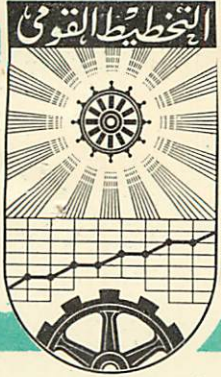الجمهورية العربية المتحدة

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Economic Criteria for Foreign
Loans
BY

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القاهرة

Economic Criteria for Foreign Loans [*]

I.

The main bottleneck in the development of underdeveloped countries is, undoubtedly, the shortage of capital including human capital, viz., technical and managerial skill and entrepreneurial ability. Left to themselves, their rate of development will be very slow depending on the success with which this shortage is reduced. However, the predominant type of the movement of foreign capital to the erstwhile under- or undeveloped countries for purposes of economic development was different from what is feasible or practicable in the case of the present-day underdeveloped countries. The movement of capital that took place to continents of America and Australia was mostly accompanied by the skill, technical, managerial and entrepreneurial, for the exploitation of the resources in these continents not with a view to withdrawing the profits and the original capital from there but with the intent and accomplishment of permanent settlement. Such capital movements to the present-day underdeveloped countries are untenable firstly because of the unwillingness of the potential lenders to these countries and secondly because of the unwillingness and incapacity of these countries to absorb more people, mainly due to their own heavy pressure of population and also to their extreme sensitiveness to anything which might appear to them as symptoms of new forms of neocolonialism or neoimperialism. Thus developmental capital movement has to take the form of loans at governmental levels or private loans under some sort of guarantee of the governments concerned or loans from international agencies. The purpose of this note is to study the terms and conditions that are generally involved in these loans, from whatever sources they may be, in the light of the long term economic advantage that accrues to the borrowing country. The following discussion is related to the development loans only and the problems connected with the acquisition of various types of skill is not considered here.

II.

Foreign loans agreements or contracts contain a large number of provisions or items. It is not possible to cover all these items or even a major number of them in the simple model that is intended to be presented here for discussion. There are three aspects, however, that are common to all loan agreements and we shall confine our attention to these only. They are:

1) the rate of interest payable on the loan,
2) the number of periods or years after which the annual repayment starts, (payments lag),
3) the number of years during which the loan has to be paid back in total, (period of repayment).

For the sake of simplicity and fixing the ideas we shall assume throughout that repayment of the loan takes place in equal amounts. Some other interesting aspects which will be neglected are, whether the loan is tied or not and whether it is a specific project loan or across the board loan. These aspects are in themselves very important and crucial, but they cannot be accounted for in a general treatment like the one to be presented here as they differ from country to country and project to project. It should be noted in this connection that the difference between the loans for financing essential and unavoidable consumption goods like wheat and rice and capital goods is not so great as it appears in as much as the import of these essential goods releases domestic funds for capital accumulation. We shall, therefore, treat all foreign loans as leading directly or indirectly to capital formation, and most of the loans presently contracted are in fact meant directly for capital formation. One point, however, must be remembered that the capital that is borrowed from abroad does not begin to yield output from the very moment it is contracted. There is a gestation lag. This lag differs from project to project which may vary from half or one year to four or five years depending upon the nature of the project and whether it is light or heavy industry project. A general discussion of the following type will have to be based on an average period of gestation lag.

The yield of the foreign capital can be derived on the basis of assumptions about the production function, viz., a) a fixed capital output ratio and b) a production function including labour as well as capital. In case of the

second alternative we have the choice to treat the borrowed capital along with all the existing capital and labour or to combine it with the incremental amounts of labour and capital in that period. Further some consideration to technical progress can also be given. We shall here confine our attention to the case of fixed capital coefficients only without introducing considerations of technical progress.

Finally, the economic criteria for the foreign loan have to be specified. No doubt, any foreign capital if economically utilized will increase domestic production and if the output is measured in net terms, this increase will be eternal. This will lead to a permanent increase in consumption according to the marginal propensity to consume of the participants in production. At the same time the rate of savings may also increase. But this is one side of the picture. Foreign loans, if they are not free grants, carry interest rates and have to be repaid. It is just possible that the terms and conditions of loans are such that their long-term effects upon the economy is adverse. It is obvious that the use of foreign capital will lead to an increase in consumption in the immediate future. But whether it leads to a net addition to savings over what it would have been otherwise, is not sure. The total annual debt charges might be more than the savings accruing from the investment of foreign capital. However, it may be objected that once the debt has been retired, the possible adverse effect mentioned just above, will not be relvant, and the net advantages of the investment of foreign capital will be reaped in perpetuity thereafter. This argument is not wholly sound; if the total annual debt charges exceed the savings accruing from the foreign capital invested during the whole or a major part of the period of the retirement of loan, then the depressing effect of the accumulated net reduction in savings may outweigh the expansionary effect of the apparent net additions in savings after the debt retirement. This calls for an analysis of the problem and the following simple model is an attempt in this direction.

III.

We tackle the problem by employing a constant net capital coefficient δ. Let the foreign capital borrowed be K_m, then the net output per year is $K_m \delta^{-1}$. Let the over-all marginal propensity to consume be c, then the total savings resulting from the investment of foreign capital is $K_m \delta^{-1}(1-c)$. Let us to begin with suppose that there is no gestation lag and that the repayment of the loan starts from the very first year in equal instalments and that the rate of interest

including other charges connected with handling the loan is r. Then the total payment to the foreign country in the first year is $K_m \cdot r + \frac{K_m}{t}$, where t is the number of years in which the debt has to be retired. In the second year the total payment will be $K_m(1-\frac{1}{t}) \cdot r + \frac{K_m}{t}$, and similarly in the n_{th} year it will be $K_m(1-\frac{n-1}{t})r + \frac{K_m}{t}$, $(n=1,\ldots t)$. The residue for capital formation in a year n during the period of debt retirement is

$$(1) \qquad S_n = K_m \cdot \frac{1}{t}(1-c) - K_m(1-\frac{n-1}{t})r - \frac{K_m}{t}, \qquad n=1,\ldots,t.$$

In (1) S_n may be positive or negative.

Let S_n the net saving due to foreign capital be invested in year $n+1$ and it will yield additional saving equal to $\frac{S_n}{t}(1-c)$; this will again lead to additional saving in year $n+2$ equal to $S_n(\frac{1-c}{t})^2$ till the t_{th} period. The total size of saving at the end of the t_{th} year resulting from the S_n in year n, is

$$(2) \qquad S_n\left[1 + \frac{1-c}{t} + (\frac{1-c}{t})^2 + \ldots (\frac{1-c}{t})^{t-n-1}\right] = S_n\left[\frac{1-(\frac{1-c}{t})^{t-n+1}}{1-\frac{1-c}{t}}\right]$$

Therefore, the net savings resulting from investment of foreign capital at the end of the t_{th} period is

$$(3) \qquad S^* = \sum_{n=1}^{t} S_n \frac{1-(\frac{1-c}{t})^{t-n+1}}{1-\frac{1-c}{t}}$$

If (3) is positive, there will not be any question about the perpentual gain from the investment of foreign capital in period t. If (3) is negative, then it is harmful and if equal to zero, then it is just worthwhile to borrow the foreign capital from the very long-term point of view. Thus the criterion whether foreign borroed is advisable or not will depend on whether

$$(4) \qquad S^* \gtreqless 0.$$

In case when the equality holds in (4) it is just worthwhile to borrow or not to borrow.

IV.

The following table gives the sign (+ or −) of the net aggregate effect of foreign loans on the domestic savings in the terminal period for relevant values of δ, c, r, and t.

Table I. ⁑)

Showing the Net Aggregate Effect of Foreign Loans on Savings in the Terminal Period.

c	δ	t=	20				30				40			
		r= .02	.04	.06	.08	.02	.04	.06	.08	.02	.04	.06	.08
.90	2	−	−	−	−	+	−	−	−	+	+	−	−
	3	−	−	−	−	−	−	−	−	−	−	−	−
	4	−	−	−	−	−	−	−	−	−	−	−	−
.85	2	+	+	−	−	+	+	+	+	+	+	+	+
	3	−	−	+	−	+	+	−	−	+	+	−	−
	4	−	−	−	−	+	−	−	−	+	−	−	−
.80	2	+	+	+	+	+	+	+	+	+	+	+	+
	3	+	−	−	−	+	+	+	−	+	+	+	+
	4	−	−	−	−	+	+	+	−	+	+	−	−

⁑) Table computed by Mr. Moharram El Haddad on the IBM 1620 of the Operations Research Centre, Cairo. The actual figures are given in Appendix A.

Table I shows the positive and negative (aggregate net) effects of foreign loans on the savings in the terminal period corresponding to the values of the parameters of the model. It can be noted that in the absence of gestation and payments lag, if the period of payment is 20 years and the marginal propensity to consume is 90%, then even if the rate of interest is as low as 2% and capital coefficient as low as 2, the net aggregate effect on saving in the terminal period is negative. It is obvious, the higher the marginal propensity to consume, the capital coefficient and rate of interest and the lower the period of repayment, the more adverse the net aggregate effect on the rate of savings

in the terminal period and vice-versa. It means that a country with a high marginal rate of consumption and high capital coefficient ought to borrow and to be lent at very favourable terms to it, if it is to derive net benefit in the long run. For example a country with a marginal propensity to consume of 85% and a capital coefficient equal to 3 should not borrow at a rate of interest higher than 2% if the loan is to be repaid of in 30 years and that about 4% if it is to be repaid in 40 years. Otherwise the developing country will end up with the familiar phenomenon of initial borrowings to be followed by the necessity of still more borrowings and so on, leading to "artificial" monetary expansions, inflation and depreciation of currency etc., etc.

V.

Now we can introduce two types of lags, gestation lag and payments lag; the first covers the period between the time when the investment of capital is made and the point of time when the yield begins to come out[1], the second covers the period between the point of time when the actual loan is contracted and the point of time when the debt retirement starts. Let the gestation lag be g years and the payments lag h years. Under these assumptions, no output will result till the end of years g and no payments will have to be made till the end of h years except the rate of interest on the original loan. During the construction period of the investment project, some purchasing power is created depending on the extent of local labour force directly or indirectly employed due to the initiation of the project financed by foreign capital, which had remained unemployed otherwise. If the project is completely financed by foreign capital, which means that all the goods on which the newly employed workers spend their wages are imported against the part of foreign capital spent on wages, then no drain on internal savings takes place. But if the investment project is not completely financed by foreign capital and that direct or indirect employment of domestic labourers is financed by domestic resources, the purchasing power thus created cannot be directly imputed to the foreign capital borrowed during the construction period. The purchasing power created during the construction period is due to domestic investment, though it has been under-taken in complementation of the investment of foreign capital. It may be argued that in whatever way we

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1) The time of borrowing capital may differ considerably from its actual investment. For our purposes, gestation lag will be assumed to cover the period between the point of time when the loan is contracted and that when the output begins to come out.

treat the domestic complementary investment, the demand for goods imported from abroad may increase which will cause a reduction in foreign exchange resources which may be offset from part of the foreign capital. Be that as it may, it can be counter-argued that the demand for imports may increase even if no foreign capital is borrowed and investment takes place from domestic resources only, and any difference that may arise due to demonstration effect possibilities in the former case must be negligible. Hence it can be safely stated that during the construction period no effect on savings takes place which can be imputed or re-legated to the use of foreign capital apart from interest payments on the capital borrowed. However, after the construction phase is over, and when the capital stock created is operated, then what purchasing power is created must be taken into account in estimating the effect on future savings. For the sake of clarity, we shall assume that the construction of plants is wholly financed by foreign capital so that the wages paid to the domestic workers employed is counteracted by imports against part of foreign exchange available through the loan proceeds.[1]

Now the total effect on savings in the terminal period, i.e., the period in which debt retirement comes to an end, will be the sum of three effects, resulting from the operations in the period of gestation lag, those in the period of the payments lag and those over the period of debt retirement. During the gestation period, no output is produced, only interest payments is made, during the payments lag and after the gestation lag, output is produced but only interest payment is made, and after the payments lag output is produced, but besides interest payment, loan payment is made.

The cumulative effect of the first phase on the savings in the terminal period can be expressed as

$$(5) \qquad S_1^{\text{i}} = - \sum_{n=1}^{g} K_m r \cdot \frac{1-(\frac{1-c}{\sigma})^{t+h+1-n}}{1-\frac{1-c}{\sigma}}$$

The cumulative effect of the second phase on the savings in the term-inal period can be expressed as

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1) In actual fact, this assumption is not necessary, the sums that are spent from domestic sources, are domestic investments, and so long as we apply the capital coefficient to the foreign capital, this assumption is not needed.

$$(6) \qquad S_2^{\pm} = \sum_{n=g+1}^{h} \left[(\frac{K_m}{\sigma}(1-c) - K_m \cdot r) \frac{1- (\frac{1-c}{\sigma})^{t+h+1-n}}{1 - (\frac{1-c}{\sigma})} \right]$$

The cumulative effect of the last phase is identical with the case we have discussed in the last section, it can be expressed as before.

$$(7)^{1)} \qquad S_3^{\pm} = \sum_{n=h+1}^{t+h} S_n^{v} \left[\frac{1- (\frac{1-c}{\sigma})^{t+h+1-n}}{1 - (\frac{1-c}{\sigma})} \right]$$

The over-all effect of the three phases on the savings at the end of the terminal period will be

$$S_{1+2+3}^{\pm} = S_1^{\pm} + S_2^{\pm} + S_3^{\pm}.$$

Now as before the criterion that whether the foreign loan is worthwhile or not depends on whether

$$(8) \qquad S_{1+2+3}^{\pm} \gtrless 0.$$

If the left hand expression in (8) is larger than zero, the loan is beneficial in the long run, if it is equal to zero, it is just worthwhile, but if it is negative, it is not worthwhile to borrow on the terms and conditions involved in the loan.

VI.

The gestation lags g, are technically given and so are the capital coefficients of production σ. The marginal propensity to consume c can also be forecast on the basis of previous estimates. The interesting aspect of the problem is to find out the combinations of payments lag h, interest rate r, and repayment period t which make the borrowing worthwhile or the contrary, given g, σ and c. Table II indicates by positive and negative signs the net favourable and unfavourable effects, respectively on the aggregate savings in the terminal

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1) The expression of S_n' is formally different from S_n. It is expressed as

$$S_n' = \sum_{n=h+1}^{t+h} \left[\frac{1-c}{\sigma} - (1- \frac{n-h}{t}) r - \frac{1}{t} \right]$$

period. It is obvious the higher the values of t and h and the smaller the value of r, the more favourable will be the effects of the loan on the net aggregate savings in the terminal period, given the values of the parameters g, δ and c. Reversely, given the terms of the loan, they will be more favourable to the borrowing country, the smaller the gestation lag, the capital coefficient and the marginal propensity to consume.

Table II is clear enough and so it is not necessary to comment on individual items. It can be noticed from the table that payments lag and gestation lag do affect the net effect of foreign loans on the net aggregate savings in the terminal period, but the alternative values of these lags which are generally relevant do not produce very pronounced changes in the situation. This can be seen by comparing the entries in the corresponding smaller blocks in the four bigger blocks in Table II. Loans at 6 to 8% rates of interest are worthwhile only when the domestic propensity to consume is below 85% and capital coefficient between 2 to 3%. If the propensity to consume of a country is high and capital coefficient is above 4, then a loan to be repaid in less than 20 years may be disadvantageous, even if the rate of interest is zero.

VII.

The purpose of this study has been to bring forth a systematic treatment of the terms of foreign loans that are received by the developing countries. A very simple model has been used and positive and negative effect have been recorded in tabular form. The calculations were performed on an electric computing machine. The study may be useful both to the lending countries and agencies and the borrowing countries. The more underdeveloped a country is, the higher are likely to be the capital coefficient, gestation lag and the marginal propensity to consume. And it is these countries which need foreign capital most. But foreign loans, if they are going to be advantageous to these countries in the long run, must be on very very favourable terms to such underdeveloped countries, i.e., payments lag and payments period must be long, and rate of interest must be very low. Lending countries and particularly the international agencies like the IBRD must take into account the relevant parameters discussed above besides the special calculations that are made regarding the specific projects in finding the terms of the loans to the underdeveloped countries if

TABLE II: Showing the Net Aggregate Effect of Foreign Loans on Saving in the Terminal Period

gc	h	t	5												10									
			20				30				40				20				30				40	
		r	.02	.04	.06	.08	.02	.04	.06	.08	.02	.04	.06	.08	.02	.04	.06	.08	.02	.04	.06	.08	.02	.04
2	.90	2	−	−	−	−	+	−	−	−	+	+	−	−	+	−	−	−	+	−	−	−	+	+
		3	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−
		4	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	.85	2	+	+	−	−	+	+	+	−	+	+	+	+	+	+	−	−	+	+	+	−	+	+
		3	−	−	−	−	+	−	−	−	+	+	−	−	+	−	−	−	+	−	−	−	+	+
		4	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−	+	−
	.80	2	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
		3	+	−	−	−	+	+	+	−	+	+	+	−	+	+	−	−	+	+	+	−	+	+
		4	−	−	−	−	+	−	−	−	+	−	−	−	+	−	−	−	+	−	−	−	+	+
4	.90	2	−	−	−	−	+	−	−	−	+	+	−	−	−	−	−	−	+	−	−	−	+	+
		3	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
		4	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−	−
	.85	2	+	−	+	−	+	+	+	−	+	+	+	+	+	+	−	−	+	+	+	−	+	+
		3	−	−	−	−	+	+	−	−	+	+	−	−	−	−	−	−	−	−	−	−	+	+
		4	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	−	−	−	−	−	+	−
	.80	2	+	+	+	−	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+	+
		3	+	−	−	−	+	+	−	−	+	+	+	−	+	−	−	−	+	+	−	−	+	+
		4	−	−	−	−	+	−	−	−	+	+	−	−	−	−	−	−	+	−	−	−	+	−

they are to be advantageous to them in the long run. The direction in which
the individual terms discussed above work, as regards the advantageous to the
borrowing country is clear. What is not obvious is where to draw the line when
all the elements of the terms are combined together. This study enables us to
draw the line between a set of combinations of advantageous terms and one
which is not so, given the other parameters.

Every country embarking upon plans of economic development resorts to fo-
reign borrowing in the initial years or in the initial first or second plan
periods with the declared aim of putting an end to the necessity of foreign
borrowing by the end of the second or the third five yearly plan. But it in-
variably turns out that as the years pass by, the need for foreign borrowing
goes on increasing and the country resorts to still further borrowing of
larger amounts in order to keep the economy at the planned rate of growth or
at least at the revised (mostly downward) planned rate of growth. One of the
reasons for this state of affairs is surely the insufficient thought that is
given to the terms of borrowing by the borrowing countries. Due to domestic
urgency , all loans forthcoming from external sources are accepted by the de-
veloping countries regardless of the terms involved. The above analysis shows
that not all loans at the terms generally prevalent these days are advantageous
in the long run.

When investment is made from domestic sources, all the real income
or resources generated remain inside the country. It is not the same when
investment is made from foreign loans. Payment of interest and other charges
and repayment of the original loan are a drain on the resources created. As
the level of consumption in the developing countries is generally too low and
as there exists a large degree of pent up demand, all payments abroad impinge
upon the resources that could be saved, as the consumption can hardly be sup-
pressed short of rationing. Hence the great need on the part of the borrowing
countries to study, the terms of loans before accepting them and also on the
part of the lending countries and agencies to do the same, if they really want
to be helpful to the former in the long run.

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(A.H.)

Appendix A; Values of S_n^{x}, for $K_m = 1$, $g = 0$, $h = 0$

t	c	.90			.85			.80		
	γ^{σ}	2	3	4	2	3	4	2	3	4
20	.02	-.2210	-.5614	-.7275	.3114	-.2210	-.4774	.8717	.1309	-.2210
	.04	-.4420	-.7786	-.9429	.0845	-.4420	-.6955	.6385	-.0940	-.4420
	.06	-.6630	-.9958	-1.1582	-.1423	-.6630	-.9137	.4053	-.3189	-.6630
	.08	-.8840	-1.2131	-1.3736	-.3694	-.8840	-1.1318	.1722	-.5438	-.8840
30	.02	.1991	-.3207	-.5741	1.0126	.1991	-.1923	1.8670	.7368	.1991
	.04	-.1272	-.6413	-.8921	.6776	-.1272	-.5144	1.5253	.4047	-.1272
	.06	-.4534	-.9620	-1.2100	.3425	-.4534	-.8364	1.1809	.0721	-.4534
	.08	-.7797	-1.2827	-1.5279	.0074	-.7797	-1.1585	.8366	-.2595	-.7797
40	.02	.6197	-.0796	-.4205	1.7146	.6197	.0930	2.8686	1.3433	.6197
	.04	.1881	-.5037	-.8410	1.2714	.1881	-.3329	2.4131	.9040	.1881
	.06	-.2434	-.9278	-1.2614	.8282	-.2434	-.7589	1.9576	.4649	-.2434
	.08	-.6750	-1.3519	-1.6820	.3850	-.6750	-1.1848	1.5021	.0255	-.6750

This and the following tables were computed by Mr. Moharram El Haddad on the IBM 1620 of the Operations Research Centre, Cairo.

Appendix B, Values of S^{*}_{1+2+3} , $K_m = 1$, $g=2$, $h=5$

t	r	c									
		.90			.85			.80		
		2	3	4	2	3	4	2	3	4
20	.02	-.1474	-.5408	-.7327	.4681	-.1474	-.4436	1.1161	.2594	-.1474
	.04	-.4526	-.8408	-1.0301	.1546	-.4526	-.7449	.7939	-.0513	-.4526
	.06	-.7579	-1.1408	-1.3275	-.1589	-.7579	-1.0462	.4716	-.3620	-.7579
	.08	-1.0631	-1.4408	-1.6250	-.4724	-1.0631	-1.3475	.1494	-.6727	-1.0631
30	.02	.2728	-.3000	-.5793	1.1693	.2728	-.1586	2.1140	.8653	.2728
	.04	-.1378	-.7034	-.9793	.7477	-.1378	-.5638	1.6807	.4475	-.1378
	.06	-.5483	-1.1069	-1.3793	.3261	-.5483	-.9690	1.2474	.0296	-.5483
	.08	-.9588	-1.5103	-1.7793	-.0955	-.9588	-1.3742	.8140	-.3883	-.9588
40	.02	.6934	-.0589	-.4256	1.8713	.6934	.1268	3.1130	1.4718	.6934
	.04	.1776	-.5658	-.9282	1.3416	.1776	-.3823	2.5685	.9468	.1776
	.06	-.3382	-1.0727	-1.4308	.8118	-.3382	-.8914	2.0241	.4218	-.3382
	.08	-.8540	-1.5796	-1.9333	.2821	-.8540	-1.4005	1.4797	-.1032	-.8540

Appendix B; S^{II}_{1+2+3} , $K_m \approx 1$, $g \approx 2$, $h \approx 10$

t	r \ δ	c = .90			c = .85			c = .80		
		2	3	4	2	3	4	2	3	4
20	.02	.0153	− .4718	− .7070	.7654	.0105	− .3527	1.5605	.5094	.0105
	.04	− .4000	− .8753	−1.1070	.3438	− .4000	− .7579	1.1272	.0916	− .4000
	.06	− .8105	−1.2787	−1.5070	− .0778	− .8105	−1.1631	.6939	− .3263	− .8105
	.08	−1.2210	−1.6822	−1.9070	− .4995	−1.2210	−1.5683	.2605	− .7441	−1.2210
30	.02	.4307	− .2310	− .5536	1.4666	.4307	− .0677	2.5584	1.1153	.4307
	.04	− .0851	− .7379	−1.0562	.9369	− .0851	− .5768	2.0140	.5903	− .0851
	.06	− .6009	−1.2448	−1.5588	.4072	− .6010	−1.0859	1.4696	.0632	− .6009
	.08	−1.1167	−1.7517	−2.0613	− .1226	−1.1167	−1.5950	.9251	− .4597	−1.1167
40	.02	.8512	.0100	− .4000	2.1686	.8512	.2177	3.5574	1.7218	.8512
	.04	.2302	− .6003	−1.0051	1.5308	.2302	− .3953	2.9019	1.0897	.2302
	.06	− .3909	−1.2106	−1.6103	.8929	− .3909	−1.0083	2.2463	.4575	− .3909
	.08	−1.0119	−1.8210	−2.2154	.2551	−1.0119	−1.6213	1.5908	− .1746	−1.0119

Appendix B. Values of S_{1+2+3}^{x} for $K_m=1$, $g=4$, $h=5$

t	σ \\ c	.90			.85			.80		
		2	3	4	2	3	4	2	3	4
20	.02	-.2526	-.6097	-.7840	.3059	-.2526	-.5216	.8938	.1166	-.2526
	.04	-.5579	-.9097	-1.0814	-.0076	-.5579	-.8229	.5716	-.1912	-.5579
	.06	-.8631	-1.2097	-1.3788	-.3211	-.8631	-1.1242	.2494	-.5048	-.8635
	.08	-1.1684	-1.5097	-1.6763	-.6346	-1.1684	-1.4255	-.0728	-.8155	-1.1684
30	.02	.1675	-.3690	-.6305	1.0072	.1675	-.2365	1.8918	.7225	-.1675
	.04	-.2430	-.7724	-1.0305	.5855	-.2430	-.6417	1.4585	.3046	-.2430
	.06	-.6535	-1.1759	-1.4305	.1639	-.6535	-1.0469	1.0251	-.1133	-.6535
	.08	-1.0641	-1.5793	-1.8305	-.2577	-1.0641	-1.4521	.5918	-.5311	-1.0641
04	.02	.5881	-.1279	-.4769	1.7091	.5881	.4885	2.8907	1.3290	.5881
	.04	.0723	-.6348	-.9795	1.1794	.7230	-.4602	2.3463	.8040	-.0723
	.06	-.4435	-1.1417	-1.4820	.6497	-.4435	-.9693	1.8019	.2790	-.4435
	.08	-.9593	-1.6486	-1.9846	.1200	-.9593	-1.4784	1.2574	-.2460	-.9593

Appendix B; Values of S^{π}_{1+2+3} for $K_m=1$, $g=4$, $h=10$

t	r	c=.90 δ=2	3	4	c=.85 δ=2	3	4	c=.80 δ=2	3	4
20	.02	− .0947	− .5408	− .7583	.6032	− .0947	− .4307	1.3382	.3666	− .0947
	.04	− .5053	− .9442	−1.1583	.1816	− .5053	− .8359	.9050	− .0573	− .5053
	.06	− .9158	−1.3477	−1.5583	− .2400	− .9158	−1.2410	.4719	− .4691	− .9158
	.08	−1.3263	−1.7511	−1.9583	− .6616	−1.3263	−1.6462	.0383	− .8870	−1.3263
30	.02	.3254	− .3000	− .6050	1.3045	.3254	− .1456	2.3362	.9725	.3254
	.04	− .1904	− .8069	−1.1075	.7747	− .1904	− .6547	1.7918	.4475	−.1904
	.06	− .7062	−1.3138	−1.6100	.2450	− .7062	−1.1638	1.2474	.0775	− .7062
	.08	−1.2220	−1.8207	−2.1126	− .2847	−1.2220	−1.6729	.7029	− .6025	−1.2220
40	.02	.7460	− .0589	− .4513	2.0064	.7460	.1398	3.3352	1.5790	.7460
	.04	.1249	− .6693	−1.0564	1.3686	.1249	− .4732	2.6796	.9468	.1249
	.06	− .4961	−1.2796	−1.6615	.7308	− .4961	−1.0862	2.0409	.3147	− .4961
	.08	−1.1172	−1.8899	−2.2667	.0929	−1.1172	−1.6992	1.3685	− .3175	−1.1172