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GRANT ELEMENT AND GRANT EQUIVALENT CALCULATORS FOR USE WITH LOTUS 1-2-3, REL. 2

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DEBT SERVICES ON LOANS

By
Kenneth Kauffman
PPC/EA

AGENCY FOR INTERNATIONAL DEVELOPMENT

Grant Element and Grant Equivalent Calculators
for Use with Lotus 1-2-3, Rel 2

The GE Calculator diskette contains a number of files with templates or calculators for Grant Elements and Grant Equivalents (see below - Further Explanation - for more on concepts). Each program can be run by retrieving the file (/fr) and following the instructions provided. The files and their purposes are as follows: AGE_MENU This contains a number of calculators and can be used like any other menu driven program, i.e., the choices displayed on the panel are selected by typing the first letter of the item selected or by moving the cursor with the left and right arrow keys to the item desired and then pressing ENTER.

HELP: After AGE_MENU is selected, the program automatically starts with the first part of Help displayed on the screen and the MENU displayed on the panel. At the bottom of the screen, the user is instructed to "type h and press ENTER" to see the second (and last) part of HELP.

The main MENU on the panel reads:

HELP AIDGE DACGE TABLE NEW TABLE EXIT

Selection of AIDGE brings up a submenu:

AIDGE_2i AIDGE_3i AIDGE_1i QUIT

Selection of any one of these (except QUIT, which returns to the main MENU) brings up a calculator for Grant Elements and Grant Equivalents of A.I.D. type loans, defined here as loans repaid with equal installments of principal and interest combined, like the usual house mortgage. The only difference among the programs is that they allow for differing numbers of interest rates. For example, the 2i calculator permits the use of one interest rate during the period prior to the first amortization payment and a second one (if desired) during the amortization period. (Two interest rates of this kind are a common feature of U.S. A.I.D. loans.) With the 3i program, the user can select two interest rates during the period prior to amortization and a third one during amortization. (Some U.S. A.I.D. loans are of this type.) Calculator 1i allows for only one interest rate throughout.

All three types of calculations can be done with the 3i calculator by setting the interest rates appropriately. However, it may be faster and safer to use the 2i and 1i programs when computing GE's for loans with the conforming characteristics.

In addition to the Grant Element and Grant Equivalent, all AIDGE programs compute a "stretched" version of these two varibles. Stretching involves carrying the present values of repayment streams back an additional year. The stretched version of the GE is used by the United States in reporting the grant elements of U.S. A.I.D. loans to the DAC.

Selection of DACGE from the MENU brings up a submenu containing choices between DACGE_1i and DACGE_3i (and QUIT). For DAC type loans (defined here as loans calling for repayment in equal installments of principal with interest on the remaining balance) these programs calculate Grant Elements (GE) and Grant Equivalents (GQ) in the same way as the AIDGE programs.

Note that GE, GQ of loans with a single repayment at maturity (bullet repayment) can be computed by setting the time to the first amortization payment equal to the maturity value.

Selecting TABLE from the MENU calls up a submenu with choices between VIEWING the TABLE and RECALCULATING the TABLE. Viewing simply allows for looking at a table of GE values computed with the DACGE_1i program. The Table shows a range of GEs for different interest rates and periods to the first amortization payment. These values are valid for a selected loan maturity, number of payments per year and discount rate. With RECALC, the user can select new values for maturity, payments per year, and, if desired, the discount rate, and then recalculate the entire table. Note that recalculation takes some time, as much as 14+ minutes in some cases with an ordinary IBM PC.

If a number of tables are needed, it is strongly recommended that use be made of the stand alone table generating programs, TABMAC G, TABMAC_M, and TABMAC_I. These versions are much faster (approximately two minutes) and better suited to printing (see below).

Selection of New Table calls up a submenu with choices between Viewing (which is the same as Viewing under TABLE) and creating a new series for the x-axis and/or y-axis. New axes values set the stage for creating a new table. The y-axis contains a series of interest rates selected by the user. The prompt requests the user to enter desired values for the first element of the series, e.g., .01--i.e., 1%, it then asks for the desired incremental value, e.g., .005, i.e., 0.5%. With this input the y-axis values are automatically recalculated. A similar process takes place with the x-axis series--number of years to the first amortization payment. Once the x- and y- axes have been set as desired, the Table can be recalculated with these values by selecting Table, then Recalc Table from the Menu and submenu respectively.

The final MENU selection is EXIT. Use this to get out of the MACRO (the CMD indicator will disappear). Press ALT and m simultaneously to return to the MENU with the macro in force (the CMD indicator will reappear). The user can always get out of any program or difficulty by pressing simultaneously CONTROL and BREAK (Scroll Lock), then pressing ESC. To return to the MENU, press ALT and m at the same time.

INDIVIDUAL CALCULATOR FILES. For the most part these files duplicate the calculators on the MENU. However, they compute more rapidly. Call up the desired file with (/fr). If the user wishes to make a number of calculations of one type, it could be done more quickly with the separate programs. For a few calculations of different kinds, the MENU would be preferable, since it is probably faster to move among calculators within it than to bring up several different files.

TABMAC FILES. For Table making, especially if the user wishes to print tables, use of the files TABMAC_G, TABMAC _M and TABMAC_I is significantly faster and produces tables more suitable for printing than the MENU Table. Moveover, TABMAC_M and TABMAC_I are not available on the MENU. TABMAC_G produces the same Table as MENU Table, i.e., y-axis = Interest Rates, x-axis = Time (yrs) to First Repayment of Principal; GEs for a selected maturity, number of payments per year and discount rate. TABMAC_M provides a Table with Maturities on the x-axis and Interest Rates on the y-axis, thus producing GEs for a selected Time (yrs) to First Repayment of Principal, number of payments per year and discount rate. TABMAC_I computes GEs for a given interest rate and varying maturities and periods to the first amortization payment.

The Tables can be printed on 8.5 X 11 inch paper with maximum right margins and condensed print. Of course, Tables can also be copies (saved) to another file on the calculator diskette (or another diskette) for use at a later time.

Note that MENU TABLE and the TABMAC files can be used to create tables with discount rates other than 10%. They can therefore duplicate the recent OECD Trade Committee publication providing TABMAC_G type tables for different discount rates. However, these OECD tables all assume only one payment per year, and would overestimate a GE when there is more than one payment. (These tables were done in the context of the discussions on adopting differentiated discount rates for calculating GEs of transactions subject to Export Credit Arrangement rules.[1/] In general,

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1/ See Note at end.

export credits, including U.S. Export-Import Bank credits, use what are defined here as DAC type loan repayment terms.) MENU Table and TABMAC_G, of course, can duplicate the tables published by the OECD DAC, which provide GE values for a range of interest rates and periods to first principal repayment for loans with one and two payments per year, a given maturity and a 10% discount rate. However, the table programs here can also create tables for many other cases, e.g., 4 or 12 payments per year and any discount rate.

Further Explanation

"Grant Element" (GE) is a concept used to measure the concessionality of a loan. Grants are the standard of comparison, having a 100% GE. While GE is a relative concept (%), the "Grant Equivalent" (GQ) concept applies the same idea to absolute values. Thus, if a $100 loan has a GE of 60%, the GQ is $60. A $200 loan with GE of 60% has a GQ of $120.

To measure GE and GQ, the payment streams (interest and principal) are discounted to the starting point of the loan. Under DAC rules, the starting point is the date of commitment, generally the date of signature of the loan agreement. DAC computes the GE on the assumption that the loan is fully disbursed at that point, i.e., that the repayment schedule is in force immediately. (See note at end for Export Credit Arrangement approach.) DAC calculations use a 10% discount rate as an agreed standard (convention). 1/

The GQ is then defined as the face value of the loan less the discounted value of the payment stream. Hence, if the interest rate on the loan is 10% and payments are made once a year, the GQ is zero. GQ increases as the interest rate declines and maturities and periods to first repayment lengthen. GQ is also affected slightly by the number of payments per year - falling as the number increases. It is possible, of course, to compute negative GQs. In general, this will occur when the interest rate exceeds 10%. (It occurs at 10% with two or more payments per year; it would not occur at as bit over 10% with less than one payment per year.)

The GE is obtained by dividing the GQ by the face value of the loan and multiplying the result by 100 to obtain a percentage.

1/ The actual subsidy involved in a loan should be measured by comparison with a market based loan of a similar kind in the originating country. The conventions used by DAC to compute GEs, however, greatly simplify the computations and provide a standard for comparing donor performance that has been accepted for this purpose.

Therefore, if:

P = Principal = face value of the loan

PV = Present Value (discounted value) of the payment stream (interest + principal)

$$GE(\%) = 100\ (GQ/P) = (P-PV)/P$$

In the calculator files, the following symbols are used in most cases:

P - Principal or face value of loan

m - maturitry of loan (years)

g - time to first repayment (amortization) of principal (yrs)

i - interest rate on loan

s - interest rate on loan during time preceding first amortization payment

r - discount rate used to compute present values of principal and interest payments

a - number of payments per year

To compute the proper discounted values, note that:

$$d = (1+r)^{(1/a)}-1$$

Use of this formula converts the selected annual discount rate (r) to the appropriate rate for the selected period value (a). E.G., if a = 2 (payments every six months) and r = 0.1, $d \doteq 0.0488$.

Also, the formula for number of payments made in the amortization period (n) is:

$$n = a(m-g)=1$$

The formulas in the calculators have been restricted by imposing

(1) $0 > g < = m$

(2) n and ag = positive integers

If these restrictions are not observed, the GE and GQ cells will display NA or ERR.

The reason for the first restriction is intuitively clear; there must be some time to the first principal repayment, the loan must have some positive duration, and the time to first principal repayment is not permitted to be longer than the loan itself.

The second restriction means that payments must be made at equal time intervals. GE, GQ for loans without such payments of interest and principal cannot be calculated with the formulas used here. They would have to be done individually.

However, most actual loans do have repayment streams of this kind. Note that the number of payments per year is a key factor in determining whether (n) and (a)x(g) are positive integers. If m = 40 years, g = 9.5 years, and a = 1, then n (31.5) and ag will not be positive integers. But when a = 2, both become positive integers, (62) and (19) respectively. 1/

Note also that (a), the number of payments per year must be positive. However, (a) can be less than unity, provided that it is consistent with other selected values. E.g., if a = 0.5, this means that payments fall due every two years. Therefore, the maturity (m) and interval to first payment of principal (g) must be at least two years.

Both DAC and A.I.D. type loans may have periods of grace before the first principal repayment falls due. However, in the programs on the diskette, the term "grace" is used sparingly. When it is used, it is shorthand for the period or interval from the beginning of a loan to the point in time when the first installment of principal repayments falls due.

The term "grace period" often has a different meaning, viz., the number of periods to the first principal repayment less one period. The logic of this definition may be understood by considering a one year loan with all payments falling due after one year. Such a loan by this definition would have no grace period, and that conforms with common sense. However, this definition, which is used by the DAC, is intuitively less comprehensible when applied to longer loans with more than one payment period per year. Thus a U.S. A.I.D. loan with terms of 40 years to maturity and 10 years to the first principal repayment,

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1/ Also, if there are two interest rates in the interval before amortization, aF = positive integer, where F = length (in years) of the first phase of the interval. This is to assure consistency between payment points and the end points of these intervals.

with interest plus principal installments due semi-annually (two payments per year), by this definition has a grace period of 9.5 years. The point to remember when using the calculators is that this definition does not apply. In all cases, "grace" is synonymous with the interval to the first repayment of principal.

Note:

Export Credit Arrangement Approach

Starting points for loans subject to the rules of the OECD Export Credit Arrangement governing minimum grant elements for tied and partially untied aid credits (including mixed credits) are those prescribed for export credit transactions under Berne Union rules. These are rather complex and depend on the nature of the transaction. In general, the starting point is related to the time of physical delivery of a capital good or completion and commissioning of a plant. Each case must be analyzed to determine what starting points are relevant and for what portion of the transaction.

Consider a simple illustration. Suppose a contract calls for commissioning a plant in three years. The assistance loan is for 10 years with four years until the first repayment of principal. If this is a DAC type loan with interest at 4%, payments due once a year, and if the discount rate is 10%, the DAC GE would be 28.65%. Under Arrangement rules, the starting point is three years later; therefore, the time to first repayment is taken as one (4-3) year. The GE is calculated as if the loan had a 7-year maturity, with one year to the first amortization payment, and the same interest rate, etc. The GE in this case is 18.27%.

Berne Union starting points can be found using the following rules:

1) In the case of a contract for the sale of capital goods consisting of individual items usable in themselves (e.g. locomotives), the starting point is the mean date or actual date when the buyer takes physical possession of the goods in his own country.

2) In the case of a contract for the sale of capital equipment for complete plant or factories where the supplier has no responsibility for commissioning, the starting point is the date when the buyer is to take physical possession of the entire equipment (excluding spare parts) supplied under the contract.

3) In the case of construction contracts where the contractor has no responsibility for commissioning, the starting point is the date when construction has been completed.

4) In the case of any contract where the supplier or contractor has a contractual responsibility for commissioning, the starting point is the date when he has completed installation or construction and preliminary tests to ensure that it is ready for

operation. This applies whether or not it is handed over to the buyer at that time in accordance with the terms of the contract and irrespective of any continuing commitment which the supplier or contractor may have, e.g. for guaranteeing its effective functioning or for training local personnel.

5. In the case of paragraphs 2), 3) and 4) above where the contract involves the separate execution of individual parts of a project, the date of the starting point is the date of the starting point for each separate part, or the mean date of those starting points, or, where the supplier has a contract, not for the whole project but for an essential part of it, the starting point may be that appropriate to the project as a whole.

GEs calculated under Arrangement rules will always be lower than the corresponding GE calculated with DAC rules. The key relationships between the two approaches are as follows:

m = maturity (yrs) in the loan agreement
m'= maturity (yrs) for Arrangement GE calculations

g = time (yrs) to 1st principal repayment in loan agreement
g'= time (yrs) to 1st principal repayment for Arrangement calculation

t = time (yrs) to Berne Union starting point
a = number of payments per year

$$m' = m - t$$
$$g' = g - t, \text{ for } g > t$$
$$g' = (1/a), \text{ for } g <= t$$

Under the terms of the agreement on tied aid credits reached in 1987, the minimum permissible GE for a tied aid credit became 30% in July 1987 (50% for Least Developed Countries) and will rise to 35% in July 1988. In addition to the starting point rules, Arrangement GE calculations use different discount rates than the DAC. The discount rate used to compute GEs for purposes of the Arrangement is a combination of the 10% DAC rate and the commercial interest reference rate (CIRR). Since CIRRs reflect market conditions, they vary among currencies and over time. 1/ The discount rate is therefore differentiated (DDR system) in the same way. For the period July 15, 1987-July 14, 1988 the discount rate (DDR) gives 50% weight to the 10% DAC rate and 50% to the CIRR. From July 15, 1988 75% weight will be given to the CIRR.

1/ In general, CIRRs are market interest rates in various OECD members' currencies for fixed rate 5-10 year loans to first class borrowers.

DDRs until January 15, 1988 are as follows:

Country	Currency	DDR-July 1987
Australia	Dollar	12.2%
Austria	Schilling	8.9
Belgium	Franc	9.4
Canada	Dollar	10.0
Denmark	Krone	11.1
Finland	Markka	9.5
France	Franc	10.2
Germany	Mark	8.1
Italy	Lire	10.6
Japan	Yen	7.5
Netherlands	Guilder	8.7
New Zealand	Dollar	13.8
Norway	Kroner	12.4
Spain	Paseta	11.9
Sweden	Kroner	11.2
Switzerland	Franc	8.4
United Kingdom	Pound	9.8
United States	Dollar	9.6
EC	ECU	9.2

These rates will be computed as of January 15, 1988, July 15, 1988 and, thereafter, annually on the latter date.

DEBT SERVICE ON LOANS

LOAN FILES

The diskette contains four LOTUS 1-2-3, Rel 2 files with programs that calculate service payments on loans and related information.

1.	DSAID.WK1	Debt Service on all A.I.D. type loans.
2.	DSDAC1I.WK1	Debt Service on DAC type loans with a single interest rate.
3.	DSDAC3I.WK1	Debt Service on DAC type loans with multiple interest rates.
4.	AIDSHED.WK1	Repayment schedule for A.I.D. type loans.

The help screens from these files are reproduced below:

1. DSAID.WK1

Service Payments on A.I.D. Type Loans

The form located in A21.G40 (at PgDn) provides debt service figures for loans repaid in equal installments (interest plus principal) like the usual house mortgage or U.S. A.I.D. loans. By entering the data called for, the user obtains information on amounts paid, to pay, etc. Loans may have one or two interest rates in the period prior to amortization.

FOR EFFICIENT DATA ENTRY PRESS ALT+a when ready to start. PRESS ENTER when finished. Cursor returns to point where ALT+a was pressed. USE ARROW KEYS to move among data entry cells.

Use .01, .05, etc., for interest rates; DO NOT enter $, %, or commas in values for loan amount; $9,999.99 should be entered as 9999.99, etc. Fractional periods can be entered as decimals if they do not repeat. But it is safer to use common fractions, e.g., 30 yrs + 1 month = 361/12; use for maturity, yrs to 1st amort pmt, and phase 1 of period prior to amortization. Note that phase 2 of period before amort is determined by selection of full period and phase 1. Phase 1 must be entered.

Values for number of payments per year (a) can be any integer 1, 2,. . .,12, i.e., payments can be once a year, twice,. . .,every month. This means that in loans with grace periods, interest is payable at the same intervals as principal + interest will be during the amortization period.

If a = 12, the first payment is due one month after the start date. Payments will then fall due every month until maturity. In this case if time to 1st amort pmt = 1 month, enter 1/12 for that item and for length of phase 1.

Note that the amounts remaining and paid are inclusive of the current payment.

The number of amortization payments must be a positive integer. This means that certain combinations of pmts per year, maturity, and yrs to the 1st amortization pmts will cause the formulas to display NA or ERR. E.g., a loan of 31.5 yrs, 10 yrs to 1st amort pmt, and one pmt per yr will not compute. Often a computable loan can be found by changing the number of pmts per yr. In this example, 2 pmts per yr yields such a result.

2. DSDAC1I.WK1

Service Payments on DAC Type Loans

(Single Interest Rate)

The form located in A41.G60 (PgDn x 2) provides debt service figures for loans repaid in equal installments of principal with interest on the remaining balance. By entering the data called for, the user obtains information on amounts paid, to pay, etc. Loans may have one interest rate only. (See below DSDAC3I.WK1 for multiple interest rates.)

FOR EFFICIENT DATA ENTRY PRESS ALT+a when ready to start. PRESS ENTER when finished. Cursor returns to point where ALT+a was pressed. USE ARROW KEYS to move among data entry cells.

Use .01, .05, etc., for interest rates; DO NOT enter $, %, or commas in values for loan amount; $9,999.99 should be entered as 9999.99, etc. Fractional periods can be entered as decimals if they do not repeat. But it is safer to use common fractions, e.g., 30 yrs + 1 month = 361/12; use for maturity and yrs to 1st amort pmt.

Values for number of payments per year (a) can be any integer 1, 2,. . .,12, i.e., payments can be once a year, twice,. . .,every month. This means that in loans with grace periods, interest is payable at the same intervals as principal + interest will be during the amortization period.

If a = 12, the first payment is due one month after the start date. Payments will then fall due every month until maturity. In

this case if time to 1st amort pmt = 1 month, enter 1/12 for that item, if 2 months 2/12 or 1/6, etc.

Note that the amounts remaining and paid are inclusive of the current payment.

The number of amortization payments must be a positive integer. This means that certain combinations of pmts per year, maturity, and yrs to the 1st amortization pmt will cause the formulas to display NA or ERR. E.g., a loan of 31.5 yrs, 10 yrs to 1st amort pmt, and one pmt per yr will not compute. Often a computable loan can be found by changing the number of pmts per yr. In this example 2 pmts per year yields such a result.

3. DSDAC3I.WK1

Service Payments on DAC Type Loans

(multiple interest rates)

The form located in A41.G60 (PgDn x 2) provides debt service figures for loans repaid in equal installments of principal with interest on the remaining balance. By entering the data called for, the user obtains information on amounts paid, to pay, etc. Loans may have one or two interest rates in the period prior to amortization and a third rate during amortization.

FOR EFFICIENT DATA ENTRY PRESS ALT+a when ready to start. PRESS ENTER when finished. Cursor returns to point where ALT+a was pressed. USE ARROW KEYS to move among data entry cells.

Use .01, .05, etc. for interest rates; DO NOT enter $, %, or commas in values for loan amount; $9,999.99 should be entered as 9999.99, etc. Fractional periods can be entered as decimals if they do not repeat. But it is safer to use common fractions, e.g., 30 yrs + 1 month = 361/12; use for maturity, yrs to 1st amort pmt, and phase 1 of period prior to amortization. Note that phase 2 of period before amort is determined by selection of full period and phase 1. Phase 1 must be entered.

Values for number of payments per year (a) can be any integer 1, 2,. . .,12, i.e., payments can be once a year, twice,. . . ,every month. This means that in loans with grace periods, interest is payable at the same intervals as principal + interest will be during the amortization period.

If a = 12, the first payment is due one month after the start date. Payments will then fall due every month until maturity. In this

case if time to 1st amort pmt = 1 month, enter 1/12 for that item and for lenth of phase 1.

Note that the amounts remaining and paid are inclusive of the current payment.

The number of amortization payments must be a positive integer. This means that certain combinations of pmts per year, maturity, and yrs to the 1st amortization pmt will cause the formulas to display NA or ERR. E.g., a loan of 31.5 yrs, 10 years to 1st amort pmt, and one pmt per yr will not compute. Often a computable loan can be found by changing the number of pmts per yr. In this example, 2 pmts per year yields such a result.

4. AIDSCHED.WK1

PRESS ALT AND a at the same time to bring up MENU. You are in HELP. This program creates debt service schedules for the amortization period of A.I.D. type loans (equal installments of principal plus interest). Step 1 is to erase the existing schedule. Erase on the menu will do this. Erase and other Menu selections are called by pressing the first letter, e.g., e, or by moving the cursor to the selection and pressing Enter.

Data Input allows you to enter new values for a schedule. You must input values for maturity, interest rates(s), time to 1st amortization pmt and number of pmts per year (1, 2, 4 or 12 are permitted). Note that you must enter a time to 1st amort pmt and the interest rate for this period in all cases. E.g., suppose a house mortgage with payments required after 1 month. You enter 1/12 for time to 1st pmt and the mortgage int rate. Beginning month for amort is entered as a number, e.g., 3 for March. Note that the implied number of pmts must be an integer. If it is not you will see err or na in some places. Often this can be taken care of by adjusting the number of pmts per year.

REMEMBER TO PRESS ENTER AFTER DATA ENTRY IS COMPLETE

Schedule can be printed on 8.5 X 11 paper with condensed print.

You should now select Erase, and then proceed through the Menu steps.