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SESSION: PRODUCER PRICE INDEX FOR SERVICES

THE DUTCH PPI FOR OPERATIONAL
MOTOR VEHICLE LEASE

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A. Introduction

A company car is a common employee benefit in the Netherlands. Most of these cars are under an operational lease contract. Lease cars amount to approximately one eighth of all cars in the Netherlands; nearly a third of all new cars are bought by lease companies. Lease (=long term rental) is a much larger industry in terms of turnover than short term rental.

The most interesting aspect of the operational lease PPI is the existence of two indices next to each other:
1) One index is based on the price levels at which new contracts are closed. This index reflects market parties' perception of price movement.
2) Another index, the true PPI, is based on the prices paid for all lease cars, including not only the prices from the new contracts, but mainly from those of all older, still running contracts. This main issue comes to the fore in section E.

B. Industry output definition

How does operational lease work in Dutch practice?
The employee chooses a car at a dealer. The employer and the lease company sign a contract. The lease company (borrows money and) buys the car from the dealer. The employer pays a fee to the lease company every month. **This fee does not change for the duration of the lease** (for instance, 48 months). This assurance of the price itself is of value to the client. According to most contracts, the lease firm pays for repair, replacement and upkeep of the car. The employee returns the car after the lease is over. The lease company sells the car and keeps the revenue.

Statistics Netherlands' output definition for operational car lease is the long-term provision of cars of a garantueed quality.

How does a lease company calculate the monthly fee?
The formula used by a lease company to calculcate the lease price is based on the following figures:
1) the acquisition price of the new car,
2) the duration of the lease,
3) the interest rate,
4) the expected value of the car after the lease term,
5) the expected costs for insurance, taxes, servicing, etcetera, and
6) a markup for administration costs, risk and profit margin.

Operational versus financial lease
The provision of money is central to the service provided. On the other hand, operational lease is considered a form of renting. The nature of an operational lease service is therefore a mixture of financial and rental service. A closer look at the market reveals that many varieties of the operational lease contract described above are possible. In the case of a purely financial lease, the lease company only provides money; the lessee buys and

owns the car. Such a financial lease contract has similarities with, for instance, the financing and mortgage of real estate. There are different aspects that characterize a car lease: the economic aspect (risk of the value of the car), the legal aspect (ownership of the car), and the fiscal aspect (treatment by accountants; e.g. appearance on the balance sheet and treatment of monthly fees as investments). Even if a price statistician decides to use a certain criterium to separate the market into operational and financial lease (and thereby in rental and financial services), this does not reflect the experience of the parties active on the market. In other words, the boundaries between types of lease are fuzzy. More complex contracts exist. For instance, a truck dealer might bundle a maintenance contract with a financing contract that is provided for by a bank and offer this bundle subsequently to a client as an operational lease contract, i.e. one service. Lease companies are often part of, owned by, or related to a large financial enterprise that provides the money and car insurance services to the lease company. The activities of many lease companies are rather administrative and financial than logistic; often the cars are never physically handled or even seen by any employee of the lease company.

Operational lease versus rental
Operational lease for a short duration resembles regular car rental for a long period. This is illustrated by the fact that some lease companies are related to car rental companies. The difference between renting and (operational) leasing is the duration of the contract. The duration of a lease is in the order of magnitude of the life span of the car; it is much shorter for regular rentals. In other words, a lease price is primarily based on the write-offs during the rental period, but for a rental price costs of administration and logistics are additional important factors.

In summary, operational car lease services are a part in a continuous spectrum of services that ranges from car rental services on one side to financial services on the other. Any boundary used in a classification is to some degree artificial.

C. Item selection methods

C.1 Cars and vans
The item selection is firstly based on a split between cars of four size segments and three types of fuel (diesel, gasoline and LPG). Additionally, some contracts including a prepayment for fuel are surveyed as these payments are very often handled by the lease company. The selection of cars within each group of car size and fuel type is based on cut-off sampling. In cooperation with market analysts from three lease firms the cars and vans in the survey are kept up to date. Their insight limits the potential new item bias. Car and van lease companies are generally not related to one car brand. Therefore, the same survey is sent to all respondents.

Price determining factors are specified and kept constant: duration of the lease, average number of miles per year, size of the client measured in number of lease cars, availablility of a replacement car and inclusion of insurance, taxes etcetera

C.2 Trucks
Truck lease is almost entirely provided by firms that are bound to one brand. Many truck lease companies are not a separate firm, but related to an importer or manufacturer of trucks. The goal of these firms is not profit maximising, but the support of truck sales by offering financing schemes to prospective customers, including financial and operational lease. Items in the survey for truck lease differ per respondent. Each respondent chooses three to five representative trucks.

D. Weighting issues

Good and timely statistics about lease cars are available from registrations from outside Statistics Netherlands. These statistics include monthly data on the number of cars sold to lease companies, by brand and precice type and version. These numbers of cars are recalculated to turn-over weights by multiplication with average car lease price.

The availability of up-to date weights gives the opportunity to deploy an advanced superlative index formula (e.g. Fisher). For practical purposes this is not done.

E. Index (pricing) methodology

A price index for operational car lease can be based on two concepts. Both are published quarterly.

E.1 The price index based on new market prices (new contracts)

One approach for developing a price index pertains to new market prices. The measured prices are the monthly fees; no other prices (like conclusion fees) exist. The only new prices in the market are those of new contracts, because once set, the monthly fee stays fixed for the entire lease term. **In the perception of the market parties, price movement is therefore the change through time of the price level at which new contracts are concluded.**
In this approach, the price index at the lowest level is constructed from the prices that are taken from two contracts at the time they are concluded. The prices can be taken from real contracts, but it is hard to find an exactly same contract in a later survey period. The alternative of choice to transaction pricing is to survey tenders, offered prices. The price quotes are fictitious, but according to the respondents they form the optimal measure for index compilation.

A Laspeyres price index for this approach is calculated with a standard Laspeyeres formula:

$$P_L^{nc,1} = \sum_{i=1}^{n} \frac{p_i^{g(1)}}{p_i^{g(0)}} * s_i^{g(0)} \quad \text{in which} \tag{1}$$

nc   marks this price index as the one for *new contracts*,

g(t)   denotes the generation[1] of lease contracts that are concluded in period *t* (*t* = 0 or 1),

$S_i^{g(0)}$ is the value of contracts of car *i* of the generation in the base period (0),

$p_i^{g(t)}$ is the price (i.e. monthly payment) of car *i* of generation *g(t)*.

The reasons for the notation $p_i^{g(t)}$ instead of the simpler p_i^t, will be clearified shortly.

E.2 The PPI based on all transactions (all running contracts)

A true PPI is based on all transactions that take place in the respective periods. In the case of operational lease, transactions pertain not only to the contracts that are closed in the respective periods but also to contracts from previous survey periods that are still running. Payments are still made and services delivered under these older contracts. There are true prices related to these services, but, extraordinarily, the prices are not new and do not change[2]. Therefore the PPI has to take all running contracts (the total lease fleet) into consideration.

In the true PPI, the price index is based on average prices in two periods of all operational lease contracts that are running. The measured prices are again the monthly fees in the lease contracts. The Laspeyres formula for this approach is familiar:

$$P_L^{ac,1} = \sum_{i=1}^{n} \frac{p_i^1}{p_i^0} * s_i^0 \text{, in which} \tag{2}$$

ac   marks this price index as that for *all running contracts* and

p_i^t is the price (i.e. monthly payment) of car *i* in period *t*.

The difficulty lies in the calculation of p_i^1 and p_i^0. In both periods 1 and 0 there are contracts of many generations running for car *i*. There is a (measured) price for each generation available from the survey for the price index according to the first approach. To determine an average price that is representative for all running contracts for car *i* in

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[1] 'Generation' refers to cars of which the contract was cncluded in a certain period; it does not refer to cars of certain technical or fashion characteristics.
[2] An old price is not a market price in the sense that it can change because of changing market situations; the only change possible is for either party to cancel the contract.

period t (t being 0 or 1), a weighted average is calculated of the prices from the contracts of all generations. This average price is substituted for p_i^t:

$$p_i^t = \frac{\sum_{\tau=-\infty}^{t}(p_i^{g(\tau)} * s_i^{g(\tau)t})}{\sum_{\tau=-\infty}^{t}s_i^{g(\tau)t}} \quad , \text{ in which} \tag{3}$$

$S_i^{g(\tau)t}$ is the value of contracts of car i of generation τ in period t,
$p_i^{g(\tau)}$ is the price of car i of generation τ, available from the new contract PPI.

The value of the contracts of a generation declines through time as there are less contracts left in the population; a generation disappears gradually from the population in the course of 5 years which is the maximum duration of car lease contracts; or 10 years for trucks. The summation in (3) can therefore be restricted to a limited number of generations, as for older generations $S_i^{g(\tau)t} = 0$. It is helpful for practical purposes to have a separate population model to determine all $S_i^{g(\tau)t}$. The reader should keep in mind that (3) does not average over time, but averages for one period over generations of cars.

It is important to note that, unlike the value of the contracts, the price is independent of t. This reflects the fact that, once set, an operational lease price stays fixed. This differs from the situation in other service industries where prices in long-term contracts are changed by renegotiation or escalated by a standard formula. Even in industries where prices in contracts change, however, an approach based on a population model of contracts can be useful. For instance, rental prices for real estate can change yearly, but new rental contracts for similar real estate do not have to be concluded on the same price level that prices of older generation contracts arrive at.

In the ABS paper "Development of a Producer Price Index for Other Financiers" prepared for the Voorburg Group conference of 2002, a similar approach is suggested as pricing option for the PPI of financial lease contracts. There, the FISIM flows of a generation of contracts decrease through time like the value of all operational lease contracts and the prices remain fixed for the entire duration of the lease as well.

Formula (2) and (3) are not easy for practical purposes. For instance, the treatment of quality change (which is not elaborated on here) is complicated. As approximation $P_L^{ac,t}$ is derived from an aggregate $P_L^{nc,t}$, as a weighted moving average, scaled to the average in the base period by the following formula which results in an acceptable approximation of (2):

$$P_L^{ac,1} = \frac{\sum_{\tau=-\infty}^{1}(P_L^{nc,\tau} * s^{g(\tau)1})}{\sum_{\tau=-\infty}^{1}s^{g(\tau)1}} \Bigg/ \frac{\sum_{\tau=-\infty}^{0}(P_L^{nc,\tau} * s^{g(\tau)0})}{\sum_{\tau=-\infty}^{0}s^{g(\tau)0}} \quad . \tag{4}$$

This calculation of $P_L^{ac,t}$ is carried out separately for small vans, for trucks and for four segments of cars.

Table 1 shows hypothetical data for an example of the calculation of the PPI according to formula (4).

Table 1. Hypothetical data for an example of the calculation of the PPI for operational car lease that reflects average price change in all operational car lease contracts.

Generation of car	Relative car lease price	Value of contracts				
		Time (period)				
		1	2	3	4	5
1	100	10	7	3	0	0
2	100		12	8	4	0
3	102			13	8	4
4	106				14	10
5	107					14

The price (or rather relative price levels) of car lease of different generations of cars is available from the new contracts price index, see paragraph E.2, $p_i^{g(t)}$ in formula (2). This is listed in the first two columns of table 1. The value of the contracts of the different generations (vertical axis) at different moments (horizontal axis) are presented in the columns on the right. A generation can be seen to disappear, for instance, generation 2 did not exist in period (time) 1, had a value of 12 in period 2, 8 in period 3 and 4 in period 4, and the value reached 0 by period 5.

The example pertains to period 4 and 5 in table 1. In the calculation of $P_L^{ac,t}$ from period 4 to period 5 according to formula (4), data from the second and the two rightmost columns in the table are used[3] ():

$$P_L^{ac,5} = \frac{\displaystyle\sum_{\tau=3}^{5}(P_L^{nc,\tau} * s^{g(\tau)5})}{\displaystyle\sum_{\tau=3}^{5} s^{g(\tau)5}} \Bigg/ \frac{\displaystyle\sum_{\tau=2}^{4}(P_L^{nc,\tau} * s^{g(\tau)4})}{\displaystyle\sum_{\tau=2}^{4} s^{g(\tau)4}} =$$

$$P_L^{ac,5} = \frac{4*102+10*106+14*107}{4+10+14} \Bigg/ \frac{4*100+8*102+14*106}{4+8+14} = 106/104 = 1,02.$$

This hypothetical example calculation shows that while the price level at which new contracts are closed, P_L^{nc} in formula (1), only rises from 106 tot 107 from generation 4 on generation 5, the true PPI, P_L^{ac} rises 2 percent, due to the disappearance from the population of comparatively cheap old contracts from generation 2 and 3.

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[3] Note that for clarity τ only starts to count in the oldest generation of which there are still contracts running; generation 2 and 3 respectively

In practice, as the PPI is a weighted moving average of the price index of new car lease contracts, the PPI changes more gradually than the price index of new contracts, see also figure 1.

Figure 1. The price index of new car lease contracts and the producer price index (PPI) of all running car lease contracts of operational car lease, 2001 Q III = 100.
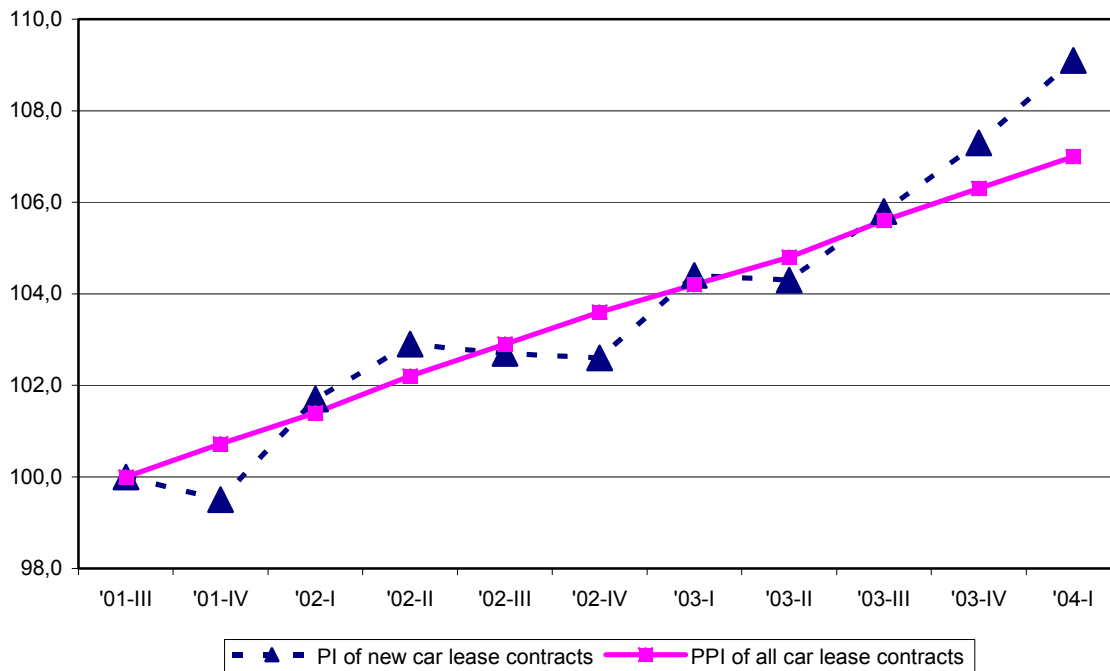
The PPI of all car lease contracts provides a good deflator in National Accounts, as the PPI reflects the price development of services on the moment the services are delivered, complying with the System of National Accounts (SNA) 1993.

F. Issues in maintaining constant quality

In practice, targeted mean imputation is used when a car in the sample is replaced, even when a small change in a car characteristric takes place as price and development and quality change are hard to disentangle. Sometimes 'expert opinions' from the market analysts from three lease firms who keep the cars and vans in the survey up to date are used (explicit method). Potentially, a quality index could be imputed from the PPI for car sales or the CPI.

Quality corrections for lease prices are based on technical car characteristrics. Quality corrections for the level of service from the lease company are not pursued.

References: *Development of a Producer Price Index for Othe Financiers*, Australian Bureau of Statistics, 2002 Voorburg Group Conference Paper.

Appendix 1. The publication of the price index numbers of operational motor vehicle lease.

Price index numbers of operational motor vehicle lease, (third quarter 2001=100) 1)

	Weighting coefficient 2)	New contracts									
		excluding fuel prepayment					including fuel prepayment				
		2002	2003	2003	2004		2002	2003	2003	2004	
		ave.	ave.	4th Q	1st Q	2nd Q*	ave.	ave.	4th Q	1st Q	2nd Q*
Motor vehicle lease, total	100	101,9	104,2	105,7	107,1	108,0	-	-	-	-	-
Cars	72	102,5	105,5	107,3	109,1	110,3	101,5	104,3	105,4	107,2	109,6
of which segment 3)											
Segment B	6	102,1	103,6	105,6	107,0	107,8	101,2	102,8	104,0	105,5	107,5
Segment C	21	103,1	107,0	108,8	110,7	111,9	102,0	105,6	106,6	108,4	110,8
Segment D	33	102,4	105,5	107,2	109,1	110,5	101,5	104,3	105,3	107,2	109,7
Segment E	12	101,6	103,7	105,9	107,3	108,5	100,8	102,9	104,3	105,8	108,1
of which fuel type 4)											
Diesel	38	101,9	104,6	106,1	107,8	109,0	-	-	-	-	-
Gasoline/LPG	34	103,1	106,4	108,8	110,6	111,8	-	-	-	-	-
Vans	7	102,2	103,5	105,2	105,6	105,6	101,1	102,5	103,7	104,2	105,8
Trucks	21	100,0	100,2	100,6	101,0	101,0	-	-	-	-	-

	Weighting coefficient 2)	All contracts									
		excluding fuel prepayment					including fuel prepayment				
		2002	2003	2003	2004		2002	2003	2003	2004	
		ave.	ave.	4th Q	1st Q	2nd Q*	ave.	ave.	4th Q	1st Q	2nd Q*
Motor vehicle lease, total	100	102,0	104,1	104,9	105,4	106,1	-	-	-	-	-
Cars	72	102,5	105,2	106,3	107,0	107,8	101,6	104,2	104,6	105,5	107,8
of which segment 3)											
Segment B	6	102,3	104,5	105,3	105,9	106,6	101,4	103,6	103,8	104,6	106,7
Segment C	21	102,8	105,9	107,2	108,0	108,9	101,8	104,7	105,3	106,2	108,7
Segment D	33	102,5	105,2	106,3	107,0	107,8	101,6	104,2	104,6	105,4	107,8
Segment E	12	102,2	104,4	105,2	105,8	106,5	101,3	103,5	103,7	104,6	106,7
Vans	7	100,8	102,0	102,6	103,1	103,5	100,0	101,3	101,6	102,1	103,1
Trucks	21	100,4	100,8	100,9	101,0	101,1	-	-	-	-	-

1) The price index numbers are calculated each month based on the middlemost month.

2) The weighting coefficients are based on industry data and data from the Business statistic of rental of cars 1999, the Business statistic rental of transportequipment (exclusing cars) 1999 and the Business statisticof trade and repair of business motor vehicles, trailers etcetera 1999

3) Segments based on the classification of RAI Datacentrum BV (RDC):
 – Segment B- small cars; length 3,4– 3,7m; motor 1000–1200 cc
 – Segment C- small/medium; length 3,7– 4,2m; motor 1200–1800 cc
 – Segment D- medium/large; length 4,4– 4,6m; motor 1600–2200 cc
 – Segment E- higher medium-sized cars; length 4,4– 4,8m; motor 2000–2800 cc

4) Split of cars on diesel and cars on gasoline and LPG