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

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

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Abstract

The seasonally and working-day-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 this paper, we analyze the reasons for that volatility and examine methods to correct it.

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

- the effects of the sales periods (which 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 effects of temperature (which play a more important role on textile and leather than on other products), that are not to be corrected since they are part of the conjuncture.

The sales phenomenon is difficult to take into account by seasonal adjustment software, which 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 present the different methods of seasonal and trading-day adjustment, and, in particular, the method of the French Quarterly National Accounts.

In the third 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 fourth 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-day-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-day-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.
As a matter of fact, the standard deviation of the variation of monthly household consumption expenditure in manufactured goods is 1.9%, and, even if textile and leather are only 20% of expenditure 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), the standard deviation of their contribution is 1.3%.
From an economical point of view, it is not easy to communicate on the fact that only 20% of expenditure in manufactured goods account for the main part of its volatility. Manufactured goods are only 27% of total household consumption, so this is less problematic for total consumption.

In this paper, we analyze the reasons for that volatility and examine methods to correct it.

Two reasons can account for the volatility of textile and leather household consumption: the effect of the sales and the effect of the temperature.
The sales are regulated periods when it is allowed to sell the old textile and leather collections at reduced prices. Their effect depends a lot from the calendar. We study this calendar in the first part of the paper and use it to make a trading-day adjustment in the second part. The sales phenomenon is difficult to take into account by seasonal adjustment software, which does not integrate the sales calendar.
The consumption of textile and leather depend a lot from the temperature. This effect is not to be corrected, since it is part of the conjuncture, but we study it in the last part of the paper.

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

The sales regulation in France has evolved a lot since the beginning of the 20th century. In concrete terms, the reconstitution of a calendar is possible only since the beginning of the 1990s. This stage is quite time-consuming.

1. 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 neighboring 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.

2. 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 worked Mondays,… number of worked 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 neighboring 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.

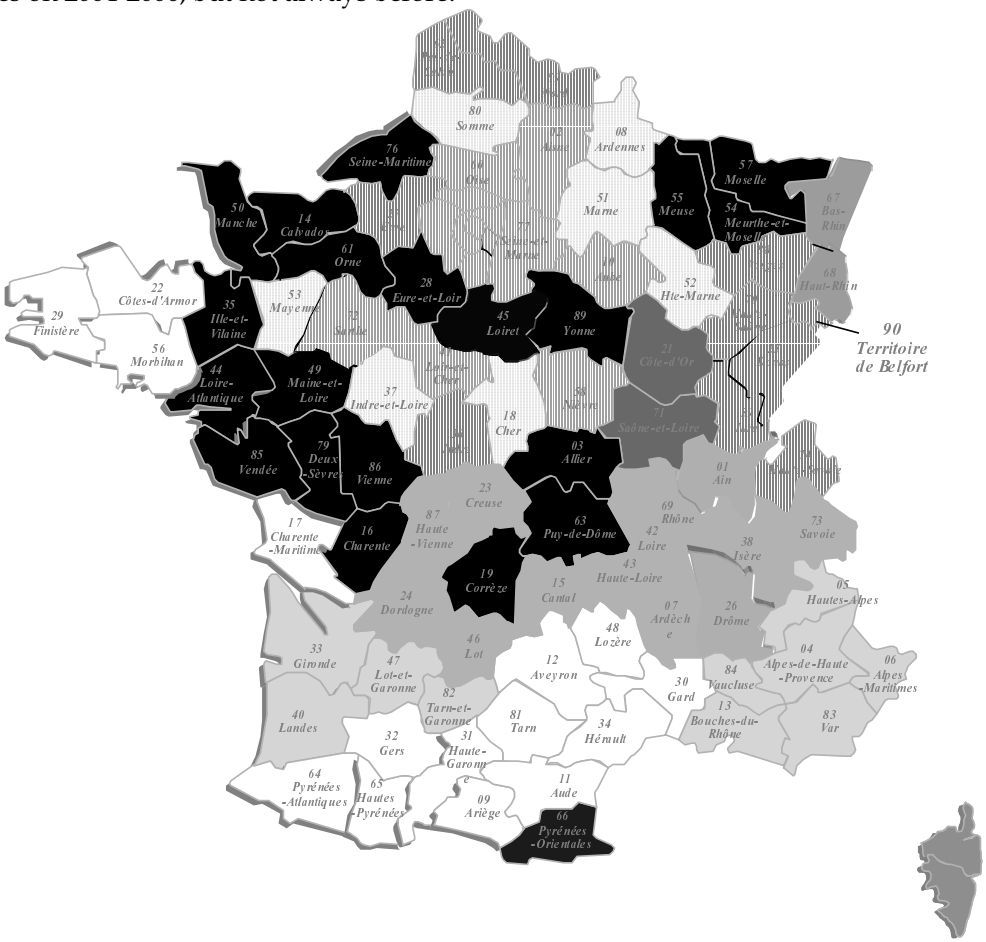

Fig. 3: result of the hierarchical classification of French departments in 10 classes according to the number of sales days per month.

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 worked Mondays, … worked 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 2nd or the 3rd 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 15th, 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 7th instead of January 11th for the other departments.

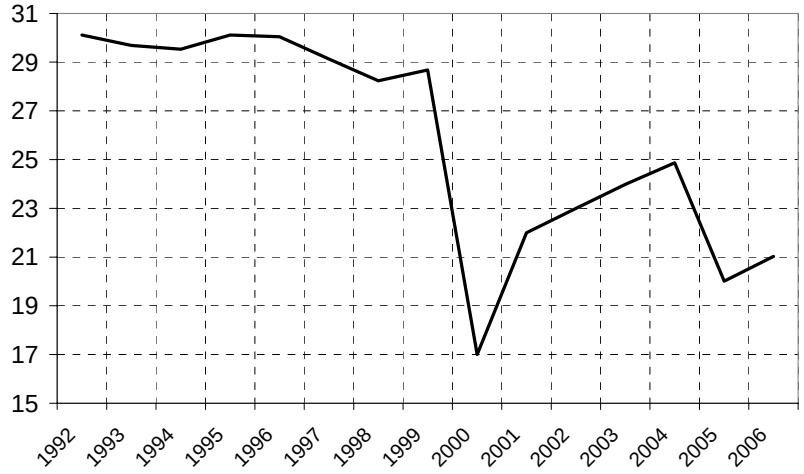

Fig. 4 : evolution of the number of sales days in January on the period 1992-2006.

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).

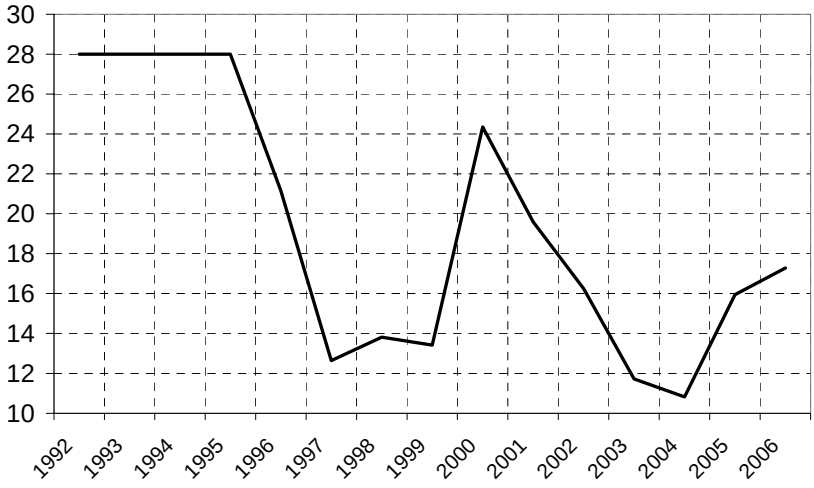

Fig. 5 : evolution of the number of sales days in February on the period 1992-2006.

The figure 6 shows that the number of sales days in June has been increasing until 2005. This is in particular due to the uses in the departments of the densely populated Ile-de-France region, where the sales begin early.

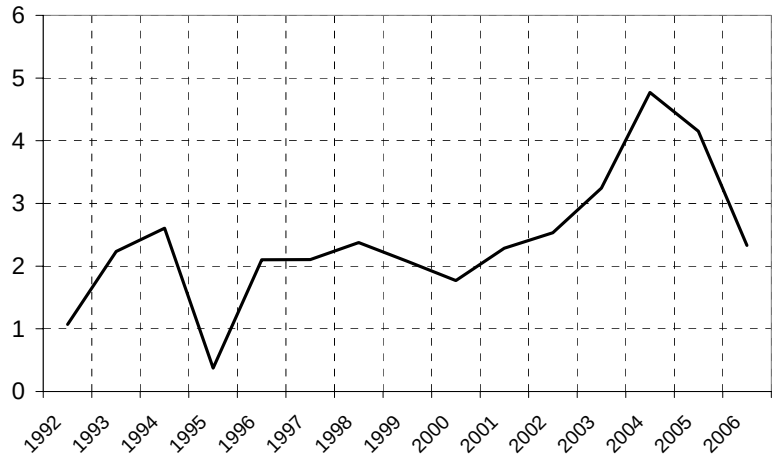

Fig. 6 : evolution of the number of sales days in June on the period 1992-2006.

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.

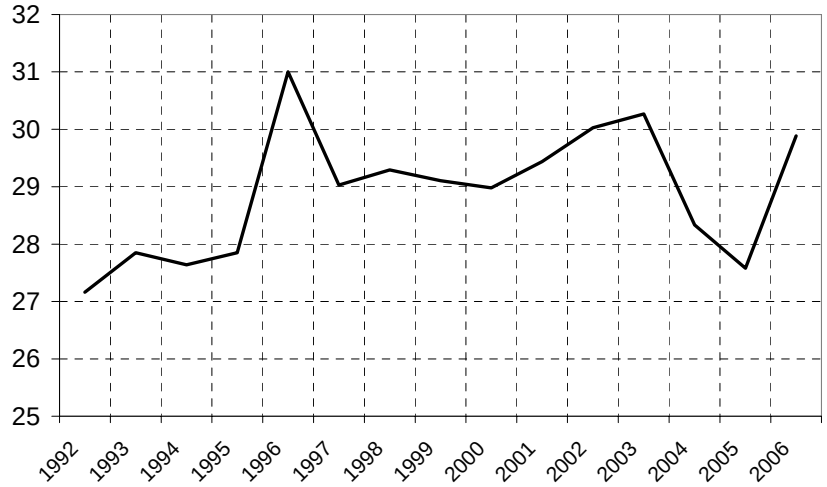

Fig. 7 : evolution of the number of sales days in July on the period 1992-2006.

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.

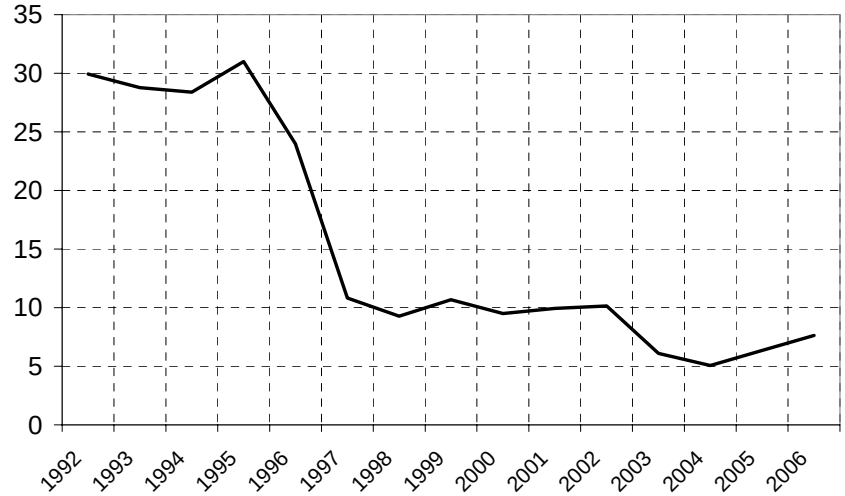

Fig. 8 : evolution of the number of sales days in August on the period 1992-2006.

This detailed calendar can help us to explain household consumption in textile and leather in the following part of the paper.

II. The seasonal and trading-day adjustment method of the French Quarterly National Accounts.

1. The different families of seasonal and trading-day adjustment.

Roughly speaking, two families of methods of seasonal and trading-day exist:

- parametrical methods, which include some old methods like linear regressions and more recent methods like TRAMO-SEATS or DEMETRA family ;
- non-parametrical methods, which use moving averages to perform seasonal adjustment, like the X12 family.

In the French quarterly national accounts, the adjustment is made at the elementary level of the goods and services classification, so as to take into account the specificities of each industry. Moreover, it is done on the indicators and not on the accounts, which are derived from the indicators with a Chow & Lin transformation. The indicators that are adjusted can be volume, value or price indicators.
The method of the French QNA is parametrical for the trading-day adjustment, and non-parametrical for the seasonal adjustment. As a matter of fact, the indicators are in a first step trading-day adjusted with an econometric method, which is a linear regression; in a second step, the trading-day adjusted series are seasonally adjusted with X11-ARIMA. In the case of the sales, the trading-day adjustment, which we describe below, is important.
N.B. these adjustments are made only if they are necessary: if no seasonal or trading-day effect is detected, no adjustment is performed. For instance, the working-day effects on price indicators are very rare, and are therefore seldom corrected.

2. The trading-day adjustment in the French quarterly national accounts.

The non-adjusted monthly series Y_t is regressed on variables that represent the number of the different kinds of days of the week (in fact, the number of days minus a long-term mean) $W_{i,t}$. The model is estimated on year-on-year variations so as to work on stationary series. It is estimated with the Feasible Generalized Least Squares method.

$$\Delta_{12} Y_t = \sum_{i=1}^{7} \alpha_i \Delta_{12} W_{i,t} + \Delta_{12} Y_t^{WDA}$$

where the explanatory variables $W_{i,t}$ are the seasonally adjusted numbers of the different kinds of days in month t

$$W_{i,t} = N_{i,t} - a_{i,january} I_{january} - a_{i,february} I_{february} - \ldots - a_{i,november} I_{november} - a_{i,december} I_{december}$$

The $N_{i,t}$s are the numbers of the different kinds of days in month t : number of worked Mondays $N_{1,t}$, worked Tuesdays $N_{2,t}$, … worked Saturdays, worked and holiday Sundays $N_{7,t}$. $a_{i,january}$ is the mean number of non holiday days of kind i (excepted for Sundays) in months of kind t on the range 1946-2010. $I_{january}$ is a dummy variable for January. The use of long-term means to get rid of the seasonality of working days is a specificity of this method: for instance, X12 uses annual differentiation to get rid of seasonality.
N.B. It is necessary to make the variables of kinds of working days independent of seasonality. As a matter of fact, some months, and in particular May, have many holidays, which makes it difficult to distinguish the seasonal from the calendar effects.
N.B. The number of holidays other than those that fall on a Sunday is not introduced in order to ensure that the explanatory variables are not linked by a linear relationship.

The coefficient α_i in front of variable $N_{i,t}$ shows the impact corresponding to the fact that day i is not a holiday.

In the estimation of the working-day adjustment, some choices can be done:

- additive or multiplicative model (in the latter case the logarithm of the series is considered);
- supplementary differentiation in order to make the series stationary if necessary;
- test on the necessity to make a special treatment for July and August or not : as a matter of fact, many workers are on holiday in these months, which makes the effect of working days weaker. The effect is estimated on these two months only, and if a Fisher test shows that the α_is are not significantly different from zero, the α_is are estimated on all the months excluding July and August, and there is no trading-day adjustment for July and August. This possibility is a particularity of the method of the French QNA.
- tests of grouping some kinds of days : so as to get the most parsimonious specifications possible, we test whether the coefficients of different kinds of days are significantly different. There are two "families" of impacts of working days :
  - the days that are favourable to traditional activity : the coefficients of week days are non zero and can be equal, but the coefficients of Saturdays and Sundays are equal to zero.
  - the days that are favourable to purchases : the coefficients of the week days are non zero and can be equal, the one of Saturdays is non zero and different from the ones of the week days (and generally superior to them), and the one of Sundays can be zero or not.

  This possibility is, like the previous one, a particularity of the method of the French QNA.
- Test on the existence of a "catch up": we test whether the weak number of working days of a month has been anticipated on the previous month or has a compensation on the following month. A company can have a target of production on several months; a household can have to make some purchases (food for instance) independently from the working days (it will buy more on a Saturday that precedes a holiday Saturday).
- Test on the stability of the effects of working days : as a matter of fact, the deformation of the purchase behaviour with the increase of the openings of the shops on Sundays and the changes in of working rhythms such as the introduction of the 35-hour week have to be taken into account as quickly as possible. If a break appears, it is necessary to estimate the coefficients on time-sliding window of p years. This parameter p has to be small enough to adapt to new phenomena but big enough to identify the new phenomenon.

This method of the QNA offers a lot of possibilities. However, many choices have to be made to use it with "sales" regressors. Therefore, this article only tests the effects of sales regressors with X12 on the indicators of textile. For the textile and leather industry, the value indicators of the quarterly national accounts are turnover series. The price indicators are consumer price indexes.

We don't expect the sales-day adjustment to smooth the series, since it does not remove all the irregular component of the series.

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

In this third 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. The proposed method is similar to the method of the French quarterly national accounts for trading-day adjustment; the difference is the use of a calendar of the sales days. The effects are estimated on the period ranging from January 1992 to September 2006, assuming that the residual of the regression is a seasonal series. 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.

1. Textile indicators.

We consider the turnover indicator provided by the French institute for fashion. We regress it on the number of working Mondays, …, Saturdays per month, the number of Sundays, and the number of

Mondays, …, Saturdays per month during the sales. The regression is made by considering that the residual is a seasonal ARIMA process.
We don't find any significant effect for Sundays. On the contrary, Saturdays and Saturdays in sales periods have a strong effect.

Variable	Value indicator Parameter estimate (t-value)
Monday	$1{,}20.10^{-2}$ (1,94)
Tuesday	$1{,}74.\ 10^{-2}$ (2,99)
Wednesday	$1{,}72.10^{-2}$ (2,99)
Thursday	$1{,}51.10^{-2}$ (2,43)
Friday	$1{,}27.10^{-2}$ (2,10)
Saturday	$2{,}29.10^{-2}$ (3,63)
Sales worked Saturday	$2{,}77.10^{-2}$ (3,28)

For the price indicator, as it is the case for many price series, there is no classical trading-day effect. However, the number of sales days definitely has an effect. In the model specification, we don't distinguish the different days of the week since the prices, unlike the value of the sales, don't depend of the kind of day. There are ten automatically identified outliers in this regression.

Variable	Price indicator Parameter estimate (t-value)
Number of sales days	-0,12 (-7,65)

Interestingly enough, if we regress the value indicator on the number of sales days of the different sales months (January, February, March, June, July and August), only the coefficients of January and June are significant. This shows that the beginning date of the sales matters much more than the end date and than the duration of the sales. It corresponds to what the professionals 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 behavior.

2. Leather value indicator

We consider the turnover indicator provided on the Banque de France web site. The significant variables are not the same as the ones for the textile indicator.

Variable	Value indicator Parameter estimate (t-value)
Wednesday	$2{,}35.10^{-2}$ (2,80)
Saturday	$4{,}77.10^{-2}$ (5,69)
Sales worked Thursday	$2{,}58.10^{-2}$ (2,55)

IV. Temperature effects.

In the fourth 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-day-adjusted series, but to explain that volatility, which, in terms of communication, is appreciable.

1. A few facts about temperature and textile and leather consumption

We can quote 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.

2. Econometric analysis

A regression gives the following results:

Variable	Value indicator Parameter estimate (t-value)
Temperature of March	$1{,}30.10^{-2}$ (2,17)
Temperature of May	$3{,}42.10^{-2}$ (3,75)
Temperature of August	$-2{,}40.10^{-2}$ (-5,16)
Temperature of September	$-3{,}44.10^{-2}$ (-5,24)
Temperature of October	$-2{,}89.10^{-2}$ (-6,04)
Temperature of November	$-0{,}84.10^{-2}$ (-2,23)

Not surprisingly, 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.
On the prices, we don't find any significant effect of temperature.

Conclusion

The reconstitution of a calendar of the sales has allowed us to quantify the trading-day effects of the sales on textile and leather consumption expenditure. Starting from that assessment, different methods of "sales-day adjustment" are possible. One would be the method of the quarterly national accounts, and the other X12-ARIMA. None of these methods reduces volatility.
A temperature correction is also interesting, even if there is no point doing it in the QNA. Many extreme values of the value series are more easily explained by the temperatures than by the sales. For the prices, the effects of the sales are greater than the ones of temperature.
It is nearly impossible to obtain a smooth textile consumption series.

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