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THE RELATIONSHIP BETWEEN WORLD COMMODITY PRICES AND FINNISH IMPORT PRICES

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INTRODUCTION

This paper reports some preliminary findings of an analysis of the price behaviour of Finland's raw material imports. The main purpose is to study the lags with which world market prices are transmitted into Finnish foreign trade prices as well as the impact of exchange rate fluctuations. In addition, the significance of reweighting world market prices to correspond to the structure of Finnish trade is examined.

I. The HWWA Index of World Market Prices of Food and Industrial Raw Materials was chosen as an indicator of world market commodity prices.[1] This is the most comprehensive of the indices available, comprising 47 commodities as compared to, e.g., only 17 for the Reuter's and 29 for the Economist indices. Furthermore, many of the additional commodities included in the HWWA index are important in Finland's trade - for example, pulp, sawngoods, steel, crude, oil, butter, cheese, and eggs.

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1. Calculated daily by the HWWA-Institute for Economic Research, Hamburg, this index is a weighted arithmetic mean (Laspreyre's formula) of 50 quotations for 47 different commodities measured in US dollars.

The index is organized into 15 subgroups and weighted according to the shares that the various commodities had in world trade during the period, 1952 - 1956. The subgroups together with their weights are presented in Appendix 1.

As mentioned above, the HWWA weighting system reflects the structure of the trade of the entire world. However, to explain Finland's unit values, it would seem preferable to weight world prices according to the importance of the various commodities in FINLAND's trade. Hence, the HWWA-index was reweighted to correspond to the structure of Finland's imports, the weights for the 15 subgroups being derived from the import values of the 47 commodities whose world market prices are included in the computation of the HWWA subgroup prices. The weights were computed for the average of the three-year period 1968 - 1970, and for the average of the three-year period 1976 - 1978. The former set of weights was used to weight the HWWA subgroup prices through 1971, and the latter set was employed from the beginning of 1973. During 1972, the weights were changed linearly from the former to the latter set to avoid introducing discontinuities into the new, reweighted index.

II. The study concentrated on explaining quarterly fluctuations in the unit values for Finland's imports of raw materials and production necessities WITHOUT crude oil (IMR) expressed in terms of both Finnmarks and US dollars. The time period was the first quarter of 1954 through the first quarter of 1979; 1954 through 1969 and 1970 through 1979 were also examined separately.

The explanatory variables employed were world raw material price indices expressed in dollars terms and, when Finnmarks were used, the dollar exchange rate. The principal world raw material price index used was the reweighted index, excluding the subgroup crude oil and distillates. However, to determine the importance of the reweighting, the original HWWA index, also excluding the oil subgroup, was tried as the explanatory variable. In addition, the effects of retaining the oil subgroup in the reweighted index were examined.

Recognising the delayed impact of world raw material price movements on Finnish unit values, various lagged weighted averages (Almon polynomials) of the quarterly changes in the world indices and the quarterly exchange rate changes were tried as explanatory variables.[1] In the following, the best results are reported and briefly discussed; the estimates for the main regressions appear in Appendix II.

Regression 1 shows the best result achieved for IMR expressed in Finnmarks and using the reweghted world index excluding oil and the exchange rate; 61 % of the variance in IMR was explained for the whole period,

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1. Only Almon polynomials whose weights conformed with economic intuition and theory were accepted, i.e., no negative weights nor weights which increased dramatically as we moved to more historically distant quarters were allowed.

significant coefficients of .69 and .75 being achieved. The constant term was insignificant in this regression, as in all subsequent ones, and was accordingly deleted; this indicates the absence of any trend in the unit value time series. Note also that the best lag structure for the world index involves the present and five previous quarters with a linear polynomial (1) and an end point condition (E).[1]

The introduction of a lagged exchange rate into regression 1a and b did not improve the results. In 1a, where no end condition was applied, the one-quarter lagged exchange rate change proved insignificant. Assigning a greater weight to this lagged change (e.g., by applying the end condition), gave a higher coefficient for the exchange rate, but the explanation was poorer (i.e the $\bar{R}^2$ value dropped considerably to 54 %).

Using data for the period 1954.1 through 1969.4, regression 2 resulted in a rise in $\bar{R}^2$ to 81 %, of wich about 71 % was explained, by exchange rate changes. Thus, in the 1950s and 1960s, a period of relative stability in world raw material prices, changes in Finland's raw material import unit values were well explained by exchange rate changes. Clearly, this was largely attributable to the devaluations of 1957.4 and 1964.4. Finally, the exchange rate coefficient of .86 - still less than 1 - chould be noted. Regression 2a re-

1. The application of an endpoint condition in a polynomial distributed lag model means that the lag weights outside the lag interval are made equal to zero. Thus in this case, where there is 5-period lag, the endpoint condition is applied to the 6th period.

vealed once again that lagging the exchange rate variable leads to a sharp drop in $\bar{R}^2$, i.e., from 81 % to 67 %.

Using data for the 1970s, regression 3 had and $\bar{R}^2$ of 35 %, a much poorer explanation. Similarly, the exchange rate proved to be and insignificant explanatory variable for this period. As before, lagging the exchange rate in 3a had a negligible impact on the results and the exchange rate remained insignificant.

In regression 4 import prices were expressed in dollar terms; thus, it was implicity assumed that the exchange rate coefficient is 1. As a result, the proportion of the variance explained in the dependent variable fell to 42 %, compared to 61 % in the case where import prices were measured in Finnmarks. Furthermore the exchange rate had a coefficient which was both negative and significant, when introduced into the regression as another explanatory variable. This indicates that expressing prices in US dollars does not remove all the variance in IMR due to exchange rate changes, and tends to support evidence that the true exchange rate coefficient is less than 1. Thus the results for the whole period appeared to be better when prices were expressed in Finnmarks and the exchange rate was used as a separate explanatory variable.[1] Finally, it should be noted that the coefficient of the world raw material price index (.72)

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1. A demand variable was also tried in hopes of further improving the results. This variable consisted of the residuals of a regression of Finland's industrial production against a time trend. However, the demand variable proved insignificant. Thus, Finnish demand has little effect on raw material import unit values.

is less than 1. This is to be expected since the trend value for the world raw material price index in dollar terms is about 5.4 % per year while the trend value for the unit values expressed in dollars is about 3.6 % per year.

Regressions 5 and 6 cover the time periods 1954.1 through 1969.4, and 1970.1 through 1979.1 respectively. The poor $\bar{R}^2$ of 17 % for regression 5 indicates that expressing values in dollar terms results in a considerable amount of variance in the unit values that cannot be explained by world raw material price movements during the 1950s and 1960s. Clearly, a comparison with 2 leads to the conclusion that measuring values in dollar does not work well in this period, a period with two large exchange rate changes. On the other hand, regression 6 produced an $\bar{R}^2$ of 39 % for the 1970s, and the shorter lag structure in regression 7 raised this somewhat to 40 %. This compares favorably with the version for this time period expressed in Finnmarks (regression 3), and leads to the conclusion that using dollars produces modest improvements in the 1970s, a period of smaller and more frequent exchange rate changes.

Next, many of the regressions were rerun using the NON-REWEIGHTED HWWA index, excluding oil, as the explanatory variable. The purpose here was to determine the importance of the reweighting of the HWWA subgroups. Regerssion 8 repeated regression 4 with the non-reweighted world index. The $\bar{R}^2$ value increased slightly to 43 %. Also, the coefficient of the world index increased from .72 to .80. Furthermore regression 9, with no end point condition on the lag structure, showed further improvement. Thus, for the whole period, better results were achieved by using the original non-reweighted HWWA index, excluding oil. Even for the 1970s, reweighting did not significantly alter the results as regression 9a indicated.

Regression 10 repeated regression 1 (in Finnmarks), again with the non-reweighted world index. The results show that both coefficients are higher than they were in regression 1. Regression 11 once again changed the lag structure resulting in further improvement. Thus, in the case where US dollars are used for the whole period, reweighting does not lead to any improvement and may even worsen the results. Comparison of regresssions 11a and b to 2 and 3, respectively, leads to the same conclusion for the shorter periods.

Finally, the regression measured in terms of Finnmarks were rerun using the reweighted index INCLUDING the oil subgroup. Regression 12, the best regression of this type for the whole period, showed lower coefficients and a slightly lower $\bar{R}^2$ value than regression 1, the comparable result excluding oil from the reweighted index. As expected, the gains from excluding the crude oil subgroup from the world raw material price index arose during the 1970s, when the explosion in oil prices occurred. These modest gains can be seen by comparing regression 13 to regression 3.

2 CONCLUSIONS

This study has indicated a number of results that could be utilized in further analyses of this type. First, the division of the total period into two parts revealed the differences between the period 1954.1 through 1969.4 period, with its two large exchange rate changes, and the period 1970.1 through 1979.1, with its smaller and more frequent exchange rate changes. In the former period, much better results were achieved by explaining the unit values in terms of Finnmarks and using the exchange rate as a separate explanatory variable. In the latter period, slightly better results were achieved by explaining the unit values in terms of US dollars. Secondly, reweighting the HWWA subgroups to correspond to the structure of Finland's import trade was found to be of little value; the results may even be poorer. Finally, as expected, a small improvement in the explanation of Finland's raw material unit values without crude oil is achieved by excluding the crude oil subgroup from the world raw material price index.

THE STRUCTURE OF THE HWWA INDEX OF WOLRD MARKET PRICES OF FOOD AND INDUSTRIAL RAW MATERIALS

Commodity group			Weights
1. Food and feedingstuffs:			32.5
- cereals	9.0		
- tropical beverages and sugar	14.7		
- oilseeds and vegetable oils	3.7		
- meat	2.2		
- dairy products and eggs	2.9		
2. Industrial raw materials:			67.5
2.1. Fuels and lubricants		25.3	
- coal and coke	4.4		
- crude oil and distillates	20.9		
2.2. Raw materials for consumer goods		17.0	
- fibres	13.0		
- hides and furs	1.0		
- pulp	3.0		
2.3. Raw materials for capital goods		25.2	
- sawngoods	5.2		
- rubber	3.8		
- iron and steel	7.7		
- non-ferrous metals	8.5		
			100.0

VARIABLES AND SYMBOLS USED IN REGRESSION EQUATIONS

IMR	unit values for Finland's imports of raw materials and production necessities without crude oil
IMRQR	quarterly changes in the logarithms of IMR
IMRQC	quarterly changes in logarithms of IMR deflated by the dollar exchange rate
E11QR	quarterly changes in the logarithms of the dollar exchange rate
HWNFQ	quarterly changes in the logarithms of the reweighted HWWAindex excluding the crude oil subgroup
HNFQ	quarterly changes in the logarithms of the non-reweighted HWWA index excluding the crude oil subroup
HWIQC	quarterly changes in the logarithms of the reweighted HWWA index
D-W	Durbin-Watson test statistic for autocorrelation
$\bar{R}^2$	corrected level of explanation

t-values are in brackets below coefficients

The length of the lag is shown in brackets after the explanatory variables

ESTIMATED REGRESSION COEFFICIENTS FOR IMPORT UNIT VALUES OF FINLAND'S IMPORTS OF RAW MATERIALS AND PRODUCTION NECESSITIES, 1954.1 - 1979.1

Equation	Estimation period	Dependent variable	Summed coefficients for explanatory variables	Mean Lag	Degree of the poly-nomial	Endpoint (period)	$\bar{R}^2$	D-W
1	1954.1-79.1	IMRQR	i) .69HWNFQ (5) (9.32)	1.7	1	6	.607	2.09
			ii) .75E11QR (11.19)	0.0	-	-		
1.a	1954.1-79.1	IMRQR	i) .69HWNFQ (5) (9.35)	1.7	1	6	.605	2.08
			ii) .80E11QR (1) (9.01)	0.1	1	None		
1.b	1954.1-79.1	IMRQR	i) .70HWNFQ (5) (8.83)	1.7	1	6	.544	2.08
			ii) .90E11QR (1) (9.80)	0.3	1	2		
2	1954.1-69.4	IMRQR	i) .46HWNFQ (5) (3.32)	1.7	1	6	.810	2.51
			ii) .86E11QR (16.72)	0.0	-	-		
2.a	1954.1-69.4	IMRQR	i) 46HWNEQ (5) (2.47)	1.7	1	6	.666	2.46
			ii) .98E11QR (1) (11.50)	0.3	1	2		
3	1970.1-79.1	IMRQR	i) .66HWNFQ (5) (6.52)	1.7	1	6	.350	1.76
			ii) .19E11QR (0.93)	0.0	-	-		
3.a	1970.1-79.1	IMRQR	i) .68HWNFQ (5) (6.66)	1.7	1	6	.361	1.72
			ii) .37E11QR (1) (1.34)	0.3	1	2		
4	1954.1-79.1	IMRQC	.72HWNFQ (5) (9.36)	1.7	1	6	.424	2.10
5	1954.1-69.4	IMRQC	.50HWNFQ (5) (3.49)	1.7	1	6	.167	2.36
6	1970.1-79.1	IMRQC	.76HWNFQ (5) (6.59)	1.7	1	6	.390	2.01
7	1970.1-79.1	IMRQC	.69HWNFQ (3) (6.47)	1.0	1	4	.399	2.02
8	1954.1-79.1	IMRQC	.80HNFQ (5) (9.43)	1.7	1	6	.433	2.15
9	1954.1-79.1	IMRQC	.65HNFQ (5) (9.47)	2.1	1	None	.440	2.15
9.a	1970.1-79.1	IMRQC	.80HNFQ (5) (6.35)	1.7	1	6	.391	2.00
10	1954.1-79.1	IMRQR	i) .76HNFQ (5) (9.31)	1.7	1	6	.613	2.13
			ii) ..76E11QR (11.29)	0.0	-	-		
11	1954.1-79.1	IMRQR	i) .81HNFQ (5) (9.50)	2.1	1	None	.620	2.13
			ii) .76E11QR (11.32)	0.0				
11.a	1954.1-69.4	IMRQR	i) .69HNFQ (5) (3.98)	1.7	1	6	.821	2.68
			ii) .87E11QR (17.40)	0.0				
11.b	1970.1-79.1	IMRQR	i) .69HNFQ (5) (6.16)	1.7	1	6	.367	1.69
			ii) 20E11QR (0.92)	0.0	-	-		
12	1954.1-79.1	IMRQR	i) .50HWIQC (4) (8.82)	1.3	1	6	.590	1.91
			ii) .71E11QR (10.35)	0.0	-	-		
13	1970.1-79.1	IMRQR	i) .46HWIQC (4) (6.35)	1.3	1	5	.344	1.56
			ii) .05E11QR	0.0	-	-		