Calendar and temperature effects in the analysis of textile and leather consumption series in France

Hélène Poncet
Calendar and temperature effects in the analysis of textile and leather consumption series in France.

Hélène PONCET, INSEE
helene.ponce@insee.fr

Abstract

The seasonally and working-days adjusted series of household consumption in textile and leather, which are used to compute the French quarterly national accounts and the monthly household consumption expenditure in manufactured goods, are very volatile. In terms of communication, this is problematic, in particular for the monthly household consumption expenditure in manufactured goods. Therefore, in this paper, we analyse the reasons for that volatility and examine methods to correct it.

Two reasons can account for the volatility of textile and leather household consumption:

- temperature effects (which play a more important role on textile and leather than on other products), that are not to be corrected;
- sales effects (which, as well, play a more important role on textile and leather than on other products), that are calendar effects, and, therefore, are corrected in the national accounts. This paper proposes an improvement of the sales effect correction in quarterly national accounts.

The sales phenomenon is difficult to take into account by seasonal adjustment software, that does not integrate the sales dates.

The first part of the paper describes the sales regulation in France and the evolution of the calendar through the last fifteen years and through the different French departments. That stage is in concrete terms very time consuming.

In the second part, we study the effect of the sales calendar on the textile and leather consumption series. Not surprisingly, we find that the beginning date matters much more than the end date. That stage allows us to propose a new method to correct the textile and leather consumption series of sales calendar effects.

In the third part, we record that, in spite of the sales calendar effect correction, the series remain volatile. Therefore, we quantify the temperature effect on these series. This part does not help to reduce the volatility of the seasonally and working-days adjusted series, but to explain that volatility, which, in terms of communication, is appreciable.

JEL classification : C22, D12, E21
Keywords : time-Series models, consumer economics: empirical analysis, consumption; saving, calendar effects.
The seasonally and working-days adjusted series of household consumption in textile and leather, which are used to compute the French quarterly national accounts and the monthly household consumption expenditure in manufactured goods, are very volatile. In terms of communication, this is problematic, in particular for the monthly household consumption expenditure in manufactured goods. As a matter of fact, household expenses in textile and leather represent only 20% of household consumption in manufactured goods (which includes as well durables - cars, household appliances - and other manufactured goods such as drugs, watches, do-it-yourself products for instance). But textile and leather can account for the main part of volatility of the total series (cf. fig. 1 & 2). Therefore, in this paper, we analyse the reasons for that volatility and examine methods to correct it.

![Graph showing volatility of expenditures in manufactured goods and textile and leather](image)

**Fig. 1:** expenses, in volume terms, seasonally and trading-day-adjusted
Two reasons can account for the volatility of textile and leather household consumption:
- temperature effects (which play a more important role on textile and leather than on other products), that are not to be corrected;
- sales effects (which, as well, play a more important role on textile and leather than on other products), that are calendar effects, and, therefore, are corrected in the national accounts. This paper proposes an improvement of the sales effect correction in quarterly national accounts.

The sales phenomenon is difficult to take into account by seasonal adjustment software, that does not integrate the sales dates.

The sales regulation in France; evolution of the calendar through the last fifteen years and through the French departments.

In this first part of the paper, we describe the sales regulation in France and the evolution of the calendar through the last fifteen years and through the different French departments. That stage is in concrete terms very costly in time.

The evolution of the legislation concerning the sales in France.

- In 1906, a law submits the sales to a prior authorization of the city mayors;
- In 1962, a decree repeals that authorization and specifies that the sales have to take place according to local uses;
- In 1989, in order to take into account the moment taken by this kind of promotion, a decree sets the number and the duration of sales periods: two times per year, for at most two months;
- In 1990, the French General Direction for Consumption, Competition and Fraud Repression (DGCCRF) tries to make an inventory of the uses and to make them official by a publication.
(after having consulted the professionals and the departmental committee of consumption) at the departmental administrative acts bulletin;

- Only since June 1991, the dates of the sales are decided by the department prefects after a consulting of the textile professionals;
- Since July 1996, the sales have a maximal duration of six weeks (and not two months any more), and there is only one date by department (before, it was possible to have different dates for textile and sport articles for instance; and it was also possible to have different dates between the tourist cities and the other cities of a department); a consultation between the prefects of neighbouring departments can also take place;
- Since 2000, the beginning date of winter sales is harmonized at the national level, but there are nevertheless a few exceptions.

The beginning date of the quarterly national accounts is 1978, but, as the dates are set at the department level only since 1991, a rigorous sales effects correction can be performed only on the 1991-present period. This rigorous correction needs a complete calendar of the departmental sales dates since 1991. In concrete terms, it takes a long time to recreate this calendar, and there are still missing values in it. This is the reason why we analyze, on a period on which we have a complete calendar (summer 2004-winter 2006), the similarities between the departments.

The similarities and difference between the departments for the sales dates.

We perform a hierarchical classification of French departments in 10 classes according to the number of sales days per month: number of working mondays, ... number of working saturdays, number of non-public-holiday sundays, number of public-holiday mondays, ..., number of public-holiday sundays, on the period summer 2004-winter 2006.

The results appear on figure 3. They confirm that there is a consultation between neighbouring departments. However, there can be differences within administrative regions.

This classification is helpful to recreate a complete sales calendar for all the departments on the period summer 1991-winter 2004. For instance, we checked that it is true that the two Breton departments of Finistère and Côtes d’Armor, that are in the same class, had similar sales dates before 2004. Therefore, if we know the dates for the department of Finistère, we can infer the dates of the department of Côtes d’Armor. Nevertheless, we must be careful: for instance, Finistère and Charente Maritime are in the same class because they have the same dates on the period 2004-2006, but it was not the case before. This is also true for the departments of the densely populated Ile-de-France region, which had the same dates on 2004-2006, but not always before.
Therefore we decided to build a calendar taking into account only the dates that were confirmed by the department prefectures; we count the number of working mondays, … working saturdays, non public-holiday sundays, public-holiday mondays, …, public-holiday sundays. Then we compute a mean of the latter variables, weighted by the population of the departments at the 2004 census. The results are shown on the following figures, and confirm the evolution of the legislation we described above.

The figure 4 shows that, in January, before 2000, the first sales day was often the 2\textsuperscript{nd} or the 3\textsuperscript{rd} of January (first working day of the month), because the length of the sales period was two months and not six weeks. In 2000, all the departments began the sales on the same date : January 15\textsuperscript{th}, so there were 17 (=31-14) sales days in January 2000. After 2000, the beginning date was never unique, although, in 2006, only one department made an exception : Pyrénées Orientales began on January 7\textsuperscript{th} instead of January 11\textsuperscript{th} for the other departments.
The figure 5 shows that after 1996, the duration of the sales was reduced. There is a peak in 2000 because the beginning date was late (January 15th).

The figure 6 shows that the number of sales days in June is increasing. This is in particular due to the uses in the departments of the densely populated Ile-de-France region, where the sales begin early.
The figure 7 shows that, as a consequence of the growth of sales days in June, the number of sales days in July is decreasing.

Fig. 7 : evolution of the number of sales days in July on the period 1992-2005.

The figure 8 shows that the number of sales days in August falls after 1996, as a consequence of the change in the legislation that reduces the length of the sales period from 2 months to 6 weeks.

Fig. 8 : evolution of the number of sales days in August on the period 1992-2005.
This detailed calendar can help us to explain household consumption in textile and leather in the following part of the paper.

**Effect of the sales calendar on the textile and leather consumption series.**

In this second part of the paper, we study the effect of the sales calendar on the textile and leather consumption series. That stage allows us to propose a new method to correct the textile and leather consumption series of sales calendar effects.

In the quarterly national accounts, the seasonal adjustment is done on the indicators and not on the accounts. This is the reason why the following regressions are done on the indicators, that are turnover data on textile and leather. We also make regressions on the price indicators, that are likely to be sensitive to the number of sales days, and therefore that are already to be corrected of sales effects in the national accounts.

**Regressions of the indicators on the number of sales days.**

We consider the year-on-year differences of the non seasonally adjusted indicators \((X(t)-X(t-12))\), and also the y.o.y. differences of the numbers of sales days.

**Textile indicators.**

We consider the turnover indicator provided on the Banque de France web site. We first regress it on the number of sales day per month. The coefficient is significant, and positive.

\[
\Delta_{12} BDF_t = 0.49 \Delta_{12} NSD_t + u_t \\
(2.80)
\]

period : 1992-01;2006-03 ; DW=2.18
BDF : Banque de France indicator
NSD : monthly number of sales days
For the prices, we consider the consumer price index. The coefficient is significant and negative:

$$\Delta_{12} CPI_t = -0.16 * \Delta_{12} NSD_t + u_t$$

period : 1992-01;2006-03 ; DW=0.94

CPI : consumer price index for textile.

To find the effects of the sales at different months, we then regress the BDF variable on five variables:
- NSDJA : monthly number of sales days, multiplied by a dummy variable for January;
- NSDFE : monthly number of sales days, multiplied by a dummy variable for February;
- NSDJU : monthly number of sales days, multiplied by a dummy variable for June;
- NSDJL : monthly number of sales days, multiplied by a dummy variable for July;
- NSDAU : monthly number of sales days, multiplied by a dummy variable for August.

Only the coefficients for January and June are significant. The results are the following:

$$\Delta_{12} BDF_t = 0.63 * \Delta_{12} NSDJA_t + 2.31 * \Delta_{12} NSDJU_t + u_t$$

$$\Delta_{12} BDF_t = -0.30 * \Delta_{12} NSDJA_t - 0.19 * \Delta_{12} NSDFE_t + u_t$$

DW=2.12

We find that the beginning date matters much more than the end date. It corresponds to what the professionnals of the textile sector assert: a majority of the purchase during the sales is done in the first days of the sales. The duration of the sales does not appear to be momentous on the purchase behaviour.

The coefficient of June is greater than the one of January. An explanation could be that there is no time report of the consumption in June and that there is one in January.

Interestingly enough, when regressing on the variables NSDJA, NSDFE, NSDJU, NSDJL, and NSDAU, we find that only the coefficients for January and February are significant:

$$\Delta_{12} BDF_t = 0.64 * \Delta_{12} NSD_t + u_t$$

DW=0.85

We then regressed the BDF variable on the kind of sales days. Only the number of Saturdays NSAO during the sales has a significant coefficient:

$$\Delta_{12} BDF_t = 2.90 * \Delta_{12} NSA_t + u_t$$

DW=2.25

Leather indicators

We consider the turnover indicator provided on the Banque de France web site. We first regress it on the number of sales day per month. The coefficient is significant, and positive.

$$\Delta_{12} LEA_t = 0.64 * \Delta_{12} NSD_t + u_t$$

period : 1992-01;2006-03 ; DW=2.41

LEA : Banque de France indicator
We don’t study the impact on other articles in this paper, because it is not as important as the impact on textile and leather.

Possibilities of correction of sales effects.

In the quarterly national accounts, the indicators are first adjusted of trading days. This is performed by a linear regression. Then, the trading-day-adjusted series are seasonally adjusted by X11-ARIMA. Such adjustments are performed, as well, on price indicators.

Here, we make the adjustment of sales days before the other adjustments. The sales-day-adjusted series is the residual of the regression of D21BDF on variables NSDJA, NSDFE, NSDJU, NSDJL, and NSDAU. We find that it is a little smoother than the non adjusted series.

The second stage is the reestimation of the trading days adjustment model. Then, we apply the new coefficients and reestimate the seasonal adjustment model.
The result is quite disappointing as it does not reduce the volatility of the series. There are two reasons for that:

- as we see in the next part, the sales don’t account for all the volatility of the series; the temperature, among other factors, plays a role as well;
- the method of correction could be improved by using X12-ARIMA for instance.

**Temperature effects.**

In the third part, we record that, in spite of the sales calendar effect correction, the series remain volatile. Therefore, we quantify the temperature effect on these series. This part does not help to reduce the volatility of the seasonally and working-days adjusted series, but to explain that volatility, which, in terms of communication, is appreciable.

**A few facts about temperature and textile and leather consumption**

We can see on figure 11 three cases in which temperature seems to have played a role on leather consumption. On textile consumption, similar cases are observed.

- in October 2001, there were high temperatures (16.0°C); a fall in expenses was observed;
- in August 2003, temperatures were very high: 24.1°C; a fall in expenses was observed as well;
- in March 2005, temperature was low and the expenses did not increase, which, in seasonally adjusted terms, meant that there was a fall in expenses.

This suggests that, if the temperature is too high in August, ..., November, then people don’t buy winter collections. If temperature is too low in March, ..., May, they don’t buy the summer collections.
**Econometric analysis**

We perform regressions on the period 1998-01:2006-03. A regression gives the following results:

\[
\Delta_{12} BDF_t = 1,03 \times \Delta_{12} TJA_t + 0,82 \times \Delta_{12} TFE_t + 2,36 \times \Delta_{12} TMA_t + 1,95 \times \Delta_{12} TAP_t \\
+ 2,52 \times \Delta_{12} TMY_t - 1,60 \times \Delta_{12} TJU_t - 0,54 \times \Delta_{12} TJL_t - 1,98 \times \Delta_{12} TAU_t - 3,79 \times \Delta_{12} TSE_t \\
- 2,49 \times \Delta_{12} TOC_t - 0,87 \times \Delta_{12} TNO_t - 0,36 \times \Delta_{12} TDE_t + u_t
\]

\[DW : 1,93\]

TJA : mean monthly temperature, multiplied by a dummy variable for January; TFE : mean monthly temperature, multiplied by a dummy variable for February; TMA : mean monthly temperature, multiplied by a dummy variable for March; TAP : mean monthly temperature, multiplied by a dummy variable for April; TMY : mean monthly temperature, multiplied by a dummy variable for May; TJU : mean monthly temperature, multiplied by a dummy variable for June; TJL : mean monthly temperature, multiplied by a dummy variable for July; TAU : mean monthly temperature, multiplied by a dummy variable for August; TSE : mean monthly temperature, multiplied by a dummy variable for September; TOC : mean monthly temperature, multiplied by a dummy variable for October; TNO : mean monthly temperature, multiplied by a dummy variable for November; TDE : mean monthly temperature, multiplied by a dummy variable for December.

\[T-stats :\]

<table>
<thead>
<tr>
<th></th>
<th>TJA</th>
<th>TFE</th>
<th>TMA</th>
<th>TAP</th>
<th>TMY</th>
<th>TJU</th>
<th>TJL</th>
<th>TAU</th>
<th>TSE</th>
<th>TOC</th>
<th>TNO</th>
<th>TDE</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1,55</td>
<td>1,47</td>
<td>2,35</td>
<td>1,20</td>
<td>1,89</td>
<td>-2,16</td>
<td>-0,71</td>
<td>-3,64</td>
<td>-4,12</td>
<td>-3,98</td>
<td>-1,45</td>
<td>-0,69</td>
</tr>
</tbody>
</table>
Not surprizingly, we find that, in the sales months, temperature does not seem to play an important role. Moreover, we find that the temperature effect is positive in the first part of the year (summer collections) and negative in the second part of the year.

On leather, the temperature effect is less significant.

Finally, on the prices, we don’t find any significant effect.

The volatility is not reduced.

**Conclusion**

The method we propose to correct the textile and leather consumption series of sales calendar effects remains to be improved, so as to reduce volatility. Nevertheless, as an important part of volatility is also due to temperature, we already know that it is nearly impossible to obtain a smooth textile consumption series.

Concerning temperature, further studies remain, as well, to be done, but we have shown in this paper that the temperature effects explain a greater part of consumption than sales effects; and that, on the prices, it is the contrary.

**Bibliography**

C. REBILLARD, internal note INSEE (2006)


Insee Méthodes n°108 : Méthodologie des comptes trimestriels.