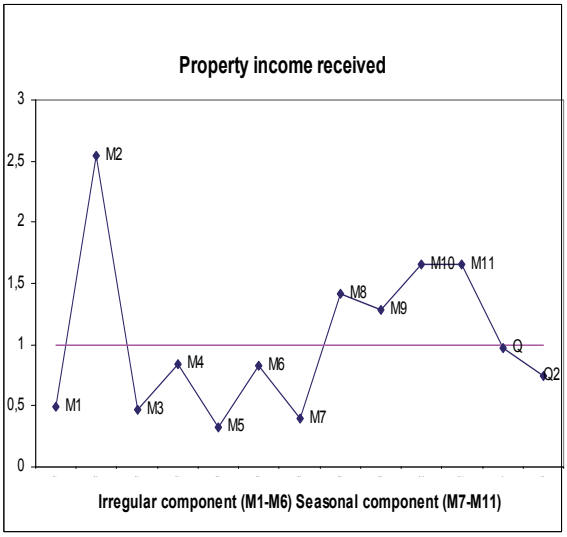
Intermediate consumption	
AICtd	rejected
AICeaster	rejected
	2,45
I/C Ratio	0,18
Stable Seasonal F, B1 Table	38,44
Stable Seasonal F, D8 Table	75,55
Moving Seasonal F, D8 Table	0,23
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,41
Average Absolute revision of changes in Seasonal Adj,	0,69



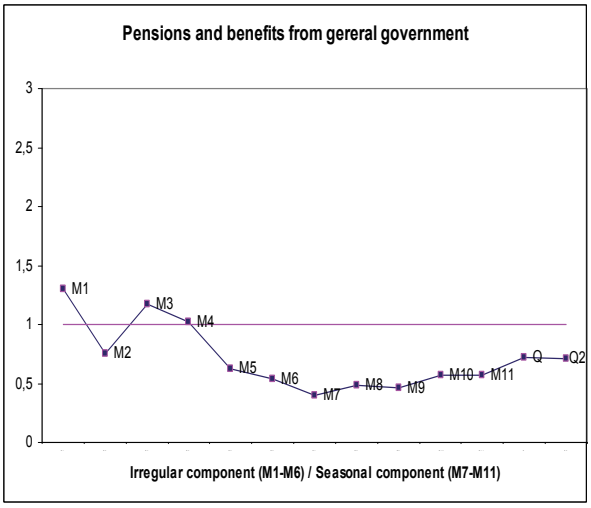
Compensation of employees	
AICtd	rejected
AICeaster	accepted
Moving seasonality ratio	3,29
I/C Ratio	0,13
Stable Seasonal F, B1 Table	0,11
Stable Seasonal F, D8 Table	0,75
Moving Seasonal F, D8 Table	2,48
Identifiable seasonality	no
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,14
Average Absolute revision of changes in Seasonal Adj,	0,17



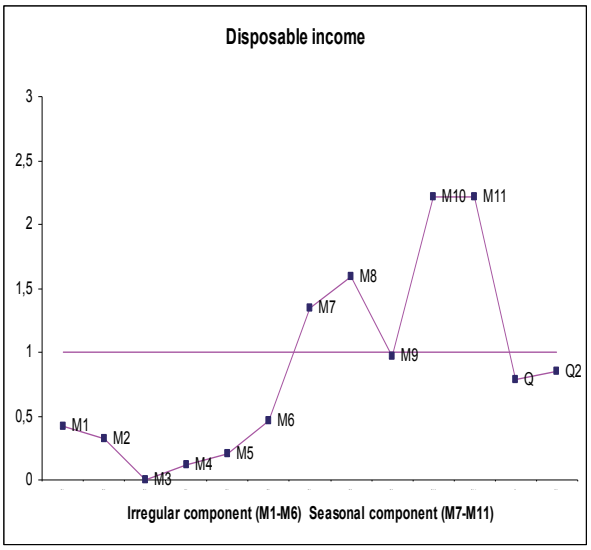
Taxes	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	4,91
I/C Ratio	0,08
Stable Seasonal F, B1 Table	38,03
Stable Seasonal F, D8 Table	145,96
Moving Seasonal F, D8 Table	2,19
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,08
Average Absolute revision of changes in Seasonal Adj,	0,08



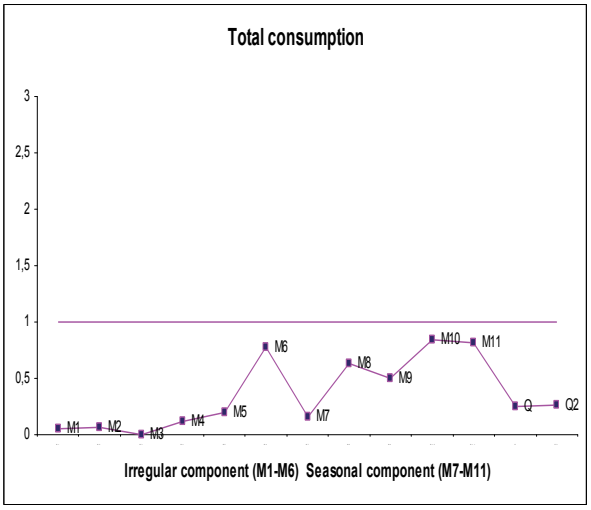
Property income received	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	1,93
I/C Ratio	0,64
Stable Seasonal F, B1 Table	30,52
Stable Seasonal F, D8 Table	35,69
Moving Seasona F, D8 Table	1,40
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	3,82
Average Absolute revision of changes in Seasonal Adj,	6,49



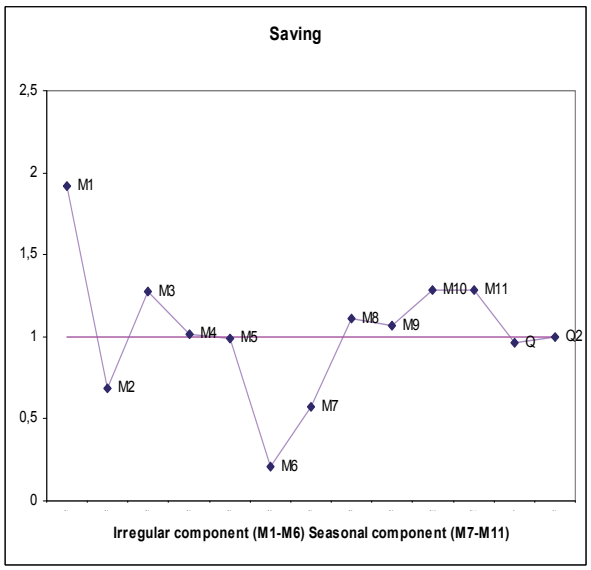
Pensions	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	5,31
I/C Ratio	1,12
Stable Seasonal F, B1 Table	27,29
Stable Seasonal F, D8 Table	50,83
Moving Seasonal F, D8 Table	3,15
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,11
Average Absolute revision of changes in Seasonal Adj,	0,3



Disposable income	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	2,83
I/C Ratio	0,25
Stable Seasonal F, B1 Table	3,92
Stable Seasonal F, D8 Table	8,22
Moving Seasonal F, D8 Table	3,36
Identifiable seasonality	no
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasona	0,17
Average Absolute revision of change	0,27



Consumption	
AICtd	rejected
AICeaster	accepted
Moving seasonality ratio	2,05
I/C Ratio	0,15
Stable Seasonal F, B1 Table	92,10
Stable Seasonal F, D8 Table	170,90
Moving Seasonal F, D8 Table	0,64
Identifiable seasonality	yes
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	0,25
Average Absolute revision of changes in Seasonal Adj,	0,32



Saving	
AICtd	rejected
AICeaster	rejected
Moving seasonality ratio	3,48
I/C Ratio	1,18
Stable Seasonal F, B1 Table	7,57
Stable Seasonal F, D8 Table	13,33
Identifiable seasonality	no
Seasonal Spectral Peaks	none
TD Spectral Peaks	none
Average Absolute revision of Seasonal Adj,	NA
Average Absolute revision of changes in Seasonal Adj,	NA