FOREST FINANCE

Guide to Lectures
Delivered at the Biltmore Forest School

By C. A. SCHENCK, Ph. D.
FORESTER TO THE BILTMORE ESTATE

1909

THE INLAND PRESS
ASHEVILLE, N. C.

FOREST FINANCE

Guide to Lectures
Delivered at the Biltmore Forest School

By C. A. SCHENCK, Ph. D.
FORESTER TO THE BILTMORE ESTATE

1909

THE INLAND PRESS
ASHEVILLE, N. C.

Digitized by the Internet Archive
in 2009 with funding from
NCSU Libraries

http://www.archive.org/details/forestfinancegui00sche

Biltmore, N. C., January 1, 1909.

In usum Delphini:

The Biltmore lectures on Forest Finance appear in print since it is necessary to place in the hands of the Biltmore students some basal findings concerning the financial side of forestry, which findings it is not easy for them to obtain elsewhere.

In America, forest finance is and will be the most important branch of forestry; the very difficulty of the financial problems involved in American forestry is enticing; and I am interested, personally, more deeply in the scientific and practical development of forest finance than in that of any other branch of American forestry.

Special students desirous to attend the Biltmore lectures on forest finance, and otherwise excluded from the Biltmore School, will be welcomed at Biltmore hereafter.

This arrangement is made for the reason that the lecturer is anxious to study forest finance through and with the students—the regulars as well as the specials.

Co-operation between teacher and pupil is essential to the development of American forest finance.

The interest tables attached to this book are obtained, by extraction and addition, from those published by the Mutual Life Insurance Company of New York.

C. A. SCHENCK.

FOREST FINANCE

SYNOPSIS OF PARAGRAPHS

Par. I. Introduction;

Par. II. Mathematical principles of finance;

Par. III. Increasing or decreasing prices;

Par. IV. Receipts and expenses in forestry;

Par. V. Taxes;

Par. VI. Protective expenses;

Par. VII. Capital and money;

Par. VIII. Interest;

Par. IX. Expectation values;

Par. X. Sale values;

Par. XI. Gauging the merits of an investment;

Par. XII. Maturity of trees.

FOREST FINANCE

PARAGRAPH 1.—INTRODUCTION.

I. Definition.

Forest Finance deals with forestry as an investment.

Treated as a branch of science in European literature, it consists of two parts:

First Part: Forest Valuation which ascertains the values of forest investments and the values of their components.

Second Part: Forest Statics which compares the investments with the returns obtained.

Forestry, from the standpoint of a commonweal (federation, state, county, town, city) deals, to a large extent, in abstract or ideal values,—values which are not expressible easily in dollars and cents. It neglects, usually, financial considerations entirely or partially.

With the private owner of forests, the financial outcome of his investments is the first and last consideration. The private owner cannot be expected to supply this country with forest products unless forestry is as remunerative an investment as agriculture is found to be, or as manufacture is supposed to be,—industries which supply this country with food products and with manufactured products.

The mathematical principles involved in Forest Finance are identical with those confronting the bankers, the insurance companies,—in fact, confronting all business men and all business enterprises that look ahead into the future.

Forest statistics, deficient unfortunately in the United States (as in any other country of rapid development), are important as a basis for financial calculations.

Forestal forecasts in the countries famous for conservative forestry are made easily and with a high degree of certainty.

In Canada, in Russia, and generally in the United States, such is not the case.

II. History.

Forest Finance is one of the most modern branches of forestry. Abroad, it was unknown, or unheeded by the practitioners, previous to Max Pressler (about 1860). Pressler's theories were developed and enlarged upon by Gustav Heyer.

Dr. Wm. Schlich's, and Prof. Charles Wimmenauer's writings are entirely in line with Heyer's teachings.

Financial considerations were despised generally by European foresters until recently. The government of Saxony was first to adopt financial success as the goal of its forest policy.

III. Literature.

The only book on forest finance written in English is Schlich's Vol. III, Part II.

The interest tables of the various insurance companies may be used to solve forestal equations, in preference to tables of logarithms.

PARAGRAPH II.—MATHEMATICAL PRINCIPLES OF FINANCE.

The ratio existing between principal invested (V) and amount obtained (N), or the ratio between "pre-value" and "aft-value" of an investment is expressed by the following equations [in which (p) represents the rate of interest and (n) the number of years covered by the investments]:—

$$N = V \times 1.\ Op^n \tag{A}$$

$$V = \frac{N}{1.\ Op^n} \tag{B}$$

$$1.\ Op^n = \frac{N}{V} \tag{C}$$

By payments (a) regularly occurring at given intervals of time a "geometrical progression" is formed after the pattern

$$a + ar + ar^2 + ar^3 + ar^4 + ar^{(n-1)}$$

The summary of this geometrical progression is

$$a\,\frac{r^n - 1}{r - 1} \tag{D}$$

If the last term of the progression is expressed as "l" (with the view to the elimination of "n"), the summary is

$$\left(\frac{r\,l - a}{r - 1}\right)$$

"rl" might be designated as "the term beyond the last", or as the term "before which the progression stops".

Similarly, the sum total of periodical payments (R) due at intervals of (m) years, for the first time due after (a) years and altogether (n) times is, considered as a pre-value,

$$R\,\frac{1.\ Op^{mn} - 1}{1.\ Op^{m} - 1} \times \frac{1.\ Op^{m-a}}{1.\ Op^{mn}} \tag{E}$$

On the other hand, for the aft-value of such periodical payments (R), the sum total is

$$R\,\frac{1.\ Op^{nm} - 1}{1.\ Op^{m} - 1} \times 1.\ Op^{m-a} \tag{F}$$

In the case of an annuity, (m) and (a) are equal to 1. Consequently, the summary of such annuities considered as a pre-value is

$$R \frac{1.\ Op^n - 1}{1.\ Op^n \times 0.\ Op} \qquad (G)$$

The aft-value of such annuities is

$$R \frac{1.\ Op^n - 1}{0.\ Op} \qquad (H)$$

The aft-value of single payments, annuities and periodical payments at the end of an indefinite period is itself indefinite (∞).

The pre-value of a single payment due after an indefinite period of years is equal to zero.

The pre-value (V) of annuities or periodical payments running for an indefinite number of years is, however, something very definite, namely, discounted backwards to the present day, in the case of an annuity:

$$V = \frac{R}{0.\ Op} \qquad (I)$$

or

$$\frac{p}{100} = \frac{R}{V}$$

It appears at a glance that this pre-value (V) derived from never-failing annuities—is merely the capital from which a perpetual revenue of p% is expected. Unknowingly, the investor usually figures at indefinitely long periods of never failing returns when capitalizing such returns at a given rate of interest. It is only too well known, however, that all investments, excepting pure real estate investments, have a merely temporary lease of life. As an illustration, we might mind the fact, that the majority of all insurance policies are surrendered,—the insured being unable to pay his dues when he meets with financial reverses: Business investments, in the majority of cases, seem to end unluckily for the investor.

The pre-value (V) of periodical payments (R) hereafter due at the end of every "mth" year until infinity is

$$V = \frac{R}{1.\ Op^m - 1} \qquad (J)$$

The influence on present values exercised by payments (receipts or expenses), expected after 100 and more years, is very small.

For the financial prospects of an enterprise, the current expenses and receipts of the first (n) years are

$$(1.\ op^n - 1)$$

times as influential as the current expenses and receipts of any and all years following after the nth year.

The above factor of influence, viz. $(1.\ op^n - 1)$, equals 10 within

50 years, in case of 5% investments;
63 years, in case of 4% investments;
83 years, in case of 3% investments.

"PROVIDED THAT THE RATE OF INTEREST IS HIGH, THE HAPPENINGS OF A MORE DISTANT FUTURE ARE IMMATERIAL TO THE INVESTOR."

The following is a synopsis of the preceding formulæ, wherein:—

p equals rate of interest.
n " number of payments.
m " duration of periodical intervals between two payments.
a " years after which a periodical rental is due for the first time.
R " rentals or payment.
V " pre-value.
N " aft-value.

		At the end (aft-value)	At the beginning (pre-value)
A sum of money equals		$V \times 1.0p^n$	$\frac{N}{1.0p^n}$
Summary of Temporary Rentals	Periodical Payments	$\frac{R(1.0p^{nm}-1)}{1.0p^m-1}$	$\frac{R(1.0p^{nm}-1)1.0p^{m-a}}{(1.0p^m-1)1.0p^{nm}}$
	Annual Payments	$\frac{R(1.0p^n-1)}{0.0p}$	$\frac{R(1.0p^n-1)}{0.0p \times 1.0p^n}$
Summary of Perpetual Rentals	Periodical Payments	∞	$\frac{R \times 1.0p^{m-a}}{1.0p^m-1}$
	Annual payments	∞	$\frac{R}{0.0p}$

No capitalist and no forester is forced to adopt a financial formula or equation when determining the merits of an investment. THE EQUATION MERELY ILLUSTRATES A LOGICAL MANNER OF FINANCIAL THINKING, WHICH IS GENERALLY ADOPTED BY THE INSURANCE COMPANIES, BANKERS, AND FAR-SIGHTED BUSINESS MEN.

PARAGRAPH III.—INCREASING OR DECREASING PRICES.

Stumpage prices are rising in America,—possibly at the rate at which the population increases, possibly faster,—promising to reach the present European level within a few decades of years. Consequently, stumpage now worth "S" dollars per thousand feet will be worth at "x%" rise, after "n" years, $S \times 1.0x^n$.

The present value of such stumpage, to be harvested after "n" years, is discounted backwards at "y" per cent. and amounts to

$$\frac{S \times 1.0x^n}{1.0y^n}$$

In place of this term, it is permissible to write:

$$\frac{S}{1.\ O(y - x)^n}$$

provided that "x" and "y" do not exceed, say, 8% and provided that the period of calculation does not exceed 100 years.

Mathematically, the substitution is incorrect; for practical purposes, however, it is permissible within certain limits.

If x equals 4.7%
and y " 3%
and n " 100 years,

the mistake made by the "short cut" equals 5.2%.

The mistake increases:

(1) With the increase of the price percentage (x) and discount percentage (y).
(2) With increasing discrepancy between price percentage (x) and discount percentage (y);
(3) With the increasing number of years (n).

Generally, the mistake does not exceed 5%. An advantage of the "short cut" is the larger scope it offers to financial imagination or to differences of opinion relative to the rise of stumpage prices or relative to the proper rate of discount. Thus, $\frac{S}{1.\ 03^n}$ might be interpreted as $\frac{S \times 1.\ 05^n}{1.\ 08^n}$ or as $\frac{S \times 1.\ 04^n}{1.\ 07^n}$ or as $\frac{S \times 1.\ 03^n}{1.\ 06^n}$

"THE BASAL RATE OF INTEREST IN AN EQUATION MAY NOT REPRESENT THE DIVIDEND WHICH THE OWNER EXPECTS TO DERIVE FROM HIS INVESTMENTS."

In the cases just given, the investor will realize 8% if stumpage prices rise at 5%; 7%, if they rise at 4%; 6%, if they rise at 3%; or only 3%, if the stumpage prices do not rise at all.

If the prices are increasing at the SAME rate at which the values are discounted backward, the summary of the pre-values is (for annuities as well as for intermittent rentals), $n \times R$.

m^{th} year: $R \frac{1.op^m}{1.op^m}$

$2m^{th}$ year: $R \frac{1.\ op^{2m}}{1.\ op^{2m}}$

Summary $= n \times R$.

Obviously, the summary of prevalues, in this case, is ∞ for indefinite rentals. It is unreasonable to suppose, that prices will ALWAYS rise and continue to rise.

The growth of trees expressed in dollars and cents is composed of the following factors:

A.—Increase of volume, due to the annual formation of a new ring or, better, of a new coat all over the old body.

B.—Increase of value, the larger diameter fetching a higher price per thousand feet board measure than the smaller diameter (difference in value of different sized logs at the same time).

C.—Increase of price (difference in price of the same sized logs at different times), due to an increase of population, to increased logging facilities and to waning supplies.

The forester speaks of the volume increment, the value increment and the price increment of a tree; and of the volume increment percentage "a%", the value increment percentage "b%", and the price increment percentage "c%" of a tree or of a forest.

Thus, a tree now worth "S" dollars is worth after "n" years $S \times 1.0a^n \times 1.0b^n \times 1.0c^n$; which term is almost equal to $S \times 1.0\ (a+b+c)^n$.

In the case of young and sound timber all percentages can be assumed to range between 1% and 4%.

In the case of primeval timber of large diameter, volume and value increment is insignificantly small. On the other hand, primeval timber is getting scarce so rapidly (walnut, cherry, white pine, yellow poplar, white oak) that a large price increment percentage can be depended upon.

Learn to differentiate between the merits of investments in first growth and of investments in second growth!!

An interesting case of a declining VALUE increment may be found in hickory poles at a time at which they begin to form heartwood; or in poplar poles at a similar time, when they begin to be less fit for match stock or for fibre.

An interesting case of declining PRICE increment (aside of panics, abandoned use of given woods, replacement of one species by another, change of tariff, export prohibition, Panama canal) may be found in small trees left by conservative lumbering. These trees had a better value BEFORE than AFTER the breaking up of the means of transportation.

PARAGRAPH IV.—RECEIPTS AND EXPENSES IN FORESTRY.

I.—The revenue in forestry may consist of:—

A.—Yields derived from sale or lease of forest pasture; from hunting privileges; from water privileges (power or reservoir); from mines, quarries, peat bogs, etc.; from turpentine and maple sugar orchards; from tan bark, cork, mosses, grasses, pharmaceutical herbs, litter, nuts, seeds and so on.

B.—Increasing volume of growing stock; increasing value of growing stock and of soil without any lumbering (so-called latent yields).

C.—Usually, during and after the installation period, yields obtained from sale of wood products, notably,

(a) Stumpage (French system);
(b) Log yards (German system);
(c) Manufactured products like lumber, staves, shingles, telephone posts, ties, blocks for carriages, pulp wood, tannin, fence posts, etc. (American system).

II.—Timber yields are ascertained by:—

A.—Cruising or valuation surveys.

B.—Yield tables (applicable only to even aged and pure forests, fairly well stocked).

C.—Volume tables (applicable only to sound trees).

D.—The increment percentage.

In the United States, reliable statistics relative to the growth of the forests —especially of second growth—and of the trees are badly lacking.

III.—Present timber values.

The present values of timber (stumpage values) depend, for a given species, on the expense now required for its utilization,—notably on the charges for transportation which are governed by:

A.—Distance from the market.

B.—Availability of water, ice, snow, railroads and public roads as means of transportation.

C.—Volume of stumpage per acre and volume on the entire tract.

D.—Quality of the logs (percentage of firsts and seconds, common, cull, mill cull, etc.).

E.—Climatic conditions (malarial climates, long and cold winters, short logging seasons).

F.—Specific gravity of timber.

In the far backwoods, stumpage even of the best trees frequently has a negative value. Near the market, even utterly poor trees assume a positive value.

IV.—Future Timber Values.

The study of future timber values is of paramount importance with the forestal investor. Similarly, the capitalist is interested in the advancing value of real estate, the coming dividends of railroad stock, etc.

He must consider

A.—For a country: The probability of a general change of timber prices due to:

a. Competition of metals and stone (building stone).
b. Waning virgin supplies.
c. Importations from Canada, the tropics and Europe.
d. Increasing population.
e. Coming prosperity or coming depression of all industries.
f. New uses of timber, especially in the spinning and weaving industries, in the food industries, in the production of alcohol.
g. Wages rising or dropping.
h. Gold standard.
i. Automobile traction.

B.—For a species: The possibility of price alterations in favor of or to the detriment of a species locally prevailing (chestnut in Pisgah Forest; spruce in the Adirondacks; cottonwood in Arkansas; remember laws causing the price of wood-alcohol to drop from 67c to 39c per gallon in 1907.)

C.—For a locality: The chances for improved access to a special market by improved railroads, improved navigation (Panama canal), and improved public roads; the chances for the opening of new local markets, or for enlarged foreign markets.

Opinions relative to future developments necessarily differ in forestry as well as in agriculture, railroading and industrial establishments. On exchange, such fluctuations and such diversity of opinion are particularly pronounced.

V.—The expenses in forestry are:

A.—Ordinary or running expenses, viz.,

1. Outlay for logging and milling;
2. Administrative expenses;
3. Taxes;
4. Protective expenses;
5. Maintenance of boundaries and land marks;
6. Natural or artificial reforestation (this expense equals, in Germany, from 10%—20% of the net stumpage values annually disposed of);
7. Forest pedagogy;
8. Up-keep of investments, notably of the means of transportation (this expense equals, in Germany, from 5% to 15% of the net stumpage values annually disposed of).

Many of these ordinary running expenses must be considered, during the installation period, as extraordinary investments.

B.—Extraordinary Investments.

1. Soil and, usually, trees.
2. Permanent means of transportation.
3. Wood working establishments.
4. Buildings, farms, pastures, ochards.
5. Surveys and working plans.
6. Fire lanes.
7. Fences for pastures, game, etc.
8. Afforestation.

All over the world, but especially so in the United States, the capital now invested in a forest is not that which promises to yield the highest rate of interest for the next period of years. The principal investment requires additions here and reductions there. The time at which alterations should be made depends upon local factors as well as upon personal opinion.

The components of the final investment in conservative forestry are those enumerated under B.—Naturally, there is no need for all of them to be at hand in every case. The share which each component takes or should take

in the aggregate investment, again depends upon local conditions and upon personal opinions.

Forest investments, in this connection, do not play any exceptional part. In agriculture, e. g., the final investments are composed of soil, improvements, roads, clearings, live stock, machinery, buildings, etc. Likewise, mining investments do not consist of mineral soil merely; but, in addition to soil, of machinery, buildings, railroads, shafts, etc.

A forest must be considered "normal" when the investment which it represents has reached, for the time being, in the owner's opinion, the highest stage of relative remunerativeness, with all of its (the investment's), components balancing in proper equilibrium. Naturally, the owner alone can decide whether this stage is actually reached or not.

PARAGRAPH V.—TAXES.

In America taxes usually depend upon the market value of a taxable object and amount, in the wooded states, to about 1% ad valorem of the same. If the market value "V" of a given forest grows at the annual rate of "x%" during "n" years, the taxes (theoretically at least) increase likewise at the rate of "x%". They accumulate at the rate of "p%" in such a manner as to amount, at the year "n", to the sum total

$$\frac{V}{100} \times \frac{1.0x^n - 1.0p^n}{1.0x - 1.0p} \times 1.0x \qquad (M)$$

Case I: x equals p

Then the aft-value of every single tax payment equals,

$$\frac{V}{100}\ (1.0x^n)$$

The summary of the aft-values equals

$$n \left\{ \frac{V}{100} \right\} 1.0x^n$$

or n% of the forest aft-value (which is $V \times 1.0x^n$).

Thus, if "n" equals 25, the taxes consume ¼ of the aft-value; if "n" equals 100, the taxes consume the entire aft-value.

Case II: x is smaller than p

Then $1.0x^n$ is much smaller than $1.0p^n$; the summary is much larger than

$$\frac{V}{100}\ (1.0x^n)$$ or much larger than

the $\frac{n}{100}$ part of the forest aft-value.

Thus, if "n" equals 25, the taxes consume more than ¼ of the aft-value; and if "n" equals 100, the taxes consume more than the entire aft-value.

Case III: x is larger than p

Here the taxes consume less than the $\frac{n}{100}$ part of the aft-value, e. g., if "n" equals 25, the taxes consume less than ¼ of the aft-value; and if "n" equals 100, the taxes consume less than the entire aft-value.

Deductions from the above:—

RULE I.

Destructive forestry is indicated where a long number of years is expected to elapse before a second cut can be obtained; where taxation ad valorem is high; where the value of the forest grows slowly (x being smaller than p).

RULE II.

The forester, bent on forest conservation, must endeavor to shorten the period of waiting between cuts by leaving sufficient stumpage and sufficient means of transportation to allow of frequent cuttings within the same forest.

RULE III.

The damaging effect of taxation depends pre-eminently on the period of waiting; the rate of interest being more irrelevant, "x" being usually equal to or close to "p". After the wholesale removal of the primeval forest, the period of waiting is excessively long. The forester's activity should be called upon before and not after the first inroads of the axe into the primeval woods.

PARAGRAPH VI.—PROTECTIVE EXPENSES.

The influence exercised on the prospects of conservative lumbering by expenses for forest protection is analogous to the influence of taxes. The decision whether and what protection should be given to a forest, solely rests with the owner.

The following may illustrate the influence of the protective expenses on a forest conservatively managed:

FIRST. An unprotected forest, "V", may yield an annual net surplus revenue "R" as long as it escapes fires and theft.

$$\frac{R}{V} \text{ equals } \frac{y}{100} \quad \text{or} \quad 100R \text{ equals } yV$$

SECOND. Sacrificing annually "D" dollars for protection, the owner retains a revenue, "R — D", and the interest percentage "y" is reduced to "z" per cent., whilst "V" remains much unchanged as long as no fire happens to occur.

$$\frac{R - D}{V} = \frac{z}{100}$$

THIRD.

Hence $$\frac{R}{R - D} = \frac{y}{z}$$

and $$\frac{D}{R} = \frac{y - z}{y} \qquad (N)$$

FOURTH.

If D equals s% of R then

Rs equals 100D and

$$\frac{s}{100} = \frac{y - z}{y} \qquad (O)$$

FIFTH.

For "y" ranging from 2% to 8% and for "s" ranging from 5% to 30%, the percentage of net revenue "z" is reduced as appears in the table following:—

s equals	5%	10%	15%	20%	25%	30%
y equals 2	1.9	1.8	1.7	1.6	1.5	1.4
y " 3	2.85	2.7	2.55	2.4	2.25	2.1
y " 4	3.8	3.6	3.4	3.2	3.0	2.8
y " 5	4.75	4.5	4.25	4.0	3.75	3.5
y " 6	5.7	5.4	5.1	4.8	4.5	4.2
y " 7	6.65	6.3	5.95	5.6	5.25	4.9
y " 8	7.6	7.2	6.8	6.4	6.0	5.6

In the case of a forest which does not yield an annual surplus revenue, the influence of the protective expenses is somewhat different from the above, as is illustrated by the following considerations:—

FIRST. Such a forest "V" grows in "n" years at "x%" to a value of $V(1.0x^n)$ wherein "V" equals the sale value.

SECOND. The same forest "V" protected at an annual expense of "w"% shows a net aft-value, omitting the influence of taxes, etc.

$$V(1.0x^n) - V\frac{w}{100}\left\{\frac{1.0p^n - 1}{0.0p}\right\} \qquad (P)$$

where "p" equals the per cent. of capitalization selected by the owner.

THIRD. The sacrifice brought by the owner for protection's sake is:

$$V\frac{w}{p}(1.0p^n - 1) \qquad (Q)$$

FOURTH. If the ratio $\frac{w}{p}$ equals $\frac{1}{4}$, then the sacrifice equals $\frac{V}{4}(1.0p^n - 1)$

If the ratio $\frac{w}{p}$ equals 1/10, then the sacrifice equals $\frac{V}{10}(1.0p^n - 1)$

Absolutely taken, the sacrifice greatly increases with the length of the period of waiting. Relatively considered, the sacrifice does not increase necessarily.

p equals 4% x equals 5%

n	1.04^n-1	Sacrifice $\frac{w}{p}=\frac{1}{4}$	Sacrifice $\frac{w}{p}=\frac{1}{10}$	1.05^n	to find z $\frac{w}{p}=\frac{1}{4}$		$\frac{w}{p}=\frac{1}{10}$	
					$1.0z^n$	z	$1.0z^n$	z
10 yr.	.48	.12V	.05V	1.63	1.51	4.0	1.58	4.75
20 "	1.19	.30V	.12V	2.65	2.35	4.3	2.53	4.75
30 "	2.24	.56V	.22V	4.32	3.72	4.5	4.10	4.8
40 "	3.80	.95V	.38V	7.04	6.09	4.6	6.66	4.8
50 "	6.11	1.53V	.61V	11.47	9.94	4.7	10.86	4.85

The figures in the last and third last columns give the rate of interest produced in a forest protected at an annual expenditure of w% of its original value.

y equals the rate of interest produced in the unprotected forest as long as all goes well.
s " per cent. of revenue sacrificed for protection.
V " the original sale of the forest.
n " number of years that elapse before the forest is cut.
x " rate at which the forest grows in value, if fires are barred.
p " rate of interest expected by the owner.
w " per cent. of the original value spent annually for protection.
z " rate of interest produced in the protected forest.

PARAGRAPH VII.—CAPITAL AND MONEY.

A.—Any object or thing having earning power is a capital. By "earning power" is understood the power to furnish commodities coveted by man.

B.—"Money" is not "capital"; it is merely the "legalized measure of values", and hence frequently the measure of "capital". Different countries legal-

ize or use different units of measure, and within the same country, time causes the unit to vary (cattle in the United States; platinum in Russia; silver in some of the Latin countries; glass pearls with the Indians; courie shells with the Siamese).

Money, in other words, is nothing but a unit of measuring, having functions like those of the yard, the bushel, the pound (all being subject to fluctuations) to wit, the functions of measuring.

C.—All production originates with nature, and all capital consists, in part, of natural creations or natural objects, namely:

1. Natural gifts (soil and soil products);
2. Natural forces (wind, water, fire, gravity, electricity, heat, rainfall).

D.—Accumulated human labor forms, usually, a part of a capital actually producing (field, wind mills or water mills).

E.—Merely natural capitals to which no human labor (accumulated) is attached, are usually unproductive; although their earning power might be at hand (most of our waterfalls; the prairies a century ago).

Mines and fields, without the addition of accumulated labor, cannot prove their earning power. The forest and the pasture—under certain conditions at least and for limited periods—may create new commodities without requiring labor to be previously performed.

F.—As long as the population increases, the individual's share in the "gifts" and in the "forces" of nature—especially in the gifts—DECREASES and the units of such gifts and forces increase in value.

On the other hand, capital consisting largely of accumulated human labor depreciates under the same circumstances.

The more a capital consists of— {natural / man-made} —components, the better are its chances to gradually— {rise / sink} —in (exchange) value.

Rule a. As long as capital, labor, population and money in circulation remain the same, values remain the same.

Rule b. If capital alone decreases (population, labor and money stagnating) less products are available and $1.00 can buy less products or less capital than heretofore. (This rule holds good, especially, in the case of the necessities of life.)

Rule c. If population alone grows (capital and money stagnating), $1.00 can buy less natural products or capital than heretofore and can buy more man-made capital or products than heretofore (since labor is cheapened).

Rule d. If money alone increases (population and capital stagnating), $1.00 can buy less products, labor or capital than heretofore.

As a matter of fact, population and circulating money are on the increase in the United States, whilst capital consisting of natural gifts is decreasing and whilst capital consisting of natural forces remains the same.

H.—All economic factors combine as a consequence to continuously lessen the purchasing power of the dollar in the United States. The legalized

measure of value getting shorter in its effect, the number of units of value (or dollars) equalling a capital or a product increase necessarily.

I.—Gold.

The world's production of gold (the money of the leading nations) has increased and continues to increase at an alarming rate. This increase has had the tendency, unavoidably, of cheapening gold, or of reducing its power to purchase other goods.

If man were actually to realize the enormous increase of the production of gold, the decline of its purchasing power would be more patent—it would become acute.

A commodity (gold is a commodity like silver or iron or wheat, after all) drops in value at a time when it is known (or supposed) to be produced in excess of the demand;—not at a time when it actually happens to be excessively produced.

In the case of gold, in the author's opinion, mankind has not begun to realize the enormous increase of the supply; and it is far from anticipating a still more gigantic increase of the supply in the near future at a time when new technical and chemical methods of "gold making" come into play.

A demoralizing "slump" in our entire monetary system is unavoidable as soon as gold can be produced at a greatly reduced expense of labor. The knowledge of a slight over-production causes the price of cereals and cotton and lumber to decline perceptibly; similarly, the knowledge of a slight excess production of gold must cause its depreciation.

In the past decades, this depreciation has been prevented by a number of countries rapidly adopting the gold standard and accumulating gold in their treasuries.

In the future, this depreciation must be marked. If the purchasing power of gold decreases at the rate of 2% per annum (and the author anticipates a more rapid decline), the consequences will be:

a. for the possessor of bonds, mortgages, life insurance policies, etc., a heavy loss of capital as well as of interests.
b. for a "country of bondholders", and therefore pre-eminently for European countries, heavy losses;
c. for "countries of stockholders", and countries rich in pastures and forests and farms, a decided superiority over others not so blessed.

A man owning 4% bonds rated at par will do well—if he desires to remain equally wealthy—to consume not over ½ of the interests obtained and to re-invest the other ½ with a view to counterbalancing the tendency of gold to depreciate.

Conclusions.

A man owning $100,000 cash in 1908 is less wealthy than the man owning the same amount in 1898.

A man who has let out, in 1898, $100,000 and who has consumed in the meantime all interest derived therefrom, is getting less wealthy. He should have saved a portion of the interest actually obtained adding it to the original $100.000.

On the other hand, a man letting out, in 1898, 10,000 acres of land and retaining them in 1908 in equal productiveness, is absolutely as wealthy now as before; relatively wealthier than before, although he was allowed to consume all interest or revenue obtained from the lease.

PARAGRAPH VIII.—INTEREST.

I.—Definitions.

A.—Interest (gross) is the price paid for the use of capital.

B.—As freight is the price of "site-difference", so is interest the price of "time-difference".

C.—Net interest is the difference of a capital's "earning power" at the beginning and at the end of a season plus the value of the product in the meantime produced by capital and not by labor.

D.—Interest may mean either the net or the gross product of capital, i. e., of any object having earning power.

E.—The price of the use of labor equals the value (of product, or of capital) which the employer hopes to create thereby.

The price of the use of capital equals the value (of product, or of new capital) which the employer hopes to create thereby.

F.—Interest is the product of capital; its price is the price of the product! In loans of capital, it is usual to loan the "measure of capital" (gold) and to turn over to the owner thereof the "measure of the product" (gold.)

The borrower may use a loan to pay WAGES and in that case he ACTUALLY borrows LABOR, reconverting "ACCUMULATED" labor into "RUNNING" labor.

II.—Gross Interest on Money Loans.

This is the product of capital employed in another man's production. It consists of the following parts:—

a. The true, net, actual, clear yield of capital "(¶a)".

b. "Risk quota", or remuneration for risk taken, or capital secretly repaid, or capital apt to be consumed in the course of the production. This quota is meant to rebuild that much of the origina capital as is liable to incidental destruction "(¶b)".

c. Remuneration for labor, financial sagacity and discomforts required from the owner in harvesting the yield of capital "(¶c)".

d. Quota which must be saved and added to the original in order to allow the owner to remain equally wealthy whilst the purchasing power of money declines "(¶d)".

The investing capitalist invariably over-estimates the true or net yields of his investment (¶a) and proceeds to consume (¶b) and (¶d).

Few families remain equally "wealthy" in the long run excepting those owning entailed real estate.

III.—Interest on merely natural investments (farms) consists of "(¶a)" and of "(¶c)". The risk "(¶b)" is little since the soil, at least, is safe. There is no "(¶d)".

IV.—Interest on capital consisting of accumulated labor has a very large "(¶b)". This is proven by the following:—

1. It can be outranked and reduced in value by other and better labor-accumulations (e. g., sulphite fiber process superseding soda fiber process; Southern cotton factories outranking Northern cotton factories; steamships superseding sailing craft).
2. The real necessities of life are more a soil product than a labor product. In the case of unnecessary articles, fashions and inventions cause continuous fluctuations of the remunerativeness of the investments producing such unnecessary articles.
3. If a production, basing largely on accumulated labor, is found to be remunerative, it is at once overdone; and competition kills the yields (e. g., bicycle manufacturing).
4. Labor-made capital (machinery) is usually consumed in the course of the production.

V.—It may be said that no man who wishes to be on the safe side, on an average, should annually consume over 2% on his investment; or that no man should rate the true earning power of his investment at a figure exceeding 2%.

The financial genius, of course, can do better and can credit himself with a large "(¶c)"; he foresees the development of the future correctly; at an outlay of $1,000, for instance, he creates or acquires a capital producing $100 of true net "(¶a)", which is worth $5,000. Thus, he owns five times as much as before at the end of the production.

Theoretically, the genius obtains wealth by buying productive capital actually under-rated by the majority of the owners, and by selling productive capital actually over-rated by others. The blunderers foresee the coming events wrongly; they sell on a rising market, and they buy on a falling market.

During the year, the investors change their opinion frequently, relative to the outlook of the future; hence continuous fluctuations on exchange. The ratings placed by two men on the same investment coincide in rare cases only; hence few transactions on exchange, a trade being made only when two men happen to agree.

VI.—Additional factors influencing the rate of interest:—

1. Unhandy credit systems;
2. Partial or slow courts;
3. Danger of foolish legislation;
4. Amount of indestructible assets.

The factors 1, 2 and 3 increase, and the factor 4 decreases the rate of interest.

The rate of interest charged for loans and bonds increases whenever the industries prosper. The available money is then withdrawn from loans and put into industrial engagements.

VII.—Limits of Interest.

1. The lowest limit is the figure at which the owner prefers to hide or consume his belongings.

2. The upper limit is the actual effect of the investment for which means and bounds do not exist. If the investment cannot be duplicated (Standard Oil), the rate of interest becomes a personal matter being governed by the capitalization which the owners choose to adopt.

VIII.—The net or true interest

1. has the tendency of equalization
   A. in loans, because interest is merely the price of such loans resembling the price of any other commodity;
   B. in investments, because universally remunerative investments are soon over-crowded by competition where duplication is possible. Where this is not possible, there abnormal revenue is at once capitalized, the new capital value being added to the original ("watered investments");
2. has the tendency of sinking because the wealth of the nations is rising at a faster rate than the chances at remunerative employment of wealth.

IX.—Justification of Interest.

1. The Church, since 325 A. D., has condemned interest after Luke VI: 35. In the early Christian era, loans for consumption only were known, not loans for production.
2. After Adam Smith, the capitalist would not care to take any risk, temporarily parting with the full control of his property, if he did not see any inducements.
3. After Senior, interests are payments due to the owner for abstaining from the immediate consumption of his property.
4. After Marx and La Salle, interest is cut-off from the wages properly belonging to the wage earner.
5. Merely natural capitals (deer, buffalo, trees, grass lands) produce annually. Thus, interest on capital is natural,—is part of the economy of nature.

X.—Rate of Interest in Forestry.

1. Conservative Forestry.
   a. There is no "(¶b)" or "(¶d)" to be deducted from the gross rate of interest, since there is no risk and no influence on the investment due to the declining purchasing power of money.
   b. The rate of interest compares favorably with agricultural interest because the products of the forest can be stored free of cost, and are exposed but little to drought, inundation, boll weevil, etc. If the products are killed by storm, fire and insects, forestry can bring them to the market, usually, at a scarcely reduced price (see American Lumberman, September 19, 1908).

The rate of true interest in conservative forestry is about $2\frac{1}{2}\%$ (in Saxony, on an average for the year 1905, $2\,{}^{4}/_{10}\%$; see Thar. Forst Jahrbuch, 1907, 1st issue.) and compares very favorably with 4% on bonds and 6% on industrial investments.

2. Destructive Forestry.

The net revenue cannot be separated easily from the capital gradually withdrawn from the forest. If only soil (S) remains after complete exhaustion, within (n) years, of a forest of the original value (Q) whilst surplus receipts, R_1, R_2, R_3, etc., are obtained during the (n) years of destructive lumbering, then the rate of interest, (x), is illustrated by the following equation:—

$$Q \times 1.0x^n = R_1\ (1.0x^{n-1}) + R_2\ (1.0x^{n-2}) + R_3\ (1.0x^{n-3}) + \ .\ .\ .\ R_n + S.$$

XI.—Saxon Statistics show:—

1. That the State forests have paid, since 1816, 2% net on the annual average.
2. That the money value of the forest, since 1816, has risen by 3% on the annual average, a rise largely due to the declining purchasing power of gold and partly due to improvements and additional investments.

XII.—The decision in the problem confronting the owner: "Shall I practice conservative forestry or destructive forestry?" must be based on the true rate of net interest obtainable from the one and from the other. It remains for the forester to demonstrate the difference between net interest and gross interest.

The chances for conservatism in forestry to be superior to radicalism are, on the whole, extremely good and especially so in the United States, since

1. The American lumber market is almost continuously overstocked beyond its digestive capacity. The virgin supplies are being exhausted, and are apt to be entirely exhausted by 1950. In the meantime the stumpage prices of all good timber must increase steadily.
2. It must be remembered that the now wealthy lumbermen have made their wealth by buying stumpage when and where it was undervalued and by holding it for a number of years. Fortunes have never been made by any particular skill in lumbering, milling or sale of lumber.

Strange as it may sound: Inactivity has paid better in the case of investments in American forestry than hard work spent in lumbering and milling.

There is no reason to anticipate that the future will materially differ from the past.

XIII.—Interpretation of the rate of interest on which a calculation is based:

1) The sum $\frac{X}{1.op^n}$ may mean

   a) that the calculator expects with a faith in his forecasts expressed by p% receipts or expenses (X) to occur (n) years from date of calculation, or

   b) that the calculator expects, with a faith in his forecasts approximated by $(p \mp y)$, receipts or expenses

   $\frac{X}{1.oy^n}$ or $X \times 1.oy^n$

   to occur n years from date of calculation.

This possibility of interpretation allows of the expression of widely different forecasts by a mere change of the rate of interest underlying the calculation. The basal rate underlying an equation does not or need not designate the actual dividend expected by the calculator. It is the mathematical outcome of his fears and his hopes, of gloomy and of rosy anticipations.

PARAGRAPH IX.—EXPECTATION VALUE.

The actual value of any object to its owner, or to anybody else (cow, house, railroad bonds, mining stock) equals the pre-value of the expected services or yields, diminished by the pre-value of the expected expense required to obtain such services or yields. Obviously, the rate of discount is of paramount importance relative to the result of the calculation. "Individual opinion" governs the rate of discount as well as the anticipations of future events.

Values rise with the expectation of rising yields, of sinking expenses and or reduced rates of interest, and vice versa. Obviously, the selection of the rate of interest, and the forecasts of future yields and expenses, depend, above all, on personal opinions which may be pessimistic or optimistic, bearish or bullish.

Applied to forestry, we find the following expectation values:

1. Value of a regular second growth forest (m) years old:

$$\frac{thn_a}{1.0p^{a-m}} + \frac{thn_b}{1.0p^{b-m}} + \frac{thn_c}{1.0p^{c-m}} + \frac{f.c. + s.v. + V}{1.0p^{r-m}} - V$$

wherein thn_a, thn_b, thn_c stands for thinnings in the year a, b, and c of the forest; f.c., for value of final cut; s.v., for soil value after final cut, and V for a perpetual rental defraying taxes and administrative expenses reduced by annual receipts for leases, etc.

2. The value of bare, absolute forest soil, planted up at an expense of "plg" and weeded at an expense of "weed" equals

$$\frac{thn_a \times 1.0p^{r-a} + thn_b \times 1.0p^{r-b} + f.c. - plg - weed \times 1.0p^{r-m}}{(1.0p^r - 1)} - V - plg$$

3. The value of an ideal forest in which all age classes are present, which is conservatively managed, close to a ready market (so that in every year of the future there may be obtained a yield from a thinning in a woodlot "a", "b", "c" years old and also a final yield diminished by reforestation expenses, whilst the expense of administration is annually "v" for the entire forest) amounts to

$$\frac{thn_a + thn_b + thn_c + (f.c. - pltg) - v}{0.0p}$$ in which

thn equals thinnings
p " rate per cent.
f.c. " final cut
pltg " planting.

$\frac{R}{C} = \frac{p}{100}$.

PARAGRAPH X.—SALE VALUE OF WOODLANDS IN U. S.

It is customary to buy timberland merely at the price of the stumpage standing thereon. The purchaser neglects:

Negative factors

1) that he can not cut all of the timber at once; and such parts, as he cuts only after some years, should not be assessed at full value;
2) that taxes, etc., accrue, whilst the timber is cut gradually;
3) that an expense for legal and timber investigations must be covered;
4) that timber values might be destroyed by fire;
5) that there is danger of fool-legislation against alien corporations.

Positive factors

a) that soil has value;
b) that stumpage prices (and merchantability, hence volume) will increase;
c) that there is a second growth already at hand;
d) that local means of transportation increase;
e) that taxes might be decreased, and that protective legislation will come;
f) that freight rates decrease;
g) that population increases, also demand;
h) that new uses are found for wood;
i) that investments in forestry are remarkably safe, compared with stocks, bonds, etc.
j) that the agricultural value of the soil increases, absolute forest soil becoming absolute farm soil, as the years go by;
k) that forest pasture, chase, minerals (rock, clay), waters and water-powers promise an increasing revenue.

PARAGRAPH XI.—GAUGING THE MERITS OF AN INVESTMENT.

The success of a business (in farms, mines, forestry) is evidenced by its net gains.

Expenses and yields can be compared either by forming their difference which comparison shows an "entrepreneur's" gain or loss; or by forming their ratio which method shows the actual dividend obtained from the business.

I.—Entrepreneur's gain and loss.

Influencing factors are:—

a. Lapse of time.
b. Constellation of economic conditions.
c. Personal foresight.
d. Rate of interest introduced into the calculation.

An undertaker's gain may be figured out retrospectively or prospectively.

An undertaker's gain is fictitious until, the property changing hands, it can be demonstrated to be a fact.

The undertaker's gain or loss disappears when the financier introduces a rate of interest at which the discounted expense equals the discounted yields.

II.—The forest dividends show what actual rate of interest the owner has made in the past or may earn in the future on his investments. The actual rate of interest introduced in the financial equation causes any undertaker's gain to vanish.

The forest dividend is deeply influenced by the price increment of trees (improved means of transportation; enlarged markets, etc.)

In the forest, it is difficult to distinguish between actual revenue drawn from the forest and capital withdrawn, since the trees are capital as well as product. In conservative forestry, careful stock taking is required periodically, so as to show the actual status of the investment.

PARAGRAPH XII.—MATURITY OF TREES.

I.—In the botanical sense, wood fiber is mature almost after the conception of the cell.

A tree 3 inches in diameter is physiologically just as mature as a tree 3 feet in diameter.

The highest stage of botanical maturity is the so-called heartwood.

II.—From the people's standpoint, timber must be considered mature at a time at which it is best adapted to general usage in the wood consuming industries. The older the tree gets, the larger is, on the whole, its diversity of utility. The rotation best adapted to supply the industries of a country is called the "technical rotation".

III.—The sylviculturist regenerating the forest from self-sown seed cannot select a rotation which does not allow the trees to profusely propagate their kind. In coppice woods, since the sprouting capacity decreases with increasing diameter, the rotation must be so low as to allow of luxuriant production (sylvicultural rotation).

IV.—From the financial standpoint, trees or forests must be considered mature when the net true interest obtained from them ceases to bear a sufficient ratio to the sale value of such trees or forests.

Wherever the woods are stocked with even aged and even sized trees, all of the trees reach maturity at or about at the same time.

The primeval woods of America do not exhibit, usually, such even aged conditions. The American forester had better speak of the maturity of trees than of the maturity of forests.

Factors influencing the maturity of trees in America are, pre-eminently:—

a. The price increment, which, in the case of large trees, far exceeds the volume increment and value increment. Stem analyses and volume tables are of little value, consequently, for the financial diagnosis of primeval trees.

b. Means or arteries of transportation and the permanency of their character. Where the means of transportation are considered as a permanent investment and not as a temporary expense to be reimbursed by current operations, a higher age of maturity results naturally.

c. In many cases the taxes per acre are not or are scarcely influenced by the severity of the cut. Here it is irrelevant, from the tax payer's standpoint, whether he proceed to log certain sizes or kinds of trees or not. Where, on the other hand, taxes are changed according to the stumpage found per acre, the standing tree must be charged with that much of the tax per acre as corresponds with its individual contents. Take, e. g., a forest of white pine containing 5,000 ft. per acre consisting of 12 trees averaging 400 ft. b. m., taxed at 30 cts. per acre. The soil has little value. A tree containing 400 ft. b.m. must annually defray $\frac{.30 \times 400}{5000} = .024$, which expense of .024 must be charged against the tree and must be defrayed from the annual increase, if any, of the value of the tree.

d. Trees acting as mother trees propagating their kind should be credited with the prospective value of the progeny produced by them, on an average. On the other hand, trees acting like weeds and retarding the growth of a younger progeny of seedlings and saplings beneath them must be charged with the loss of prospective increment incurred by such second growth.

e. Since protective and administrative expenses are governed more by area than by the density of the stands, it is necessary in rare cases only to charge a pro rata of the protective and administrative expenses against the individual tree. These expenses incumber the soil like prescriptive rights.

f. The question of maturity is a question to be answered in the first and last instance by the owner who is governed by his personal attitude regarding the rate of interest obtainable from his investment; by the prospects of price increment as they appear to him and by personal moments like the lack of cash to defray running expenses, mortgages, etc.; chance of remunerative investment elsewhere; desire to distribute risks; tastes and predilections.

Trees of defective character infested by insects or fungi have reached maturity, generally speaking, since the spread of the disease checks their financial increment, and may cause the increment to be negative.

V.—In Europe the following number of years denote, on an average, the maturity of timber: pine 100 yrs.; spruce 90 yrs.; fir 120 yrs.; beech 120 yrs.; oak 160 yrs.; oak coppice 18 yrs.; willows 1 and 2 yrs.

In America, naturally, fixed rotations have not been adopted, since the cutting takes place, usually, in the primeval woods. In Virginia, a second and third growth of pine is cut under a rotation of about 60 years. Catalpa

is coppiced under a rotation of about 10 years. The very prime trees, notably hardwoods, of a primeval wood are immature from a financial standpoint, if the owner believes that the greatest advance in prices will come to them, such giants getting rare and more rare, year by year.

In many cases, the price of inferior stumpage does not promise to rise as much as the price of prime stumpage. On the other hand, in many a case, the indicating percentage of trees promising a large percentage of "cull lumber" is manifestly superior to that of trees containing a large percentage of "fas lumber".

In Europe, the question of maturity is largely a question of age or (which is almost the same) of diameter. In America, on the other hand, the question is one of conditions—condition of transportation, danger from fire, condition of health, the chances for their improvement or deterioration. Thus, a diameter limit or age limit can scarcely denote maturity. The American forester in charge of large districts is confronted many a time with the necessity of treating individual trees according to their financial merits, whilst his European colleague in charge of small ranges has to deal with even aged aggregates resulting from second growths.

VI.—The term "indicating percentage" denotes the current dividend obtainable from a tree or woodlot. This percentage indicates the maturity of a tree or of a woodlot.

A tree or woodlot is mature and should be removed when it ceases to yield (latently, of course) the dividend desired by the owner.

The owner or investor discards an investment in forestry as well as in stock when the dividend seems to fall below the limit obtainable by him in other enterprises of similar safety. If he discards at the right time, he will make money; and otherwise not.

In the following remarks, the indicating percentage is called "x"; the forest percentage denoting the "limit" just mentioned is called "p".

Previous to maturity, "x" is larger than "p"; at maturity, "x" equals "p"; after maturity "x" is smaller than "p".

The indicating percentage of a woodlot, for a period of 10 years, is as follows, if the stumpage is now worth "S.S." dollars; if it is worth, after ten years, "$S.S_{10}$"; if the cleared soil is worth "C" dollars; if administration and taxes are "v" dollars per annum, forming an administrative capital "V":—

$$(SS + C + V)\ 1.0x^{10} = SS_{10} + C + V \qquad \text{or}$$

$$(SS + C)\ 1.0x^{10} + v\frac{(1.0x^{10} - 1)}{0.0x} = C + SS_{10}$$

According to Krafft, the indicating percentage had better be considered as a dividend on stumpage merely whilst the soil and the administrative capital should yield the forest dividend required by the owner.

Krafft's "x" is more sensitive than the "x" commonly applied since it bears a ratio to part of the investment only. Krafft's "x" is found as follows:—

$$SS \times 1.0x^{10} + (C + V)\ 1.0p^{10} = SS_{10} + C + V$$

In conservative logging when a portion only of the trees are removed from every acre, the indicating percentage had best be considered as a tree dividend.

Whether and how much of the taxes and administrative expense (e) should be charged to the tree, depends upon the local circumstances. Trees occupying soil and preventing, by their presence, a second growth from developing, must be charged with the interest on the value of the soil thus occupied.

On the other hand, trees acting as mother trees must be credited with the value of the progeny resulting from their presence.

The tree indicating percentage might be expressed, adopting Krafft's method, as follows:

$$T_0 \times 1.0x^n + e\,\frac{(1.0p^n - 1)}{0.0p} + (\text{soil})\ 1.0p^n = T_n + \text{soil} + \text{value of progeny}$$

in which "T_0" equals the tree value now. Where the forest stocks on agricultural soil, all trees unable to defray the interest on such valuable soil, appear to be mature, or hypermature.

VII.—The forester making a working plan for pine and spruce woods is usually confronted by the question of the best diameter limit. The plan advises the owner as to the limit yielding the highest entrepreneur's gain or the highest forest dividend.

The heavier the present cut, the smaller is the investment left, whilst the protecting expenses remain the same. On the face of it, it seems unwise to cut clear without considering the financial prospects of trees which might be left on the ground, having 10″, 12″, 14″, etc. in diameter. Obviously, the logging expenses per M feet b. m., are smaller in the case of heavy cutting, than in the case of light cutting, particularly so when the logger must avoid any damage to the trees left standing.

Again, obviously, the longer the period of waiting for a second cut, the less are the chances for a good return from conservative logging.

The diameter limit might be tested either with the help of the indicating percentage or by the method of the entrepreneur's gain.

INTEREST TABLES

(EXPLANATORY)

Column I indicates the number of years.

Column II gives the present value of $1.00 due at the end of the number of years indicated in column I.

Column III gives the present value of $1.00 per annum due every year during the period of years indicated in column I.

Column IV gives the aft-value of $1.00 left invested for the number of years indicated in column I.

Column V gives the aft-value of $1.00 payable annually and left invested for the number of years indicated in column I.

I	II	III	IIII	V
1	.9950	.9950	1.0050	1.0000
2	.9901	1.9851	1.0100	2.0050
3	.9851	2.9702	1.0151	3.0150
4	.9802	3.9505	1.0202	4.0301
5	.9754	4.9259	1.0253	5.0503
6	.9705	5.8964	1.0304	6.0755
7	.9657	6.8621	1.0355	7.1059
8	.9609	7.8230	1.0407	8.1414
9	.9561	8.7791	1.0459	9.1821
10	.9513	9.7304	1.0511	10.2280
11	.9466	10.6770	1.0564	11.2792
12	.9419	11.6189	1.0617	12.3356
13	.9372	12.5562	1.0670	13.3972
14	.9326	13.4887	1.0723	14.4642
15	.9279	14.4166	1.0777	15.5365
16	.9233	15.3399	1.0831	16.6142
17	.9187	16.2586	1.0885	17.6973
18	.9141	17.1728	1.0939	18.7858
19	.9096	18.0824	1.0994	19.8797
20	.9051	18.9874	1.1049	20.9791
21	.9006	19.8880	1.1104	22.0840
22	.8961	20.7841	1.1160	23.1944
23	.8916	21.6756	1.1216	24.3104
24	.8872	22.5629	1.1272	25.4320
25	.8828	23.4456	1.1328	26.5591
26	.8784	24.3240	1.1385	27.6919
27	.8740	25.1980	1.1442	28.8304
28	.8697	26.0677	1.1499	29.9745
29	.8653	26.9330	1.1556	31.1244
30	.8610	27.7941	1.1614	32.2800
31	.8567	28.6508	1.1672	33.4414
32	.8525	29.5033	1.1730	34.6086
33	.8482	30.3515	1.1789	35.7817
34	.8440	30.1955	1.1848	36.9606
35	.8398	32.0354	1.1907	38.1454
36	.8356	32.8710	1.1967	39.3361
37	.8315	33.7025	1.2027	40.5328
38	.8274	34.5299	1.2087	41.7354
39	.8232	35.3531	1.2147	42.9441
40	.8191	36.1722	1.2208	44.1588
41	.8151	36.9873	1.2269	45.3796
42	.8110	37.7983	1.2330	46.6065
43	.8070	38.6053	1.2392	47.8306
44	.8030	39.4082	1.2454	49.0788
45	.7990	40.2072	1.2516	50.3242
46	.7950	41.0022	1.2579	51.5758
47	.7910	41.7932	1.2642	52.8337
48	.7871	42.5803	1.2705	54.0978
49	.7832	43.3635	1.2768	55.3683
50	.7793	44.1428	1.2832	56.6452
55	.7601	47.9782	1.3156	63.1200
60	.7414	51.7020	1.3488	69.7600
65	.7231	55.2764	1.3829	76.5800
70	.7053	58.9364	1.4178	83.5600
75	.6879	62.4745	1.4536	90.7200
80	.6710	65.7988	1.4903	98.0600
85	.6545	69.1099	1.5280	105.6000
90	.6383	72.3268	1.5665	113.3000
95	.6226	75.4747	1.6061	121.2200
100	.6073	78.5449	1.6467	129.3400
105	.5923	81.5306	1.6882	137.6400
110	.5777	84.4531	1.7309	146.1800
115	.5635	87.2985	1.7746	154.9200
120	.5496	90.0736	1.8194	163.8800

I	II	III	IIII	V
1	.9901	.9901	1.0100	1.0000
2	.9803	1.9704	1.0201	2.0100
3	.9706	2.9410	1.0303	3.0301
4	.9610	3.9020	1.0406	4.0604
5	.9515	4.8534	1.0510	5.1010
6	.9420	5.7955	1.0615	6.1520
7	.9327	6.7282	1.0721	7.2135
8	.9235	7.6517	1.0829	8.2857
9	.9143	8.5660	1.0937	9.3685
10	.9053	9.4713	1.1046	10.4622
11	.8963	10.3676	1.1157	11.5668
12	.8874	11.2551	1.1268	12.6825
13	.8787	12.1337	1.1381	13.8093
14	.8700	13.0037	1.1495	14.9474
15	.8613	13.8651	1.1610	16.0969
16	.8528	14.7179	1.1726	17.2579
17	.8444	15.5622	1.1843	18.4304
18	.8360	16.3983	1.1961	19.6147
19	.8277	17.2260	1.2081	20.8109
20	.8195	18.0456	1.2202	22.0190
21	.8114	18.8570	1.2324	23.2392
22	.8034	19.6604	1.2447	24.4716
23	.7954	20.4558	1.2572	25.7163
24	.7876	21.2434	1.2697	26.9735
25	.7798	22.0232	1.2824	28.2432
26	.7720	22.7952	1.2953	29.5256
27	.7644	23.5596	1.3082	30.8209
28	.7568	24.3164	1.3213	32.1291
29	.7493	25.0658	1.3345	33.4504
30	.7419	25.8077	1.3478	34.7849
31	.7346	26.5423	1.3613	36.1327
32	.7273	27.2696	1.3749	37.4941
33	.7201	27.9897	1.3887	38.8690
34	.7130	28.7027	1.4026	40.2577
35	.7059	29.4086	1.4166	41.6603
36	.6989	30.1075	1.4308	43.0769
37	.6920	30.7995	1.4451	44.5076
38	.6852	31.4847	1.4595	45.9527
39	.6784	32.1630	1.4741	47.4123
40	.6717	32.8347	1.4889	48.8864
41	.6650	33.4997	1.5038	50.3752
42	.6584	34.1581	1.5188	51.8790
43	.6519	34.8100	1.5340	53.3978
44	.6454	35.4554	1.5493	54.9318
45	.6391	36.0945	1.5648	56.4811
46	.6327	36.7272	1.5805	58.0459
47	.6265	37.3537	1.5963	59.6263
48	.6203	37.9740	1.6122	61.2226
49	.6141	38.5881	1.6283	62.8348
50	.6080	39.1961	1.6446	64.4632
55	.5786	42.1430	1.7284	72.8400
60	.5505	44.9521	1.8166	81.6600
65	.5238	47.6247	1.9093	90.9300
70	.4983	50.1644	2.0066	100.6600
75	.4742	52.5841	2.1090	110.9000
80	.4500	54.8858	2.2166	121.6600
85	.4292	57.0742	2.3296	132.9600
90	.4084	59.1750	2.4485	144.8500
95	.3886	61.1394	2.5733	157.3300
100	.3697	63.0259	2.7046	170.4600
105	.3518	64.8197	2.8425	184.2500
110	.3347	66.5272	2.9875	198.7500
115	.3185	68.1518	3.1399	213.9900
120	.3030	69.6979	3.3001	230.0100

I	II	III	IIII	V
1	.9852	.9852	1.0150	1.0000
2	.9707	1.9559	1.0302	1.0150
3	.9563	2.9122	1.0457	3.0452
4	.9422	3.8544	1.0614	4.0909
5	.9283	4.7826	1.0773	5.1523
6	.9145	5.6972	1.0934	6.2290
7	.9010	6.5982	1.1098	7.3230
8	.8877	7.4859	1.1265	8.4328
9	.8746	8.3605	1.1434	9.5593
10	.8617	9.2222	1.1605	10.9027
11	.8489	10.0711	1.1779	11.8633
12	.8364	10.9075	1.1959	13.0412
13	.8240	11.7315	1.2130	14.2368
14	.8118	12.5434	1.2318	15.4504
15	.7999	13.3432	1.2502	16.6821
16	.7880	14.1313	1.2690	17.9324
17	.7764	14.9076	1.2880	19.2014
18	.7649	15.6726	1.3073	20.4894
19	.7536	16.4262	1.3270	21.7967
20	.7425	17.1686	1.3469	23.1237
21	.7315	17.9001	1.3671	24.4705
22	.7207	18.6208	1.3876	25.8376
23	.7100	19.3309	1.4084	27.2251
24	.6995	20.0304	1.4295	28.6335
25	.6892	20.7196	1.4509	30.0630
26	.6790	21.3986	1.4727	31.5140
27	.6690	22.0676	1.4948	32.9867
28	.6591	22.7267	1.5172	34.4815
29	.6494	23.3761	1.5400	35.9987
30	.6398	24.0158	1.5631	37.5387
31	.6303	24.6461	1.5865	39.1018
32	.6210	25.2671	1.6103	40.6883
33	.6118	25.8790	1.6345	42.2986
34	.6028	26.4817	1.6590	43.9331
35	.5939	27.0756	1.6839	45.5921
36	.5851	27.6607	1.7091	47.2760
37	.5764	28.2371	1.7348	48.9851
38	.5679	28.8051	1.7608	50.7199
39	.5595	29.3646	1.7872	52.4807
40	.5513	29.9158	1.8140	54.2679
41	.5431	30.4590	1.8412	56.0819
42	.5351	30.9940	1.8688	57.9231
43	.5272	31.5212	1.8969	59.7920
44	.5194	32.0406	1.9253	61.6889
45	.5117	32.5523	1.9542	63.6142
46	.5042	33.0565	1.9835	65.5684
47	.4967	33.5532	2.0133	67.5519
48	.4894	34.0426	2.0435	69.5652
49	.4821	34.5247	2.0741	71.6087
50	.4750	34.9997	2.1052	73.6828
55	.4409	37.2715	2.2679	84.5296
60	.4093	39.3803	2.4432	96.2147
65	.3799	41.3373	2.6320	108.8000
70	.3527	43.1549	2.8355	122.3640
75	.3274	44.8409	3.0546	136.9670
80	.3039	46.4073	3.2907	152.7110
85	.2821	47.8603	3.5450	169.6600
90	.2618	49.2099	3.8189	187.9300
95	.2431	50.4618	4.1141	207.6000
100	.2256	51.6247	4.4320	228.8030
105	.2094	52.7036	4.7746	251.6330
110	.1944	53.7055	5.1436	276.2380
115	.1805	54.6351	5.5411	302.7330
120	.1675	55.4985	5.9693	331.2880

I	II	III	IIII	V
1	.9804	.9804	1.0200	1.0000
2	.9612	1.9416	1.0404	2.0200
3	.9423	2.8839	1.0612	3.0604
4	.9238	3.8077	1.0824	4.1216
5	.9057	4.7135	1.1041	5.2040
6	.8880	5.6014	1.1262	6.3081
7	.8706	6.4720	1.1487	7.4343
8	.8535	7.3255	1.1717	8.5830
9	.8368	8.1622	1.1951	9.7546
10	.8203	8.9826	1.2190	10.9497
11	.8043	9.7868	1.2434	12.1687
12	.7885	10.5753	1.2682	13.4121
13	.7730	11.3484	1.2936	14.6803
14	.7579	12.1062	1.3195	15.9739
15	.7430	12.8493	1.3459	17.2934
16	.7284	13.5777	1.3728	18.6393
17	.7142	14.2919	1.4002	20.0121
18	.7002	14.9920	1.4282	21.4123
19	.6864	15.6785	1.4568	22.8406
20	.6730	16.3514	1.4859	24.2974
21	.6598	17.0112	1.5157	25.7833
22	.6468	17.6580	1.5460	27.2990
23	.6342	18.2922	1.5769	28.8450
24	.6217	18.9139	1.6084	30.4219
25	.6095	19.5235	1.6406	32.0303
26	.5976	20.1210	1.6734	33.6709
27	.5859	20.7069	1.7069	35.3443
28	.5744	21.2813	1.7410	37.0512
29	.5631	21.8444	1.7758	38.7922
30	.5521	22.3965	1.8114	40.5681
31	.5412	22.9377	1.8476	42.3794
32	.5306	23.4683	1.8845	44.2270
33	.5202	23.9886	1.9222	46.1116
34	.5100	24.4986	1.9607	48.0338
35	.5000	24.9986	1.9999	49.9945
36	.4902	25.4888	2.0399	51.9944
37	.4806	25.9695	2.0807	54.0343
38	.4712	26.4406	2.1223	56.1149
39	.4619	26.9026	2.1647	58.2372
40	.4529	27.3555	2.2080	60.4020
41	.4440	27.7995	2.2522	62.6100
42	.4353	28.2348	2.2972	64.8622
43	.4268	28.6616	2.3432	67.1595
44	.4184	29.0800	2.3901	69.5027
45	.4102	29.4902	2.4379	71.8927
46	.4022	29.8923	2.4866	74.3306
47	.3943	30.2866	2.5363	76.8172
48	.3865	30.6731	2.5871	79.3535
49	.3790	31.0521	2.6388	81.9406
50	.3715	31.4236	2.6916	84.5794
55	.3365	33.1748	2.9717	98.5865
60	.3048	34.7609	3.2810	114.0520
65	.2760	36.1973	3.6225	131.1250
70	.2500	37.4986	3.9995	149.9780
75	.2265	38.6763	4.4158	170.7900
80	.2051	39.7445	4.8754	193.7720
85	.1858	40.7111	5.3828	219.1400
90	.1683	41.5869	5.9431	247.1570
95	.1524	42.3800	6.5617	278.0850
100	.1380	43.0984	7.2446	312.2320
105	.1250	43.7489	7.9987	349.9300
110	.1132	44.3382	8.8312	391.5590
115	.1026	44.8719	9.7503	437.5150
120	.0929	45.3554	10.7652	488.2580

I	II	III	IIII	V
1	.9756	.9756	1.0250	1.0000
2	.9518	1.9274	1.0506	2.0250
3	.9286	2.8560	1.0769	3.0756
4	.9060	3.7620	1.1038	4.1525
5	.8839	4.6458	1.1314	5.2563
6	.8623	5.5081	1.1597	6.3877
7	.8413	6.3494	1.1887	7.5474
8	.8207	7.1701	1.2184	8.7361
9	.8007	7.9709	1.2489	9.9545
10	.7812	8.7521	1.2801	11.2034
11	.7621	9.5142	1.3121	12.4835
12	.7436	10.2578	1.3449	13.7956
13	.7254	10.9832	1.3785	15.1404
14	.7077	11.6909	1.4130	16.5190
15	.6905	12.3814	1.4483	17.9319
16	.6736	13.0550	1.4845	19.3802
17	.6572	13.7122	1.5216	20.8647
18	.6412	14.3534	1.5597	22.3863
19	.6255	14.9789	1.5987	23.9460
20	.6103	15.5892	1.6386	25.5447
21	.5954	16.1845	1.6796	27.1833
22	.5809	16.7654	1.7216	28.8629
23	.5667	17.3321	1.7646	30.5844
24	.5529	17.8850	1.8087	32.3490
25	.5394	18.4244	1.8539	34.1578
26	.5262	18.9506	1.9003	36.0117
27	.5134	19.4640	1.9478	37.9120
28	.5009	19.9649	1.9965	39.8598
29	.4887	20.4535	2.0464	41.8563
30	.4767	20.9303	2.0976	43.9027
31	.4651	21.3954	2.1500	46.0003
32	.4538	21.8492	2.2038	48.1503
33	.4427	22.2919	2.2589	50.3540
34	.4319	22.7238	2.3153	52.6129
35	.4214	23.1452	2.3732	54.9282
36	.4111	23.5563	2.4325	57.3014
37	.4011	23.9573	2.4933	59.7339
38	.3913	24.3486	2.5557	62.2273
39	.3817	24.7303	2.6196	64.7830
40	.3724	25.1028	2.6851	67.4026
41	.3633	25.4661	2.7522	70.0876
42	.3545	25.8206	2.8210	72.8398
43	.3458	26.1664	2.8915	75.6608
44	.3374	26.5038	2.9638	78.5523
45	.3292	26.8330	3.0379	81.5161
46	.3211	27.1542	3.1139	84.5540
47	.3133	27.4675	3.1917	87.6679
48	.3057	27.7732	3.2715	90.8596
49	.2982	28.0714	3.3533	94.1311
50	.2909	28.3623	3.4371	97.4843
55	.2571	29.7140	3.8888	115.551
60	.2273	30.9087	4.3998	135.992
65	.2009	31.963	4.9780	159.120
70	.1775	32.898	5.6321	185.284
75	.1569	33.645	6.3722	214.888
80	.1387	34.452	7.2096	248.383
85	.1226	35.096	8.1570	286.280
90	.1084	35.666	9.2289	329.154
95	.0958	36.171.	10.4416	377.664
100	.0846	36.614	11.8137	432.549
105	.0748	37.007	13.3661	494.644
110	.0661	37.355	15.1226	564.902
115	.0584	37.664	17.1098	644.392
120	.0517	37.934	19.3581	734.326

I	II	III	IV	V
1	.9709	.9709	1.0300	1.0000
2	.9426	1.9135	1.0609	2.0300
3	.9151	2.8286	1.0927	3.0909
4	.8885	3.7171	1.1255	4.1836
5	.8626	4.5797	1.1593	5.3091
6	.8375	5.4172	1.1941	6.4684
7	.8131	6.2303	1.2299	7.6625
8	.7894	7.0197	1.2668	8.8923
9	.7664	7.7861	1.3048	10.1591
10	.7441	8.5302	1.3439	11.4639
11	.7224	9.2526	1.3842	12.8075
12	.7014	9.9540	1.4258	14.1920
13	.6810	10.6350	1.4685	15.6178
14	.6611	11.2961	1.5126	17.0863
15	.6419	11.9379	1.5580	18.5989
16	.6232	12.5611	1.6047	20.1569
17	.6050	13.1661	1.6528	21.7616
18	.5874	13.7535	1.7024	23.4144
19	.5703	14.3238	1.7535	25.1169
20	.5537	14.8775	1.8061	26.8704
21	.5375	15.4150	1.8603	28.6765
22	.5219	15.9369	1.9161	30.5368
23	.5067	16.4436	1.9736	32.4529
24	.4919	16.9325	2.0328	34.4265
25	.4776	17.4131	2.0938	36.4593
26	.4637	17.8768	2.1566	38.5530
27	.4502	18.3270	2.2213	40.7096
28	.4371	18.7641	2.2879	42.9309
29	.4243	19.1885	2.3566	45.2189
30	.4120	19.6004	2.4273	47.5754
31	.4000	20.0004	2.5001	50.0027
32	.3883	20.3888	2.5751	52.5028
33	.3770	20.7658	2.6523	55.0778
34	.3660	21.1318	2.7319	57.7302
35	.3554	21.4872	2.8139	60.4621
36	.3450	21.8323	2.8983	63.2759
37	.3350	22.1672	2.9852	66.1742
38	.3252	22.4925	3.0748	69.1594
39	.3158	22.8082	3.1670	72.2342
40	.3066	23.1148	3.2620	75.4013
41	.2976	23.4124	3.3599	78.6633
42	.2890	23.7014	3.4607	82.0232
43	.2805	23.9819	3.5645	85.4839
44	.2724	24.2543	3.6715	89.0484
45	.2644	24.5187	3.7816	92.7199
46	.2567	24.7754	3.8950	96.5015
47	.2493	25.0247	4.0119	100.3965
48	.2420	25.2667	4.1323	104.4084
49	.2350	25.5017	4.2562	108.5406
50	.2281	25.7298	4.3839	112.7969
55	.1968	26.7744	5.0821	136.072
60	.1697	27.6756	5.8916	163.053
65	.1464	28.452	6.8300	194.333
70	.1263	29.123	7.9178	230.594
75	.1089	29.702	9.1789	272.630
80	.0940	30.201	10.6409	321.363
85	.0811	30.701	12.3357	377.857
90	.0699	31.002	14.3005	443.349
95	.0603	31.323	16.5782	519.273
100	.0520	31.599	19.2186	607.288
105	.0449	31.838	22.2797	709.323
110	.0387	32.043	25.8282	827.608
115	.0334	32.220	29.9420	964.733
120	.0288	32.373	34.7110	1,123.70

I	II	III	IV	V
1	.9662	.9662	1.0350	1.0000
2	.9335	1.8997	1.0712	2.0350
3	.9019	2.8016	1.1087	3.1062
4	.8714	3.6731	1.1475	4.2149
5	.8420	4.5151	1.1877	5.3625
6	.8135	5.3286	1.2293	6.5502
7	.7860	6.1145	1.2723	7.7794
8	.7594	6.8740	1.3168	9.0517
9	.7337	7.6077	1.3629	10.3685
10	.7089	8.3166	1.4106	11.7314
11	.6849	9.0016	1.4600	13.1420
12	.6618	9.6633	1.5111	14.6020
13	.6394	10.3027	1.5640	16.1130
14	.6178	10.9205	1.6187	17.6770
15	.5969	11.5174	1.6753	19.2957
16	.5767	12.0941	1.7340	20.9710
17	.5572	12.6513	1.7947	22.7050
18	.5384	13.1897	1.8575	24.4997
19	.5202	13.7098	1.9225	26.3572
20	.5026	14.2124	1.9898	28.2797
21	.4856	14.6980	2.0594	30.2695
22	.4692	15.1671	2.1315	32.3289
23	.4533	15.6204	2.2061	34.4604
24	.4380	16.0574	2.2833	36.6665
25	.4231	16.4815	2.3632	38.9499
26	.4088	16.8904	2.4460	41.3131
27	.3950	17.2854	2.5316	43.7591
28	.3817	17.6670	2.6202	46.2906
29	.3687	18.0358	2.7119	48.9108
30	.3563	18.3920	2.8068	51.6227
31	.3442	18.7363	2.9050	54.4295
32	.3326	19.0689	3.0067	57.3345
33	.3213	19.3902	3.1119	60.3412
34	.3105	19.7007	3.2209	63.4532
35	.3000	20.0007	3.3336	66.6740
36	.2898	20.2905	3.4503	70.0076
37	.2800	20.5705	3.5710	73.4579
38	.2706	20.8411	3.6960	77.0289
39	.2614	21.1025	3.8254	80.7249
40	.2526	21.3551	3.9593	84.5503
41	.2440	21.5991	4.0978	88.5095
42	.2358	21.8349	4.2413	92.6074
43	.2278	22.0627	4.3897	96.8487
44	.2201	22.2828	4.5433	101.2383
45	.2127	22.4955	4.7024	105.7817
46	.2055	22.7009	4.8669	110.4840
47	.1985	22.8994	5.0373	115.3510
48	.1918	23.0912	5.2136	120.3883
49	.1853	23.2766	5.3961	125.6018
50	.1791	23.4556	5.5849	130.9979
55	.1508	24.2641	6.6331	160.947
60	.1269	24.9447	7.8781	196.517
65	.1069	25.5168	9.3567	238.763
70	.0900	26.0004	11.1128	288.938
75	.0758	26.4067	13.1986	348.531
80	.0638	26.7488	15.6757	419.307
85	.0537	27.0368	18.6179	503.368
90	.0452	27.2793	22.1122	603.205
95	.0381	27.4798	26.2623	721.780
100	.0321	27.6554	31.1914	862.612
105	.0270	27.8002	37.0456	1,029.874
110	.0227	27.9221	43.9986	1,228.53
115	.0191	28.0247	52.2565	1,464.471
120	.0161	28.1111	62.0643	1,744.69

I	II	III	IIII	V
1	.9615	.9615	1.0400	1.0000
2	.9246	1.8861	1.0861	2.0400
3	.8890	2.7751	1.1249	3.1216
4	.8548	3.6299	1.1699	4.2465
5	.8219	4.4518	1.2167	5.4163
6	.7903	5.2421	1.6253	6.6330
7	.7599	6.0021	1.3159	7.8983
8	.7307	6.7327	1.3686	9.2142
9	.7026	7.4353	1.4233	10.5828
10	.6756	8.1109	1.4802	12.0061
11	.6496	8.7605	1.5395	13.4864
12	.6246	9.3851	1.6010	15.0258
13	.6006	9.9856	1.6651	16.6268
14	.5775	10.5631	1.7315	18.2919
15	.5553	11.1184	1.8009	20.0236
16	.5339	11.6523	1.8730	21.8245
17	.5134	12.1657	1.9479	23.6975
18	.4936	12.6593	2.0258	25.6454
19	.4746	13.1339	2.1068	27.6712
20	.4564	13.5903	2.1911	29.7781
21	.4388	14.0292	2.2788	31.9692
22	.4220	14.4511	2.3699	34.2480
23	.4057	14.8568	2.4647	36.6179
24	.3901	15.2470	2.5633	39.0826
25	.3751	15.6221	2.6658	41.6459
26	.3607	15.9828	2.7725	44.3117
27	.3468	16.3296	2.8834	47.0842
28	.3335	16.6631	2.9987	49.9676
29	.3207	16.9837	3.1187	52.9663
30	.3083	17.2920	3.2434	56.0849
31	.2965	17.5885	3.3731	59.3283
32	.2851	17.8736	3.5081	62.7015
33	.2741	18.1476	3.6484	66.2095
34	.2636	18.4112	3.7943	69.8579
35	.2534	18.6646	3.9461	73.6522
36	.2437	18.9083	4.1039	77.5983
37	.2343	19.1426	4.2681	81.7022
38	.2253	19.3679	4.4388	85.7903
39	.2166	19.5845	4.6164	90.4091
40	.2083	19.7928	4.8010	95.0255
41	.2003	19.9931	4.9931	99.8265
42	.1926	20.1856	5.1928	104.8200
43	.1852	20.3708	5.4005	110.0124
44	.1780	20.5488	5.6165	115.4129
45	.1712	20.7200	5.8412	121.0294
46	.1646	20.8847	6.0748	126.8706
47	.1583	21.0429	6.3178	132.9454
48	.1522	21.1951	6.5705	139.2632
49	.1463	21.3415	6.8333	145.8337
50	.1407	21.4822	7.1067	152.6671
55	.1157	22.1086	8.6464	191.159
60	.0951	22.6235	10.5196	237.991
65	.0781	23.0466	12.7987	294.967
70	.0642	23.3945	15.5716	364.290
75	.0528	23.6281	18.9453	448.642
80	.0434	23.9154	23.0498	551.245
85	.0357	24.1085	28.0436	676.090
90	.0293	24.2673	34.1193	827.983
95	.0241	24.3977	41.5114	1,012.785
100	.0198	24.5050	50.5049	1,237.622
105	.0163	24.5931	61.4470	1,511.175
110	.0134	24.6656	74.7597	1,843.992
115	.0110	24.7251	90.9566	2,248.915
120	.0090	24.7741	110.663	2,741.558

I	II	III	IIII	V
1	.9569	.9569	1.0450	1.0000
2	.9157	1.8727	1.0920	2.0450
3	.8765	2.7490	1.1412	3.1370
4	.8386	3.5875	1.1925	4.2782
5	.8022	4.3900	1.2462	5.4707
6	.7679	5.1579	1.3023	6.7169
7	.7348	5.8927	1.3609	8.0192
8	.7032	6.5959	1.4221	9.3800
9	.6729	7.2688	1.4861	10.8021
10	.6439	7.9125	1.5530	12.2882
11	.6162	8.5289	1.6229	13.8412
12	.4897	9.1186	1.6959	15.4640
13	.5643	9.6829	1.7722	17.1599
14	.5400	10.2229	1.8519	18.9321
15	.5167	10.7395	1.9353	20.7841
16	.4945	11.2340	2.0224	22.7193
17	.4732	11.7072	2.1134	24.7417
18	.4528	12.1600	2.2085	26.8551
19	.4333	12.5933	2.3079	29.0634
20	.4146	13.0079	2.4117	31.3716
21	.3968	13.4047	2.5202	33.7831
22	.3797	13.7844	2.6337	36.3034
23	.3634	14.1478	2.7522	38.9370
24	.3477	14.4955	2.8760	41.6892
25	.3327	14.8282	3.0054	44.5652
26	.3184	15.1466	3.1407	47.5706
27	.3047	15.4513	3.2820	50.7113
28	.2916	15.7429	3.4279	53.9933
29	.2790	16.0219	3.5840	57.4230
30	.2670	16.2889	3.7453	61.0071
31	.2555	16.5444	3.9139	64.7524
32	.2445	16.7889	4.0900	68.6662
33	.2340	17.0229	4.2740	72.7562
34	.2239	17.2468	4.4664	77.0303
35	.2143	17.4610	4.6673	81.4966
36	.2050	17.6660	4.8774	86.1640
37	.1962	17.8622	5.0969	91.0413
38	.1878	18.0500	5.3262	96.1382
39	.1797	18.2297	5.5659	101.4644
40	.1719	18.4016	5.8164	107.0303
41	.1645	18.5661	6.0781	112.8467
42	.1574	18.7235	6.3516	118.9248
43	.1507	18.8742	6.6374	125.2764
44	.1442	19.0184	6.9361	131.9138
45	.1380	19.1563	7.2482	138.8500
46	.1320	19.2884	7.5744	146.0982
47	.1263	19.4147	7.9153	153.6726
48	.1209	19.5356	8.2715	161.5879
49	.1157	19.6513	8.6437	169.8594
50	.1107	19.7620	9.0326	178.5030
55	.0888	20.2480	11.2563	227.9180
60	.0713	20.6380	14.0274	289.4980
65	.0572	20.9509	17.4807	366.2380
70	.0459	21.2021	21.7841	461.8700
75	.0368	21.4118	27.1470	581.2670
80	.0296	21.5653	33.8301	729.5580
85	.0237	21.6951	42.1585	914.6330
90	.0190	21.7992	52.5371	1145.2700
95	.0153	21.8828	65.4708	1432.6840
100	.0123	21.9499	81.5885	1790.8600
105	.0098	22.0036	101.674	2237.2000
110	.0079	22.0468	126.704	2793.4300
115	.0063	22.0815	157.897	3486.6000
120	.0051	22.1093	196.768	4350.4000

I	II	III	IIII	V
1	.9524	.9524	1.0500	1.0000
2	.9070	1.8594	1.1025	2.0500
3	.8638	2.7232	1.1576	3.1525
4	.8227	3.5460	1.2155	4.3101
5	.7835	4.3295	1.2763	5.5256
6	.7462	5.0757	1.3401	6.8019
7	.7107	5.7864	1.4071	8.1420
8	.6768	6.4632	1.4775	9.5491
9	.6446	7.1078	1.5513	11.0266
10	.6139	7.7217	1.6289	12.5779
11	.5847	8.3064	1.7103	14.2068
12	.5568	8.8623	1.7959	15.9171
13	.5303	9.3936	1.8856	17.7130
14	.5051	9.8986	1.9799	19.5986
15	.4810	10.3797	2.0789	21.5786
16	.4581	10.8378	2.1829	23.6575
17	.4363	11.2741	2.2920	25.8404
18	.4155	11.6896	2.4066	28.1324
19	.3957	12.0853	2.5270	30.5390
20	.3769	12.4622	2.6533	33.0660
21	.3589	12.8212	2.7860	35.7193
22	.3418	13.1630	2.9253	38.5052
23	.3256	13.4886	3.0715	41.4305
24	.3101	13.7986	3.2251	44.5020
25	.2953	14.0939	3.3864	47.7271
26	.2812	14.3752	3.5557	51.1135
27	.2678	14.6430	3.7335	54.6691
28	.2551	14.8981	3.9201	58.4026
29	.2429	15.1411	4.1161	62.3227
30	.2314	15.3725	4.3219	66.4388
31	.2204	15.5928	4.5380	70.7608
32	.2099	15.8027	4.7649	75.2988
33	.1999	16.0025	5.0032	80.0638
34	.1904	16.1929	5.2533	85.0670
35	.1813	16.3742	5.5160	90.3203
36	.1727	16.5469	5.7918	95.8363
37	.1644	16.7113	6.0814	101.6281
38	.1566	16.8679	6.3855	107.7095
39	.1491	17.0170	6.7048	114.0950
40	.1420	17.1591	7.0400	120.7998
41	.1353	17.2944	7.3920	127.8398
42	.1288	17.4232	7.7616	135.2318
43	.1227	17.5459	8.1497	142.9933
44	.1169	17.6628	8.5572	151.1430
45	.1113	17.7741	8.9850	139.7002
46	.1060	17.8801	9.4343	168.6852
47	.1009	17.9810	9.9060	178.1194
48	.0961	18.0772	10.4013	188.0254
49	.0916	18.1687	10.9213	198.4267
50	.0872	18.2559	11.4674	209.3480
55	.0683	18.6335	14.6356	272.7130
60	.0535	18.9293	18.6792	353.5840
65	.0419	19.1191	23.8399	456.7980
70	.0329	19.3427	30.4264	588.5290
75	.0257	19.4849	38.8327	756.6540
80	.0202	19.5965	49.5614	971.2290
85	.0158	19.6838	63.2544	1,245.0880
90	.0124	19.7523	80.7304	1,594.6100
95	.0097	19.8058	103.035	2,040.7000
100	.0076	19.8479	131.501	2,610.0300
105	.0060	19.8808	167.833	3,336.6600
110	.0047	19.9066	214.202	4,264.0300
115	.0037	19.9268	273.382	5,447.6400
120	.0029	19.9427	348.912	6,958.2400

I	II	III	IIII	V
1	.9479	.9479	1.0550	1.0000
2	.8985	1.8463	1.1130	2.0550
3	.8516	2.6979	1.1742	3.1680
4	.8072	3.5052	1.2388	4.3423
5	.7651	4.2703	1.3070	5.5811
6	.7252	4.9955	1.3788	6.8881
7	.6854	5.6830	1.4547	8.2669
8	.6516	6.3346	1.5347	9.7216
9	.6176	6.9522	1.6191	11.2563
10	.5854	7.5376	1.7081	12.8754
11	.5549	8.0925	1.8021	14.5835
12	.5260	8.6185	1.9012	16.3856
13	.4986	9.1171	2.0058	18.2868
14	.4726	9.5896	2.1161	20.2926
15	.4479	10.0376	2.2325	22.4087
16	.4246	10.4622	2.3553	24.6411
17	.4024	10.8646	2.4848	26.9964
18	.3815	11.2461	2.6215	29.4812
19	.3616	11.6077	2.7656	32.1027
20	.3427	11.9501	2.9178	34.8683
21	.3249	12.2752	3.0782	37.7861
22	.3079	12.5832	3.4275	40.8643
23	.2919	12.8750	3.4262	44.1118
24	.2767	13.1517	3.6146	47.5380
25	.2622	13.4139	3.8134	51.1526
26	.2486	13.6625	4.0231	54.9660
27	.2356	13.8981	4.2444	58.9891
28	.2233	14.1214	4.4778	63.2335
29	.2117	14.3331	4.7241	67.7114
30	.2006	14.5337	4.9840	71.4355
31	.1902	14.7239	5.2581	77.4194
32	.1803	14.9042	5.5473	82.6775
33	.1709	15.0751	5.8524	88.2248
34	.1620	15.2370	6.1742	94.0771
35	.1535	15.3906	6.5138	100.2514
36	.1455	15.5361	6.8721	106.7652
37	.1379	15.6740	7.2501	113.6373
38	.1307	15.8047	7.6488	120.8873
39	.1239	15.9287	8.0695	128.5361
40	.1175	16.0461	8.5133	136.6056
41	.1113	16.1575	8.9815	145.1189
42	.1055	16.2630	9.4755	154.1005
43	.1000	16.3630	9.9967	163.5760
44	.0948	16.4579	10.5465	173.5727
45	.0899	16.5477	11.1266	184.1192
46	.0852	16.6329	11.7385	195.2457
47	.0807	16.7137	12.3841	206.9842
48	.0765	16.7902	13.0653	219.3684
49	.0725	16.8628	13.7838	232.4336
50	.0688	16.9315	14.5420	246.2175
55	.0526	17.2251	19.0046	327.3563
60	.0403	17.4498	24.8381	433.4200
65	.0308	17.6216	32.4623	572.0364
70	.0230	17.7630	43.4150	771.1818
75	.0176	17.8614	56.7414	1,013.4800
80	.0138	17.9309	72.4703	1,299.4600
85	.0106	17.9898	94.7152	1,703.9127
90	.0081	18.0349	123.7883	2,232.5145
95	.0062	18.0694	161.7855	2,923.3727
100	.0047	18.0958	211.4463	3,826.2963
105	.0036	18.1160	276.3503	5,006.3691
110	.0028	18.1315	361.2768	6,550.4873
115	.0021	18.1433	472.0413	8,564.3873
120	.0016	18.1523	616.9357	11,198.8309

I	II	III	IIII	V
1	.9434	.9434	1.0600	1.0000
2	.8900	1.8334	1.1236	2.0600
3	.8396	2.6730	1.1910	3.1836
4	.7921	3.4651	1.2625	4.3746
5	.7473	4.2124	1.3382	5.6371
6	.7050	4.9173	1.4185	6.9753
7	.6651	5.5824	1.5036	8.3938
8	.6274	6.2098	1.5938	9.8975
9	.5919	6.8017	1.6895	11.4913
10	.5584	7.3601	1.7908	13.1808
11	.5268	7.8869	1.8983	14.9716
12	.4970	8.3838	2.0122	16.8699
13	.4688	8.8527	2.1329	18.8821
14	.4423	9.2950	2.2609	21.0151
15	.4173	9.7122	2.3966	23.2760
16	.3936	10.1059	2.5404	25.6725
17	.3714	10.4772	2.6928	28.2129
18	.3503	10.8276	2.8543	30.9057
19	.3305	11.1581	3.0256	33.7600
20	.3118	11.4699	3.2071	36.7856
21	.2942	11.7641	3.3996	39.9927
22	.2775	12.0416	3.6035	43.3923
23	.2618	12.3034	3.8197	46.9958
24	.2470	12.5504	4.0489	50.8156
25	.2330	12.7834	4.2919	54.8645
26	.2198	13.0032	4.5494	59.1564
27	.2074	13.2105	4.8223	63.7058
28	.1956	13.4062	5.1117	68.5281
29	.1846	13.5907	5.4184	73.6398
30	.1741	13.7648	5.7435	79.0582
31	.1643	13.9291	6.0881	84.8017
32	.1550	14.0840	6.4534	90.8898
33	.1462	14.2302	6.8406	97.3432
34	.1379	14.3681	7.2510	104.1838
35	.1301	14.4982	7.6861	111.4348
36	.1227	14.6210	8.1473	119.1209
37	.1158	14.7368	8.6361	127.2681
38	.1092	14.8460	9.1543	135.9042
39	.1031	14.9491	9.7035	145.0585
40	.0972	15.0463	10.2857	154.7620
41	.0917	15.1380	10.9029	165.0477
42	.0865	15.2245	11.5570	175.9505
43	.0816	15.3062	12.2505	187.5076
44	.0770	15.3832	12.9855	199.7580
45	.0727	15.4558	13.7646	212.7435
46	.0685	15.5244	14.5905	226.5081
47	.0647	15.5890	15.4659	241.0985
48	.0610	15.6500	16.3939	256.5645
49	.0575	15.7076	17.3775	272.9584
50	.0543	15.7619	18.4202	290.3359
55	.0406	15.9905	24.6507	394.1783
60	.0303	16.1611	32.9883	533.1383
65	.0226	16.2891	44.1458	719.0966
70	.0169	16.3845	59.0772	967.9533
75	.0126	16.4558	79.0587	1,300.9783
80	.0095	16.5091	105.7985	1,746.6416
85	.0071	16.5489	141.5827	2,343.0450
90	.0053	16.5787	189.4698	3,141.1633
95	.0039	16.6009	253.5538	4,209.2300
100	.0029	16.6175	339.3125	5,638.5416
105	.0022	16.6299	454.0770	7,551.2833
110	.0016	16.6392	607.6591	10,110.9850
115	.0012	16.6461	813.1867	13,536.4450
120	.0009	16.6513	1,088.2280	18,120.4667

I	II	III	IIII	V
1	.9346	.9328	1.0700	1.0000
2	.8736	1.8043	1.1449	2.0700
3	.8163	2.6228	1.2250	3.2142
4	.7629	3.3857	1.3108	4.4400
5	.7130	4.0986	1.4026	5.7514
6	.6663	4.7657	1.5007	7.3529
7	.6227	5.3886	1.6058	8.6542
8	.5820	5.9700	1.7182	10.2600
9	.5439	6.5143	1.8385	11.9786
10	.5083	7.0228	1.9671	13.8159
11	.4751	7.4971	2.1049	15.7843
12	.4440	7.9414	2.2522	17.8886
13	.4150	8.3557	2.4098	20.1400
14	.3878	8.7442	2.5785	22.5500
15	.3624	9.1071	2.7590	25.1286
16	.3387	9.4457	2.9522	27.8886
17	.3161	9.7686	3.1588	30.8400
18	.2959	10.0571	3.3800	34.0000
19	.2765	10.3343	3.6165	37.3786
20	.2584	10.5928	3.8697	40.9528
21	.2415	10.8343	4.1406	44.8657
22	.2257	11.0600	4.4304	49.0057
23	.2109	11.2714	4.7405	53.4343
24	.1971	11.4685	5.0724	55.3200
25	.1842	11.6528	5.4275	63.2500
26	.1722	11.8242	5.8075	68.6786
27	.1609	11.9857	6.2140	74.4857
28	.1504	12.1357	6.6490	80.7000
29	.1406	12.2757	7.1144	87.3346
30	.1314	12.4071	7.6124	94.4628
31	.1228	12.5300	8.1452	102.0742
32	.1147	12.6457	8.7154	110.2700
33	.1072	12.7528	9.3255	118.9500
34	.1002	12.8528	9.9783	128.2618
35	.0937	12.9457	10.6768	138.2400
36	.0875	13.0343	11.4241	148.9157
37	.0818	13.1157	12.2239	160.3414
38	.0765	13.1914	13.0795	172.5642
39	.0715	13.2628	13.9950	185.6428
40	.0668	13.3300	14.9747	199.6386
41	.0624	13.3928	16.0230	214.6143
42	.0583	13.4514	17.1446	230.6371
43	.0545	13.5057	18.3448	247.7828
44	.0509	13.5571	19.6290	266.1428
45	.0476	13.6043	21.0030	285.7571
46	.0445	13.6485	22.4332	306.1886
47	.0416	13.6900	24.0463	329.2328
48	.0387	13.7314	25.7888	354.1257
49	.0363	13.7657	27.5306	379.0086
50	.0339	13.8000	29.4577	406.5386
55	.0242	13.9385	41.3162	575.9458
60	.0173	14.0371	57.9482	813.5458
65	.0123	14.1085	81.2755	1146.7928
70	.0088	14.1585	113.9929	1614.1844
75	.0062	14.1959	159.8823	2141.1757
80	.0045	14.2200	224.2440	2269.7471
85	.0032	14.2385	314.5138	3160.6285
90	.0023	14.2514	441.1230	4478.7682
95	.0016	14.2614	618.7000	6287.4714
100	.0011	14.2685	867.7600	8824.2857
105	.0008	14.2728	1217.0812	12382.2855
110	.0006	14.2757	1707.0235	17372.5886
115	.0004	14.2785	2394.1978	24371.7642
120	.0003	14.2800	3357.9923	34188.5400

I	II	III	IIII	V
1	.9259	.9250	1.0800	1.0000
2	.8573	1.7825	1.1664	2.0800
3	.7938	2.5762	1.2597	3.2463
4	.7350	3.3112	1.3605	4.5062
5	.6806	3.9912	1.4693	5.8366
6	.6302	4.6212	1.5869	7.3362
7	.5840	5.1987	1.7138	8.9225
8	.5403	5.7450	1.8509	10.6363
9	.5002	6.2462	1.9990	12.4875
10	.4632	6.7087	2.1589	14.4862
11	.4289	7.1375	2.3317	16.6463
12	.3971	7.5350	2.5182	18.9775
13	.3676	7.9037	2.7196	21.4950
14	.3405	8.2425	2.9372	24.2150
15	.3152	8.5587	3.1722	27.1525
16	.2919	8.8513	3.4260	30.3250
17	.2703	9.1200	3.7000	33.7500
18	.2502	9.3712	3.9960	37.4500
19	.2317	9.6025	4.3157	41.4463
20	.2145	9.8175	4.6610	45.7625
21	.1987	10.0150	5.0339	50.4237
22	.1839	10.2000	5.4366	55.4575
23	.1703	10.3700	5.8716	60.8950
24	.1577	10.5275	6.3413	66.7663
25	.1460	10.6737	6.8486	73.1075
26	.1352	10.8087	7.3964	79.9800
27	.1252	10.9337	7.9882	87.3525
28	.1159	11.0500	8.6272	95.3400
29	.1073	11.1575	9.3174	103.9675
30	.0994	11.2562	10.0629	113.2862
31	.0920	11.3487	10.8678	123.3475
32	.0852	11.4337	11.7371	134.2138
33	.0789	11.5125	12.6763	145.9537
34	.0730	11.5862	13.6904	158.6300
35	.0676	11.6537	14.7853	172.3163
36	.0626	11.7162	15.9684	187.1050
37	.0580	11.7737	17.2460	203.0750
38	.0537	11.8275	18.6249	220.3113
39	.0497	11.8775	20.1159	238.9488
40	.0460	11.9237	21.7250	259.0625
41	.0426	11.9662	23.4630	280.7875
42	.0395	12.0050	25.3400	304.2500
43	.0365	12.0425	27.3672	329.5900
44	.0338	12.0762	29.5567	356.9588
45	.0313	12.1075	31.9213	386.5163
46	.0290	12.1362	34.4750	418.4375
47	.0269	12.1625	37.2330	452.9125
48	.0249	12.1875	40.2117	490.1463
49	.0230	12.2112	43.4207	530.2588
50	.0213	12.2325	46.9029	573.7863
55	.0145	12.3175	68.9160	848.9500
60	.0099	12.3750	101.2605	1253.2563
65	.0067	12.4150	148.7849	1847.3113
70	.0046	12.4412	218.6150	2720.1875
75	.0031	12.4600	321.2177	4002.7213
80	.0021	12.4725	471.9761	5887.2013
85	.0014	12.4812	693.4888	8656.1100
90	.0010	12.4862	1018.9649	12724.5613
95	.0007	12.4900	1497.1993	18702.4913
100	.0005	12.4925	2199.8838	27486.0475
105	.0003	12.4950	3232.3656	40392.0700
110	.0002	12.4962	4749.4130	59355.1625
115	.0001	12.4975	6978.4677	87218.3463
120	.0001	12.4975	10253.6792	128158.4900

I	II	III	IIII	V
1	.9091	0.908	1.1000	1.0000
2	.8264	1.735	1.2100	2.1000
3	.7513	2.486	1.3310	3.3100
4	.6830	3.169	1.4641	4.6410
5	.6209	3.790	1.6105	6.1050
6	.5645	4.354	1.7716	7.7160
7	.5132	4.867	1.9487	9.4870
8	.4665	5.334	2.1436	11.4360
9	.4241	5.758	2.3580	13.5800
10	.3855	6.144	2.5938	15.9380
11	.3505	6.494	2.8531	18.5310
12	.3186	6.813	3.1385	21.3850
13	.2897	7.102	3.4523	24.5230
14	.2633	7.366	3.7976	27.9760
15	.2394	7.605	4.1773	31.7730
16	.2176	7.823	4.5950	35.9500
17	.1978	8.021	5.0545	40.5450
18	.1799	8.200	5.5600	45.6000
19	.1635	8.364	6.1160	51.1600
20	.1486	8.513	6.7276	57.2760
21	.1351	8.648	7.4004	64.0040
22	.1228	8.771	8.1404	71.4040
23	.1117	8.882	8.9545	79.5450
24	.1015	8.984	9.8500	88.5000
25	.0923	9.076	10.8349	98.3490
26	.0839	9.160	11.9184	109.1840
27	.0763	9.236	13.1103	121.1030
28	.0693	9.306	14.4213	134.2130
29	.0630	9.369	15.8634	148.6340
30	.0573	9.426	17.4498	164.4980
31	.0521	9.478	19.1948	181.9480
32	.0474	9.525	21.1143	201.1430
33	.0431	9.568	23.2257	222.2570
34	.0391	9.608	25.5483	245.4830
35	.0356	9.643	28.1032	271.0320
36	.0324	9.675	30.9135	299.1350
37	.0294	9.705	34.0049	330.0490
38	.0273	9.726	37.4054	364.0540
39	.0243	9.756	41.1460	401.4600
40	.0221	9.778	45.2605	442.6050
41	.0201	9.798	49.7866	487.8660
42	.0183	9.816	54.7655	537.6550
43	.0166	9.833	60.2420	592.4200
44	.0151	9.848	66.2662	652.6620
45	.0137	9.862	72.8928	718.9280
46	.0125	9.874	80.1822	791.8220
47	.0113	9.886	88.2004	872.0040
48	.0103	9.896	97.0207	960.2070
49	.0094	9.905	106.7228	1057.2280
50	.0085	9.914	117.3926	1163.9260
55	.0053	9.946	189.0668	1880.6680
60	.0033	9.966	304.4944	3034.9440
65	.0020	9.979	490.3932	4893.9320
70	.0013	9.986	789.7876	7887.8760
75	.0008	9.991	1271.9648	12709.6480
80	.0005	9.994	2048.5188	20475.1880
85	.0003	9.996	3299.1742	32981.7420
90	.0002	9.997	5313.3659	53123.6590
95	.0001	9.998	8557.2549	85562.5490
100	.00007	9.9992	13781.6139	137806.1390
105	.00005	9.9994	22195.5102	221945.1020
110	.00003	9.9996	35746.1983	357451.9830
115	.00002	9.9997	57569.8666	575688.6660
120	.00001	9.9998	92717.0213	927160.2130