

Time Value of Money



Critical Equation #10 for Business Leaders

$$(1+R)^N \text{ et al.}$$

Overview

The time value of money is fundamental to all aspects of business decision-making. Consider the following: **"Would you rather have \$100 today or \$200 10 years from now?"** As simple as this question might seem, there are complex factors that can influence your choice. Our purpose is to explore and simplify the concept of time value of money, providing the insight and tools you need to answer this type of question and, ultimately, create shareholder value.

One aspect of time value of money that is critical to long-term growth is compounding. Einstein has been quoted as saying **"The most powerful force in the universe is compound interest."** Others have referred to compounding as the **"8th wonder of the world."** While both quotes are anecdotal at best, they do emphasize the importance of understanding the time value of money.

In the sections that follow, we will:

- present in detail TRI's Critical Equation # 10 on time value of money,
- define both future and present value,
- provide a simple formulation for solving time value of money problems,
- examine a variety of applications for decision-makers, and
- bring it back to work throughout.

Finally, we will provide references to our other TRI Critical Equations as appropriate.



Preparing to Solve Time Value of Money Problems

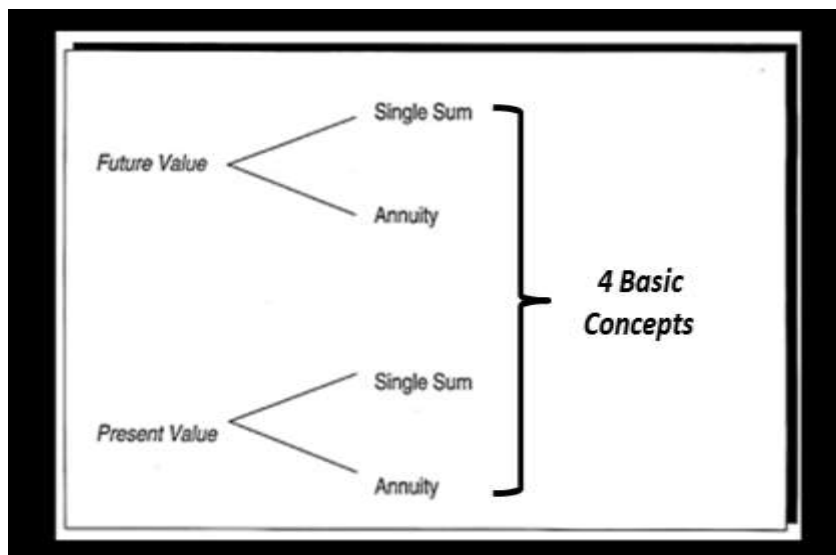
In this section, we will introduce the basic concept of time value of money and the structure for solving a problem. There are two basic classifications of value in this domain: present value and future value. Future value refers to a scenario in which an investment is made today and we need to determine what the value will be at a point in the future. Present value comes into play when you have the right to receive money in the future and would like to understand its value today.

Within each classification there are two sub-classifications. The first is a single sum, which is simply \$X either today or at a future point in time (e.g., \$100 to be received in 25 years; \$200 to be invested today). The second is an annuity. An annuity in its most basic form is a constant dollar amount per a stated time period (e.g., \$300 invested per year for five years; \$400 received per year for the next 10 years). Key phrases that let you know you are dealing with an annuity are “*per year*” or “*per stated time period.*”

Exhibit 1 summarizes the four types of time value of money scenarios that business leaders need to understand.

Exhibit 1

Four Basic Concepts of Time Value of Money



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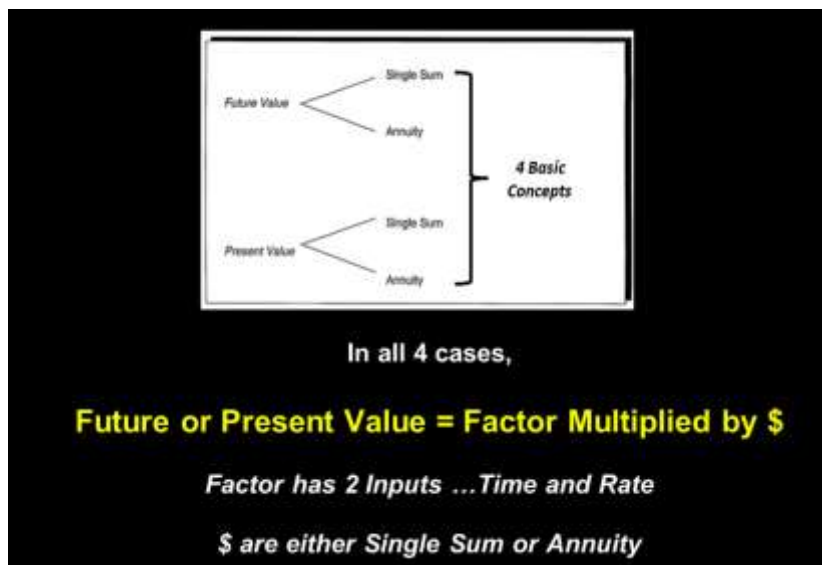
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For each of the four concepts in Exhibit 1, there are two critical additional inputs needed to solve any time value of money problem. The first is the rate of return, and the second is the time dimension. A precise rate of return and time dimension will give us what is referred to as a factor for a specific type of time value of money problem. To find our solution, we multiply the dollars involved (either single sum or annuity) by that factor. This is shown in Exhibit 2.

Exhibit 2

Solving a Time Value of Money Problem



Behind all of the factors are the TRI Critical Equations that are among the most well known in finance. Exhibit 3 provides the equations to solve for any factor. These are the formulas that are built into the solutions found in time value of money tables and in the coding of financial calculators and/or spreadsheets like Excel. R is the rate of return and N is the time horizon. While we state R as a percentage (e.g., 10% in the Exhibit) in the formula it would be input as a decimal (e.g., .10).



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Exhibit 3

TRI Critical Equations for Time Value of Money

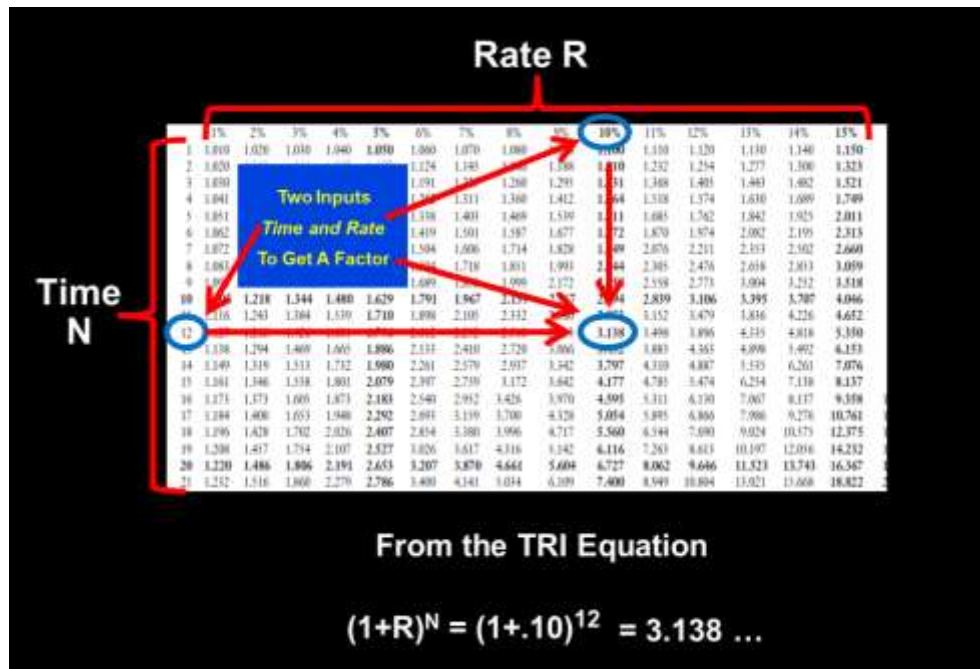
Time Value of Money Factors & Formulas	
R = Rate (e.g., 10%) N = Time (e.g., 7 years)	
Future Value of Single Sum	$(1+R)^N$
Future Value of Annuity *	$\{[(1+R)^N - 1]/R\}$
Present Value of Single Sum	$(1+R)^{-N}$
Present Value of Annuity *	$\{1 - [1/(1+R)^N]\}/R$
* In Arrears	

Numerical values for the factors of all four cases in Exhibits 1, 2 and 3 can be found in time value of money tables. Typically, you will find the rate across the top and the time down the left-hand side. By identifying the rate and time, you can go to the intersection and determine the factor. Because rate and time are usually rounded to whole numbers in the tables, they can provide a reasonable approximation of the factor. The equations, on the other hand, are valuable for arriving at precise answers for problems that involve non-whole numbers, like a rate of 8.76% and time horizon of 22.5 years. Exhibit 4 demonstrates the use of one of the tables. This example is specifically for future value of a single sum but the other three work in an identical fashion. The four time value of money tables that correspond to Exhibits 1, 2 and 3 can be found in the appendix.



Exhibit 4

Time Value of Money Table for Factor Determination



As the analysis has been presented to date, there are four numbers in any problem (rate, time, \$ as single sum or annuity, and the solution). Once you know three of the four constants, the fourth can always be calculated. As an example, we might want to know how long it would take \$100 to triple to \$300 if our return was 12%, or what rate we would need to earn to double our money over 10 years. Any combination is feasible to ask questions around.

The next four sections are devoted to numerical applications of the equation.



Sample Problems – Future Value of a Single Sum - $(1+R)^N$

The following examples are solved via the tables. Try the formulas as practice.

How much will \$100 invested today at 7% per year be worth by the end of four years?

$$\text{Future Value of a Single Sum} = (1 + .07)^4 = 1.311$$

$$\text{Future Value} = \$100 \times 1.311 = \$131.10$$

Note, in future value of single sum problems, there is an implicit assumption that no monies are removed over time. This is the concept of compounding interest, or interest on interest. In our first problem, this means the total \$107 at the end of year one is reinvested at 7% for the second year. In the second year, we earn not only the 7% on the original \$100 but 7% on the \$7 (or 49 cents) of interest earned in the first year. This is why the 7% two-year factor is 1.145. The table values are truncated at three decimals. Graphically this would be a non-linear relationship to indicate the constant growth.

How much will \$1,000 invested today at 10% per year be worth after 20 years?

$$\text{Future Value of a Single Sum} = (1 + .10)^{20} = 6.727$$

$$\text{Future Value} = \$1,000 \times 6.727 = \$6,727$$

Note that in the example the compounded interest over 20 years dwarfs the initial investment of \$1,000. This is an example of the power of time with continual reinvestment.

How much would \$100 be worth if it is invested today for five years at 10%, and the full amount at end of the fifth year reinvested for the next 10 years at 5%? That is, how much would you have at the end of 15 years? Test your knowledge and prove the answer is approximately \$262. After you are satisfied with the \$262, ask yourself how much would \$100 invested today for 10 years at 5% and the full proceeds at end of year 10 reinvested for the next five years at 10% be worth at the end of 15 years? That is, as in the prior problem, how much would you have at the end of 15 years?

Before you jump to the tables, a calculator or the formulas, think logically what the answer has to be. The answer is still \$262 because these are just multiplicative relationships. Does this mean you would be indifferent to an offer of both options? If your only concern was terminal value (how much you have at the end of 15 years), you would be indifferent. What if you had the option of getting out



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of either scenario before year 15? Would you still be indifferent? The answer is no. In this problem, the first scenario will always have a larger value up to that last second before the end of year 15. Prove it.

One of the most common heuristics involving the time value of money, and the future value of a single sum, is the **“Rule of 72.”** The essence of this rule is that by dividing 72 by the rate, you will get a reasonable approximation of how long it takes to double your money. For example, with a 10% annual rate, divide 72 by 10, and the answer is 7.2 years. A more precise answer, arrived at via our formulas, would be 7.273 years.

Sample Problems – Future Value of an Annuity - $\{[(1+R)^N - 1]/R\}$

How much would you have if you invested \$1,000 per year for four years (with the first annuity payment at the end of year one or in arrears) if the rate was 10%?

$$\text{Future Value of an Annuity} = \{[(1 + .10)^4 - 1] / .10\} = 4.641$$

$$\text{Future Value} = \$1,000 \times 4.641 = \$4,641$$

This problem could also be solved as four single sums of \$1,000 each for their respective time. The fourth payment of \$1,000, under the assumption of arrearage, would not earn any interest because the process immediately stops at the end of the fourth year, before any interest can be earned on it.

How much would you have if you invested \$2,000 per year for 30 years (with the first annuity payment at the end of year one or in arrears) if the rate was 12%?

$$\text{Future Value of an Annuity} = \{[(1 + .12)^{30} - 1] / .12\} = 241.333$$

$$\text{Future Value} = \$2,000 \times 241.333 = \$482,665$$

In this example, you can vividly see the impact of time and rate on final value. Over the 30 years, \$60,000 was invested. The difference of \$422,665 is all of the accumulated return. This is a very common retirement scenario. We chose 12% because many academics would suggest this is a proxy for long-term stock market returns. The 30 years corresponds to a working career and the buildup phase of retirement monies.



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Sample Problems – Present Value of a Single Sum - $(1+R)^{-N}$

What is the present value of \$1,000 to be received in three years at 10%?

$$\text{Present Value of a Single Sum} = (1 + .10)^{-3} = .751$$

$$\text{Present Value} = \$1,000 \times .751 = \$751$$

In this example, you have the right to receive \$1,000 three years from today. The question being answered is, what would you pay for this right? In a perfect world, if 10% represented your true required return, you would be indifferent to the choice of an offer of \$751 today or \$1,000 in three years. Consider turning this into a future problem of a single sum. If you invested \$751 today at 10% you would have \$1,000 in three years. Of course, if 10% was not your opportunity cost of money, then your decision may change.

The most important takeaway of this problem is to understand that **present values are market values**. The question “What is the present value?” is equivalent to asking “What is the market value?” or “How much would you pay today?” This is the essence of why present value concepts are used in all types of valuation when there is a time dimension to when monies are received.

Our next example is designed to demonstrate how to deal with the present value of a series of divergent monies over time. This is a very common real-world business application. Your business is doing an appropriation request and the finance team has generated the following cash flow stream:

End of Year	Cash Flow
1	\$100
2	\$200
3	\$0
4	\$100

Your required rate of return (an example would be the cost of capital in TRI Equation 4) is 8%. What is the present value of the cash flow? The key is to recognize that each cash flow can be treated as an individual single sum. Calculate the factors using the present value of a single sum formula, $(1+R)^{-N}$, and create a chart as follows:



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End of Year	Cash Flow X Factor = Present Value		
1	\$100	X .926	= \$92.60
2	\$200	X .857	= \$171.40
3	\$0	X .794	= \$0
4	\$100	X .735	= <u>\$73.50</u>
			\$337.50
			=====

The present value of the sum is the sum of the individual present values, and it equals \$337.50. (This approach is also readily and easily applied in a spreadsheet format.) Therefore, \$337.50 is the maximum amount the company could invest and still earn an 8% return. If we pay less than \$337.50 and generate the expected cash flows, our return exceeds the 8%. If we pay more and generate the cash flows as given our return will be less than the 8%. This is the logic behind all NPV and IRR problems.

Sample Problems – Present Value of an Annuity - $\{1 - [1/(1+R)^N]\}/R$

What is the present value of receiving \$1,000 per year (payment in arrears) for five years at 12%?

$$\text{Present Value of an Annuity} = \{1 - [1 / (1 + .12)^5]\} / .12 = 3.605$$

$$\text{Present Value} = \$1,000 \times 3.605 = \$3,605$$

This problem could also be solved as five individual present values of single sums of \$1,000 each for their respective time.

If the rate in our problem was 15%, holding everything else constant, what is the present value?

$$\text{Present Value of an Annuity} = \{1 - [1 / (1 + .15)^5]\} / .15 = 3.352$$

$$\text{Present Value} = \$1,000 \times 3.352 = \$3,352$$



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Note, when the rate goes up the present value goes down. This is a fundamental result with positive rates:

Rates Up ... Present Value Down
Rates Down... Present Value Up

There is a very interesting problem in present value space when the annuity is to be received forever. A perpetual annuity is often referred to as perpetuity. The implication in our formulation is that N goes to ∞ .

$$\text{If } N \text{ goes to } \infty \text{ then } \{1 - [1/(1+R)^N]\}/R \Rightarrow 1/R.$$

The implication for valuing perpetuity is that we divide the perpetual cash flow by the rate. As an example, what is the present value of receiving \$100 per year forever, if you require a 10% return?

$$\text{Present Value} = \$100/.10 = \$1,000$$

If you converted this problem into a future value problem, imagine making an investment of \$1,000 earning exactly 10% each year forever. There is an assumption of yearly compounding. At the end of year one you could withdraw the \$100 of interest earned and have the \$1,000 investment for year two. At the end of year two you could withdraw another \$100, and so on and so forth. You could forever make withdrawals of the \$100 per year (at the end of the year) and never dip into your original investment. Perpetuity valuation can occur with consols (perpetual bonds issued in Europe to fight wars in antiquity) and preferred stock as examples. In appropriation requests, it is also common after a period of growth to assume a terminal value based upon a perpetuity formulation. This assumption is made to reflect simplicity and maybe a conservative case, and also because the forecasts beyond the growth period (typically five to 10 years in practice) can be fraught with significant error.

Annual to Continuous Compounding

All of the equations and examples thus far have assumed an annual rate paid at the end of the year on the beginning balance. There are other rates that assume other-than-annual compounding. This is often the case in financial service markets and deposits. For example, you may have heard the statement "7% annual rate with monthly compounding." The number of times compounding will occur within a year is given by M. Any of the formulas in Exhibit 3 can be adjusted to allow for M-period compounding by dividing the R by M and multiplying the N by M.



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The formula for the future value of a single sum is given by:

$$(1+R)^N$$

The formula for the future value of a single sum with M period compounding is therefore given by:

$$(1+R/M)^{NM}$$

With an annual rate of 10% and five years, the factor is 1.611 (from the formula or table in the appendix). With monthly compounding (i.e., M = 12) the factor is 1.645. A \$100,000 investment under annual compounding would grow to \$161,100. With monthly compounding the terminal value would be \$164,500, or \$3,400 more, as a result of the frequency of compounding.

The limit condition of compounding would occur when M goes to infinity. In financial theory this is defined as continuous compounding. The formula for the future value of a single sum with continuous compounding is given by:

$$e^{RN}$$

where e is Napier's number, or the base of the natural logarithm. An approximate value of e is 2.713. As esoteric as the equation may seem, continuous compounding has many applications in finance. The last time we saw the concept was in TRI Equation 6 on Options. It is embedded within the Black-Scholes formula.

One needs to be very careful when comparing rates with divergent compounding periods; for example, 6% compounded semi-annually vs 5.8% compounded daily. We can only make the comparison after calculating what is often called the "effective annual rate" or "effective (or equivalent) annual rate." The mathematics is detailed below using the M period compounding model above. Six percent compounded semi-annually equates to an effective annual rate of 6.09%, while 5.8% compounded daily (using 365 days) equates to an effective annual rate of 5.97%. Only the effective annual rates can be truly compared.

$$\text{Effective Annual Rate} = [1 + (R / M)]^M - 1$$

$$\text{EAR} = [1 + (.06 / 2)]^2 - 1 = .0609 = 6.09\%$$

$$\text{EAR} = [1 + (.058 / 365)]^{365} - 1 = .0597 = 5.97\%$$



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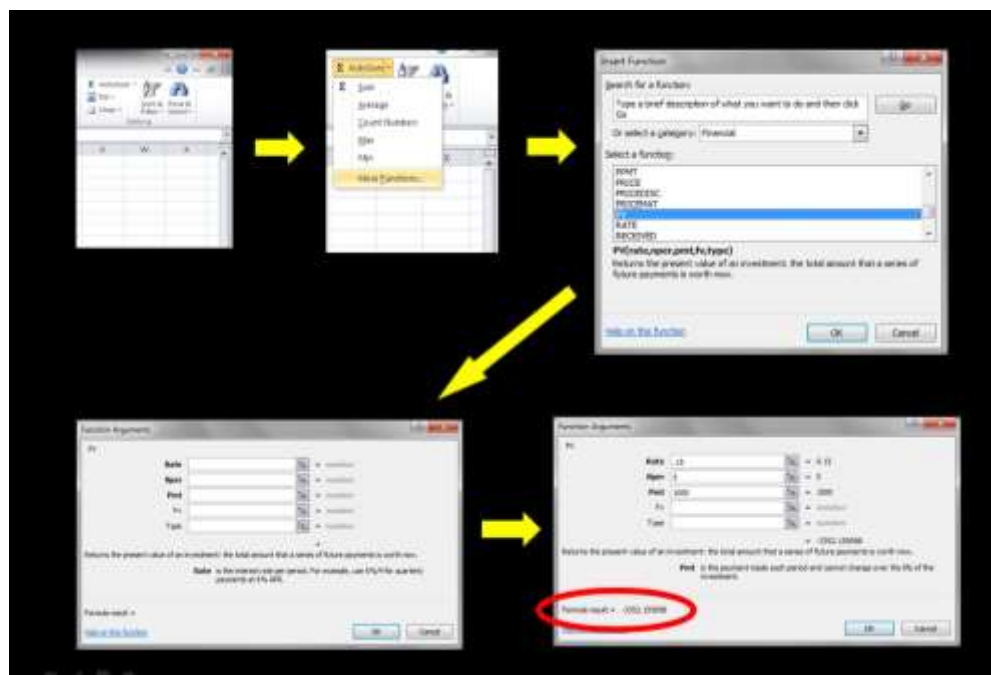
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Excel Applications

In this section, we review the basics of solving a present value problem in Excel. The example in Exhibit 5 is specifically for present value. It outlines the steps to solve the present value of the problem above, where we have the right to receive \$1,000 per year for five years at 15%. Remember that we calculated that present value at \$3,352. Note the Excel answer enclosed in the red ellipse is -\$3,352. The interpretation of the minus sign is that this is the amount we would pay today to have the right to receive \$1,000 per year for five years if we required a 15% return.

Exhibit 5

Excel Applications of Present Value



We leave it to the reader to practice with the Excel time value of money functions. Excel is extremely robust with regard to all financial functions.



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Valuing a Bond

The valuation of a corporate bond is an excellent example of the mathematics of present value applied to a financial instrument. An investor in a bond typically invests \$1,000 per bond at original issuance of the bond by the corporation. The investor receives an interest amount per year (in practice semi-annual), which is referred to as the coupon rate. The bond will have a maturity and, if all goes well, will be repaid in full at the original investment at that time.

Exhibit 6 is the market value of a bond for a AAA-rated company. The bond was originally issued in 1975 and matures in 2004; that is, it has a 30-year maturity. When the bond was originally issued, 30-year AAA interest rates were 8.5%. In the ideal world, the investor would give the company \$1,000 and expect to receive \$85 per year and \$1,000 at the end of the 30 years. Corporate bonds typically trade, and rarely will investors hold them until maturity. Any trades will be at a fair market value. Even if the creditworthiness of the business does not change (i.e., remains AAA rated), if interest rates change after the original issuance, the market value may deviate from the \$1,000 face value per bond.

The primary reason AAA rates can vary over time is that U.S. government debt (with a remaining identical maturity) can vary due to changes in macro-economic conditions and inflationary expectations. That is, the government yield curve will have shifted. The market value of the bond at any time, prior to maturity, is the present value of the remaining coupon payments (in this case the \$85 per year) and the present value of \$1,000 to be received at maturity. Technically, if the bond only has 20 years left, the market value must be reflective of the 20 years, not the original 30.

The upper left-hand corner of Exhibit 6 shows the market value of the aforementioned bond, the upper right-hand corner shows AAA bond yields, and the lower middle shows an overlay of both graphics. The key is the inverse relationship between rates and value, which we articulated earlier. The bond markets of the world are an area where the concept manifests itself in trading all the time.



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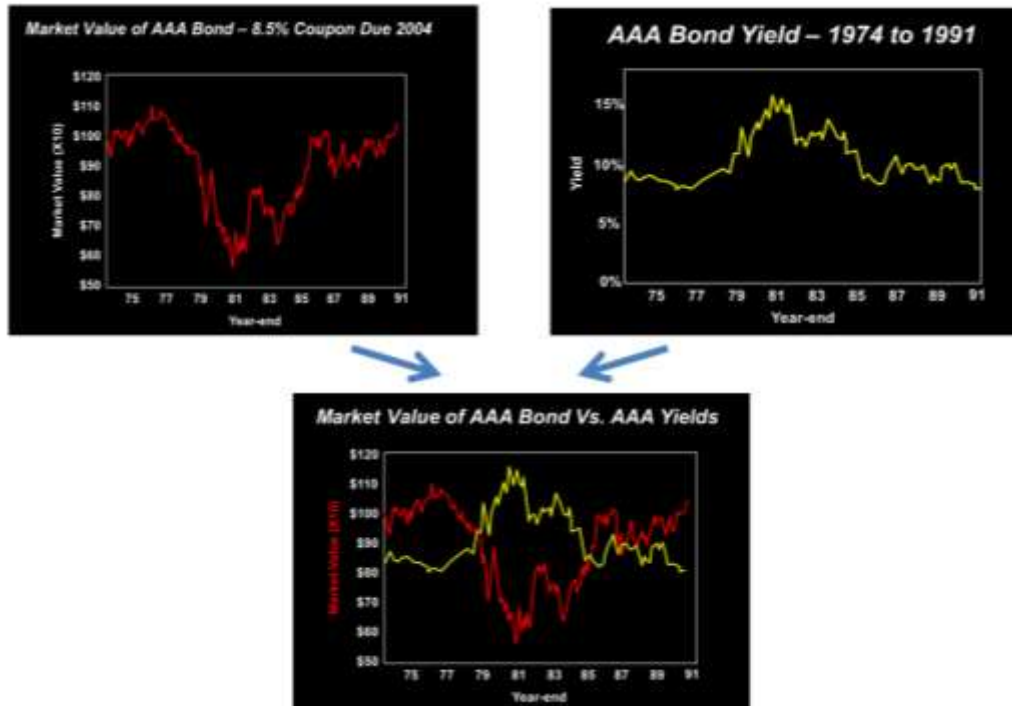
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Exhibit 6

The Inverse Relationship between Rates and Value in the Bond Market



The market value of the bond dropped to under \$600 by the early 1980s even though the credit quality of the issuer of the bond remained AAA. This was a period of significant (and for the U.S. unprecedented) inflation. The inflation expectations exceeded 12% at the time, and interest rates increased. You will note the example ends in the early 1990s. Interest rates on AAA debt had dropped to below 8.5% and it was an opportunity for the company to call the debt (essentially refinance it at lower rates). As we discussed in TRI Equation #6 on Options, the opportunity to call requires the payment of a premium. In effect, this is what homeowners do all the time, typically without any pre-payment penalty, but at a much larger corporate level.

Time value of money is basic to valuing bonds. At the time of this writing, many (but not all) investment experts believe that an increase in interest rates is inevitable coming off of global monetary easing and that bond markets could drop significantly in value. We will check back on this one in a few years. Negative interests are also a current reality in capital markets and, while beyond our scope of detail, do create many unique mathematical relationships in the time value of money.



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Valuing a Capital Investment (or Application to an Appropriation Request)

In TRI Equation #9 on Cash Flow, we presented a sample appropriation request of Hypo-Product. This was a standard free cash flow application. Exhibit 20 in TRI Equation #9 showed a summary of many relevant metrics, including net present value, and is reproduced as Exhibit 7 below, with Excel modifications to demonstrate the present value syntax. The cost of capital was 14%. Note the NPV formula has two pieces (the present value of cash flows and the initial investment assumed paid today).

Exhibit 7

NPV using Excel

	BOY 1	EOY 1	EOY 2	EOY 3	
Project Metrics					
Gross Margin %		40.0%	42.0%	45.0%	
Operating Margin %		22.0%	26.6%	28.2%	
Growth Rate in Sales			19.7%	32.7%	
Growth Rate in Gross Margin			23.7%	42.2%	
Growth Rate in Operating Margin			47.5%	67.0%	
Change in Working Capital		971250	191536	380147	
Operating Cash Flow (OCF)	-2,000,000	-168,250	778,873	961,088	
Residual Value *				2,342,734	
OCF with Residual Value	-2,000,000	-168,250	778,873	3,303,742	
Cumulative Cash Flow	-2,000,000	-1,168,250	-389,377	428,348	
Total Capital at Risk	2,000,000	2,571,250	2,562,506	2,342,734	
NOPAT	0	293,900	570,209	941,156	
Capital Charge		280,100	350,975	338,742	
Economic Profit	0	225,800	219,234	602,414	
Return on Total Capital (ROTC) ***		17.0%	23.7%	40.0%	
*** At average of Total Capital					
Shareholder Value Creation					
Net Present Value (NPV)					681,662
IRR					26.2%
Payback (Years)					7.00
Max Case Cash					2,342,734
Value Creation **					681,662
* Residual Value (EOY 3) net book					
Inventory					1,250,865
Receivables					1,134,256
Payables					1,042,388
Net Working Capital					1,342,734
Net Investment					800,000
Total Capital					2,342,734
** Value Creation (present value of Economic Profit at 14%)					
*** NPV Excel Formula: =NPV(0.14,E15:G15)+D15					
*** At average of Total Capital					

Valuing a Stock

Equity markets are intrinsically forward looking, and in the spirit of efficiency, prices should reflect all relevant information. The forward-looking nature of equity markets makes them potentially ideal to use time value of money techniques, specifically present value, to determine the market value.



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Financial and investment analysts will routinely use present value techniques from the very simple to the incredibly complex. One of the basic models for valuing equity is referred to as a constant growth model. In this model, the most common application is that an estimate of the price per share is the present value of future dividends. (Naturally, there are variations for non-dividend-paying companies, as well as discounted cash flow models). In the constant growth model, the dividend is assumed to grow at a constant rate per year forever. (There are also multistage dividend growth models that allow for growth rates to regress to regular growth in the economy.) The rate used is the cost of equity capital as discussed in TRI Equation #4, with the CAPM being the most widely used in practice. The dividend growth model in simplest form is given by:

$$P = D/(K_e - g)$$

Where P is the price per share, D is expected dividend per share at the end of year one, K_e is the cost of equity, and g is the growth of dividends per year forever. If D was \$1.00, $K_e = 10\%$ and $g = 2\%$, the estimate of the stock price would be:

$$P = \$1.00/(.10-.02) = \$1.00/.08 = \$12.50$$

In the price per share formulation above, note that when $g = 0\%$ (that is, no growth), the formula simplifies to D/K_e . This is our aforementioned perpetuity formulation derived from the present value of an annuity. In this case, the annuity is the D per year forever.

Valuing the Decision to Take a Discount

One of the timeless problems in finance is determining the optimal timing to take a discount or not with trade credit. For example, if you were offered 2/10 N/30 terms, (taking a 2% discount to pay within 10 days, or paying the total in 30) and your cost of borrowing was 10% on an annual basis, does it pay to take the discount even if you have to borrow? The basic answer is nearly always yes, because the opportunity cost of not taking the discount is often calculated at approximately 36%. By taking advantage of a discount, a customer is essentially changing the total amount due into two components: interest paid on the invoice and the revised balance due to the vendor. For example, a \$5,000 net due amount would now be considered \$100 of interest, and \$4,900 of amount due for the goods or services. This basic solution is given by 2/98 times 360/20.

$$(2/98) \times (360/20) = 36.7\%$$



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The reality is that when the time value of money is considered, the cost of not taking the discount is given by using the logic of $(1+R)^N$.

$$[1+(2/98)]^{(360/20)} - 1 = 43.8\% \text{ as a \%}.$$

The true cost of not taking the discount is significantly higher than the routine 36% tossed around in examples. A key lesson is to make sure you are taking the discounts when the math is in your favor.

Summary

While Einstein may have overstated when he said "***the most powerful force in the universe is compound interest,***" the time value of money *is* fundamental to all aspects of business decision-making. We have tried to provide insight into the basics of this concept through TRI's Critical Equation #10.



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Appendix – Time Value of Money Tables

Presented below are the four time value of money tables as discussed in Exhibits 1, 2, 3 and 4.

Future Value of Single Sum ... $(1+R)^N$

	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.010	1.020	1.030	1.040	1.050	1.060	1.070	1.080	1.090	1.100	1.110	1.120	1.130	1.140	1.150	1.160	1.170	1.180	1.190	1.200
2	1.020	1.040	1.061	1.082	1.103	1.124	1.145	1.166	1.188	1.210	1.232	1.254	1.277	1.300	1.323	1.346	1.369	1.392	1.416	1.440
3	1.030	1.060	1.091	1.123	1.155	1.187	1.220	1.252	1.285	1.318	1.351	1.384	1.417	1.451	1.484	1.517	1.551	1.584	1.618	1.652
4	1.041	1.082	1.125	1.170	1.216	1.262	1.310	1.358	1.407	1.456	1.505	1.554	1.603	1.653	1.702	1.752	1.801	1.851	1.900	1.950
5	1.052	1.104	1.159	1.217	1.276	1.336	1.400	1.465	1.531	1.598	1.665	1.733	1.801	1.870	1.939	2.008	2.078	2.147	2.217	2.287
6	1.062	1.125	1.194	1.265	1.340	1.419	1.501	1.587	1.675	1.765	1.856	1.948	2.041	2.135	2.230	2.326	2.422	2.518	2.615	2.712
7	1.072	1.147	1.228	1.315	1.407	1.504	1.605	1.710	1.818	1.929	2.042	2.158	2.275	2.394	2.514	2.635	2.756	2.878	2.999	3.122
8	1.083	1.170	1.263	1.363	1.467	1.576	1.689	1.806	1.927	2.051	2.178	2.308	2.440	2.574	2.710	2.847	2.985	3.124	3.264	3.405
9	1.094	1.193	1.298	1.409	1.525	1.646	1.772	1.902	2.036	2.173	2.313	2.456	2.602	2.750	2.899	3.050	3.202	3.355	3.509	3.664
10	1.105	1.216	1.334	1.460	1.592	1.729	1.870	2.015	2.164	2.316	2.471	2.629	2.790	2.953	3.118	3.284	3.451	3.619	3.788	3.958
11	1.115	1.240	1.370	1.507	1.649	1.796	1.947	2.102	2.260	2.421	2.585	2.752	2.921	3.092	3.264	3.437	3.611	3.786	3.962	4.139
12	1.127	1.268	1.408	1.556	1.709	1.867	2.029	2.195	2.364	2.536	2.711	2.888	3.067	3.247	3.428	3.610	3.793	3.977	4.162	4.348
13	1.138	1.294	1.445	1.603	1.765	1.931	2.101	2.274	2.450	2.628	2.808	2.989	3.171	3.354	3.538	3.722	3.907	4.092	4.278	4.465
14	1.149	1.319	1.473	1.639	1.805	1.981	2.159	2.340	2.523	2.708	2.894	3.081	3.269	3.458	3.648	3.838	4.028	4.218	4.409	4.600
15	1.161	1.340	1.500	1.670	1.848	2.036	2.226	2.418	2.612	2.808	2.995	3.183	3.372	3.562	3.753	3.944	4.135	4.326	4.517	4.708
16	1.173	1.373	1.539	1.719	1.907	2.105	2.305	2.507	2.711	2.917	3.124	3.332	3.541	3.750	3.960	4.170	4.380	4.590	4.800	5.010
17	1.184	1.400	1.571	1.761	1.959	2.167	2.376	2.587	2.800	3.015	3.231	3.448	3.665	3.882	4.100	4.318	4.536	4.754	4.972	5.190
18	1.196	1.428	1.602	1.802	2.009	2.226	2.445	2.666	2.888	3.112	3.337	3.562	3.787	4.012	4.237	4.462	4.687	4.912	5.137	5.362
19	1.208	1.457	1.634	1.844	2.061	2.288	2.517	2.748	2.980	3.213	3.446	3.679	3.912	4.145	4.378	4.611	4.844	5.077	5.310	5.543
20	1.220	1.486	1.666	1.886	2.113	2.350	2.589	2.830	3.071	3.312	3.553	3.794	4.035	4.276	4.517	4.758	4.999	5.240	5.481	5.722
21	1.232	1.516	1.699	1.929	2.176	2.423	2.672	2.922	3.171	3.420	3.669	3.918	4.167	4.416	4.665	4.914	5.163	5.412	5.661	5.910
22	1.245	1.546	1.733	1.973	2.224	2.480	2.739	2.998	3.256	3.514	3.772	4.030	4.288	4.546	4.804	5.062	5.320	5.578	5.836	6.094
23	1.257	1.577	1.767	2.015	2.273	2.538	2.806	3.074	3.341	3.608	3.875	4.142	4.409	4.676	4.943	5.210	5.477	5.744	6.011	6.278
24	1.270	1.608	1.801	2.061	2.321	2.595	2.872	3.149	3.425	3.701	3.976	4.251	4.526	4.801	5.076	5.351	5.626	5.901	6.176	6.451
25	1.282	1.640	1.834	2.104	2.373	2.656	2.933	3.210	3.486	3.761	4.036	4.311	4.586	4.861	5.136	5.411	5.686	5.961	6.236	6.511
26	1.295	1.673	1.867	2.147	2.422	2.705	2.982	3.259	3.534	3.809	4.084	4.359	4.634	4.909	5.184	5.459	5.734	6.009	6.284	6.559
27	1.308	1.707	1.901	2.191	2.471	2.759	3.039	3.318	3.593	3.868	4.143	4.418	4.693	4.968	5.243	5.518	5.793	6.068	6.343	6.618
28	1.321	1.740	1.934	2.234	2.520	2.808	3.088	3.368	3.643	3.918	4.193	4.468	4.743	5.018	5.293	5.568	5.843	6.118	6.393	6.668
29	1.333	1.773	1.967	2.277	2.569	2.857	3.137	3.417	3.692	3.967	4.242	4.517	4.792	5.067	5.342	5.617	5.892	6.167	6.442	6.717
30	1.346	1.807	2.001	2.320	2.618	2.906	3.186	3.466	3.741	4.016	4.291	4.566	4.841	5.116	5.391	5.666	5.941	6.216	6.491	6.766
31	1.359	1.840	2.034	2.363	2.667	2.955	3.235	3.515	3.790	4.065	4.340	4.615	4.890	5.165	5.440	5.715	5.990	6.265	6.540	6.815
32	1.372	1.873	2.067	2.406	2.716	3.004	3.284	3.564	3.839	4.114	4.389	4.664	4.939	5.214	5.489	5.764	6.039	6.314	6.589	6.864
33	1.385	1.907	2.100	2.449	2.765	3.053	3.333	3.613	3.888	4.163	4.438	4.713	4.988	5.263	5.538	5.813	6.088	6.363	6.638	6.913
34	1.400	1.940	2.133	2.492	2.814	3.102	3.382	3.662	3.937	4.212	4.487	4.762	5.037	5.312	5.587	5.862	6.137	6.412	6.687	6.962
35	1.413	1.973	2.166	2.535	2.863	3.151	3.431	3.711	3.986	4.261	4.536	4.811	5.086	5.361	5.636	5.911	6.186	6.461	6.736	7.011
36	1.426	2.006	2.199	2.578	2.912	3.200	3.480	3.760	4.035	4.310	4.585	4.860	5.135	5.410	5.685	5.960	6.235	6.510	6.785	7.060
37	1.440	2.040	2.232	2.621	2.961	3.249	3.529	3.809	4.084	4.359	4.634	4.909	5.184	5.459	5.734	6.009	6.284	6.559	6.834	7.109
38	1.453	2.073	2.265	2.664	3.010	3.298	3.578	3.858	4.134	4.409	4.684	4.959	5.234	5.509	5.784	6.059	6.334	6.609	6.884	7.159
39	1.467	2.107	2.298	2.707	3.059	3.347	3.627	3.907	4.182	4.457	4.732	5.007	5.282	5.557	5.832	6.107	6.382	6.657	6.932	7.207
40	1.480	2.140	2.331	2.750	3.108	3.396	3.676	3.956	4.232	4.507	4.782	5.057	5.332	5.607	5.882	6.157	6.432	6.707	6.982	7.257



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	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000	1.000
2	2.015	2.020	2.030	2.040	2.050	2.060	2.070	2.080	2.090	2.100	2.110	2.120	2.130	2.140	2.150	2.160	2.170	2.180	2.190	2.200
3	3.030	3.060	3.090	3.120	3.150	3.180	3.210	3.240	3.270	3.310	3.340	3.370	3.400	3.430	3.460	3.490	3.520	3.550	3.580	3.610
4	4.060	4.120	4.180	4.240	4.300	4.370	4.440	4.500	4.570	4.640	4.710	4.770	4.830	4.890	4.950	5.010	5.070	5.130	5.190	5.250
5	5.100	5.200	5.290	5.390	5.490	5.590	5.690	5.790	5.890	5.990	6.090	6.190	6.290	6.390	6.490	6.590	6.690	6.790	6.890	6.990
6	6.150	6.300	6.440	6.590	6.740	6.890	7.040	7.190	7.340	7.490	7.640	7.790	7.940	8.090	8.240	8.390	8.540	8.690	8.840	8.990
7	7.210	7.400	7.590	7.780	7.970	8.160	8.350	8.540	8.730	8.920	9.110	9.300	9.490	9.680	9.870	10.060	10.250	10.440	10.630	10.820
8	8.280	8.500	8.720	8.940	9.160	9.380	9.600	9.820	10.040	10.260	10.480	10.700	10.920	11.140	11.360	11.580	11.800	12.020	12.240	12.460
9	9.360	9.700	10.040	10.380	10.720	11.060	11.400	11.740	12.080	12.420	12.760	13.100	13.440	13.780	14.120	14.460	14.800	15.140	15.480	15.820
10	10.460	10.900	11.340	11.780	12.220	12.660	13.100	13.540	13.980	14.420	14.860	15.300	15.740	16.180	16.620	17.060	17.500	17.940	18.380	18.820
11	11.580	12.100	12.620	13.140	13.660	14.180	14.700	15.220	15.740	16.260	16.780	17.300	17.820	18.340	18.860	19.380	19.900	20.420	20.940	21.460
12	12.720	13.300	13.880	14.460	15.040	15.620	16.200	16.780	17.360	17.940	18.520	19.100	19.680	20.260	20.840	21.420	22.000	22.580	23.160	23.740
13	13.880	14.500	15.120	15.740	16.360	16.980	17.600	18.220	18.840	19.460	20.080	20.700	21.320	21.940	22.560	23.180	23.800	24.420	25.040	25.660
14	14.940	15.700	16.460	17.220	17.980	18.740	19.500	20.260	21.020	21.780	22.540	23.300	24.060	24.820	25.580	26.340	27.100	27.860	28.620	29.380
15	16.000	17.000	18.000	19.000	20.000	21.000	22.000	23.000	24.000	25.000	26.000	27.000	28.000	29.000	30.000	31.000	32.000	33.000	34.000	35.000
16	17.100	18.300	19.500	20.700	21.900	23.100	24.300	25.500	26.700	27.900	29.100	30.300	31.500	32.700	33.900	35.100	36.300	37.500	38.700	39.900
17	18.200	19.600	21.000	22.400	23.800	25.200	26.600	28.000	29.400	30.800	32.200	33.600	35.000	36.400	37.800	39.200	40.600	42.000	43.400	44.800
18	19.300	21.000	22.800	24.600	26.400	28.200	30.000	31.800	33.600	35.400	37.200	39.000	40.800	42.600	44.400	46.200	48.000	49.800	51.600	53.400
19	20.400	22.400	24.400	26.400	28.400	30.400	32.400	34.400	36.400	38.400	40.400	42.400	44.400	46.400	48.400	50.400	52.400	54.400	56.400	58.400
20	21.600	24.000	26.400	28.800	31.200	33.600	36.000	38.400	40.800	43.200	45.600	48.000	50.400	52.800	55.200	57.600	60.000	62.400	64.800	67.200
21	22.800	25.600	28.400	31.200	34.000	36.800	39.600	42.400	45.200	48.000	50.800	53.600	56.400	59.200	62.000	64.800	67.600	70.400	73.200	76.000
22	24.000	27.200	30.400	33.600	36.800	40.000	43.200	46.400	49.600	52.800	56.000	59.200	62.400	65.600	68.800	72.000	75.200	78.400	81.600	84.800
23	25.200	28.800	32.400	36.000	39.600	43.200	46.800	50.400	54.000	57.600	61.200	64.800	68.400	72.000	75.600	79.200	82.800	86.400	90.000	93.600
24	26.400	30.400	34.000	37.600	41.200	44.800	48.400	52.000	55.600	59.200	62.800	66.400	70.000	73.600	77.200	80.800	84.400	88.000	91.600	95.200
25	27.600	32.000	35.600	39.200	42.800	46.400	50.000	53.600	57.200	60.800	64.400	68.000	71.600	75.200	78.800	82.400	86.000	89.600	93.200	96.800
26	28.800	33.600	37.200	40.800	44.400	48.000	51.600	55.200	58.800	62.400	66.000	69.600	73.200	76.800	80.400	84.000	87.600	91.200	94.800	98.400
27	30.000	35.200	38.800	42.400	46.000	49.600	53.200	56.800	60.400	64.000	67.600	71.200	74.800	78.400	82.000	85.600	89.200	92.800	96.400	100.000
28	31.200	36.800	40.400	44.000	47.600	51.200	54.800	58.400	62.000	65.600	69.200	72.800	76.400	80.000	83.600	87.200	90.800	94.400	98.000	101.600
29	32.400	38.400	42.000	45.600	49.200	52.800	56.400	60.000	63.600	67.200	70.800	74.400	78.000	81.600	85.200	88.800	92.400	96.000	99.600	103.200
30	33.600	40.000	43.600	47.200	50.800	54.400	58.000	61.600	65.200	68.800	72.400	76.000	79.600	83.200	86.800	90.400	94.000	97.600	101.200	104.800
31	34.800	41.600	45.200	48.800	52.400	56.000	59.600	63.200	66.800	70.400	74.000	77.600	81.200	84.800	88.400	92.000	95.600	99.200	102.800	106.400
32	36.000	43.200	46.800	50.400	54.000	57.600	61.200	64.800	68.400	72.000	75.600	79.200	82.800	86.400	90.000	93.600	97.200	100.800	104.400	108.000
33	37.200	44.800	48.400	52.000	55.600	59.200	62.800	66.400	70.000	73.600	77.200	80.800	84.400	88.000	91.600	95.200	98.800	102.400	106.000	109.600
34	38.400	46.400	50.000	53.600	57.200	60.800	64.400	68.000	71.600	75.200	78.800	82.400	86.000	89.600	93.200	96.800	100.400	104.000	107.600	111.200
35	39.600	48.000	51.600	55.200	58.800	62.400	66.000	69.600	73.200	76.800	80.400	84.000	87.600	91.200	94.800	98.400	102.000	105.600	109.200	112.800
36	40.800	49.600	53.200	56.800	60.400	64.000	67.600	71.200	74.800	78.400	82.000	85.600	89.200	92.800	96.400	100.000	103.600	107.200	110.800	114.400
37	42.000	51.200	54.800	58.400	62.000	65.600	69.200	72.800	76.400	80.000	83.600	87.200	90.800	94.400	98.000	101.600	105.200	108.800	112.400	116.000
38	43.200	52.800	56.400	60.000	63.600	67.200	70.800	74.400	78.000	81.600	85.200	88.800	92.400	96.000	99.600	103.200	106.800	110.400	114.000	117.600
39	44.400	54.400	58.000	61.600	65.200	68.800	72.400	76.000	79.600	83.200	86.800	90.400	94.000	97.600	101.200	104.800	108.400	112.000	115.600	119.200
40	45.600	56.000	59.600	63.200	66.800	70.400	74.000	77.600	81.200	84.800	88.400	92.000	95.600	99.200	102.800	106.400	110.000	113.600	117.200	120.800



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1	0.990	0.980	0.971	0.962	0.952	0.943	0.933	0.925	0.917	0.909	0.900	0.893	0.885	0.877	0.870	0.862	0.853	0.847	0.840	0.833
2	0.980	0.961	0.941	0.921	0.902	0.883	0.873	0.857	0.842	0.826	0.817	0.797	0.783	0.769	0.756	0.743	0.731	0.719	0.708	0.694
3	0.971	0.942	0.913	0.884	0.864	0.845	0.836	0.794	0.772	0.751	0.731	0.712	0.693	0.675	0.658	0.644	0.624	0.609	0.591	0.579
4	0.962	0.924	0.888	0.853	0.823	0.792	0.761	0.731	0.708	0.683	0.659	0.638	0.613	0.592	0.572	0.552	0.534	0.516	0.499	0.482
5	0.953	0.906	0.863	0.822	0.784	0.747	0.713	0.681	0.650	0.621	0.595	0.567	0.543	0.519	0.497	0.476	0.456	0.437	0.419	0.402
6	0.944	0.888	0.837	0.790	0.746	0.703	0.666	0.630	0.596	0.564	0.535	0.507	0.480	0.456	0.432	0.410	0.390	0.370	0.352	0.335
7	0.935	0.871	0.811	0.760	0.711	0.665	0.623	0.583	0.547	0.513	0.482	0.452	0.427	0.400	0.376	0.354	0.333	0.314	0.296	0.279
8	0.927	0.853	0.789	0.731	0.677	0.627	0.582	0.540	0.502	0.467	0.434	0.404	0.376	0.351	0.327	0.305	0.285	0.266	0.249	0.231
9	0.919	0.837	0.766	0.703	0.645	0.592	0.544	0.500	0.460	0.424	0.390	0.361	0.333	0.308	0.294	0.263	0.243	0.225	0.209	0.194
10	0.908	0.820	0.744	0.676	0.614	0.558	0.509	0.463	0.422	0.386	0.352	0.322	0.295	0.270	0.247	0.227	0.206	0.193	0.176	0.162
11	0.899	0.804	0.722	0.650	0.585	0.527	0.475	0.429	0.388	0.350	0.317	0.287	0.261	0.237	0.215	0.195	0.176	0.162	0.148	0.136
12	0.887	0.788	0.701	0.623	0.557	0.497	0.444	0.397	0.356	0.319	0.286	0.257	0.231	0.208	0.187	0.168	0.152	0.137	0.124	0.112
13	0.879	0.777	0.681	0.601	0.530	0.469	0.413	0.369	0.328	0.290	0.258	0.229	0.204	0.182	0.163	0.145	0.130	0.116	0.104	0.093
14	0.870	0.766	0.661	0.577	0.506	0.442	0.388	0.340	0.299	0.261	0.227	0.200	0.174	0.160	0.141	0.125	0.111	0.099	0.088	0.078
15	0.861	0.743	0.642	0.553	0.481	0.417	0.362	0.313	0.275	0.239	0.205	0.181	0.160	0.140	0.123	0.108	0.097	0.084	0.074	0.065
16	0.853	0.729	0.623	0.534	0.458	0.394	0.339	0.292	0.252	0.218	0.188	0.163	0.141	0.123	0.107	0.095	0.083	0.071	0.062	0.054
17	0.844	0.714	0.603	0.513	0.436	0.373	0.317	0.270	0.231	0.198	0.170	0.146	0.125	0.108	0.093	0.080	0.069	0.060	0.052	0.045
18	0.836	0.700	0.587	0.494	0.416	0.353	0.296	0.250	0.212	0.180	0.153	0.130	0.111	0.095	0.081	0.069	0.059	0.051	0.044	0.038
19	0.829	0.686	0.570	0.475	0.396	0.333	0.277	0.232	0.194	0.164	0.138	0.116	0.098	0.081	0.070	0.060	0.051	0.043	0.037	0.031
20	0.820	0.673	0.554	0.456	0.377	0.312	0.258	0.215	0.178	0.149	0.124	0.104	0.087	0.073	0.061	0.051	0.043	0.037	0.031	0.026
21	0.811	0.660	0.538	0.439	0.359	0.294	0.242	0.199	0.164	0.135	0.112	0.091	0.077	0.064	0.055	0.044	0.037	0.031	0.026	0.022
22	0.803	0.647	0.522	0.422	0.342	0.278	0.226	0.184	0.150	0.123	0.100	0.081	0.068	0.056	0.046	0.038	0.032	0.026	0.022	0.018
23	0.795	0.634	0.507	0.406	0.326	0.262	0.210	0.170	0.134	0.112	0.091	0.074	0.060	0.049	0.040	0.033	0.027	0.022	0.018	0.015
24	0.788	0.622	0.492	0.390	0.310	0.247	0.195	0.156	0.126	0.102	0.082	0.066	0.053	0.043	0.035	0.028	0.023	0.019	0.015	0.013
25	0.780	0.610	0.478	0.375	0.296	0.233	0.184	0.146	0.116	0.092	0.074	0.059	0.047	0.038	0.030	0.024	0.020	0.016	0.013	0.010
26	0.772	0.598	0.464	0.361	0.281	0.220	0.172	0.135	0.106	0.084	0.066	0.051	0.042	0.033	0.026	0.021	0.017	0.014	0.011	0.009
27	0.764	0.586	0.450	0.347	0.268	0.207	0.160	0.125	0.099	0.076	0.060	0.047	0.037	0.029	0.023	0.019	0.014	0.011	0.009	0.007
28	0.757	0.574	0.437	0.333	0.253	0.192	0.146	0.112	0.090	0.069	0.054	0.042	0.033	0.026	0.020	0.016	0.012	0.010	0.008	0.006
29	0.749	0.560	0.424	0.321	0.241	0.180	0.134	0.102	0.082	0.063	0.048	0.037	0.029	0.022	0.017	0.014	0.011	0.009	0.008	0.005
30	0.742	0.552	0.412	0.308	0.231	0.174	0.131	0.099	0.075	0.057	0.044	0.033	0.026	0.020	0.015	0.012	0.009	0.007	0.005	0.004
31	0.733	0.541	0.400	0.296	0.220	0.164	0.123	0.092	0.069	0.052	0.039	0.030	0.023	0.017	0.013	0.010	0.008	0.006	0.005	0.004
32	0.727	0.531	0.388	0.283	0.210	0.153	0.113	0.081	0.061	0.047	0.035	0.027	0.020	0.015	0.011	0.009	0.007	0.005	0.004	0.003
33	0.720	0.520	0.377	0.274	0.200	0.146	0.107	0.079	0.059	0.045	0.032	0.024	0.018	0.013	0.010	0.007	0.006	0.004	0.003	0.002
34	0.713	0.510	0.366	0.264	0.190	0.138	0.100	0.073	0.053	0.039	0.029	0.021	0.016	0.012	0.009	0.006	0.005	0.004	0.003	0.002
35	0.706	0.500	0.353	0.251	0.181	0.130	0.094	0.068	0.049	0.036	0.026	0.019	0.014	0.010	0.008	0.006	0.004	0.003	0.002	0.002
36	0.699	0.490	0.341	0.244	0.173	0.123	0.089	0.063	0.045	0.032	0.023	0.017	0.012	0.009	0.007	0.005	0.004	0.003	0.002	0.001
37	0.692	0.481	0.331	0.234	0.164	0.116	0.082	0.059	0.041	0.029	0.021	0.015	0.011	0.008	0.006	0.004	0.003	0.002	0.002	0.001
38	0.685	0.471	0.323	0.227	0.157	0.109	0.076	0.054	0.034	0.027	0.019	0.013	0.010	0.007	0.005	0.004	0.003	0.002	0.001	0.001
39	0.679	0.462	0.316	0.220	0.149	0.101	0.071	0.050	0.031	0.024	0.017	0.012	0.009	0.006	0.004	0.003	0.002	0.002	0.001	0.001
40	0.672	0.453	0.307	0.206	0.142	0.097	0.067	0.046	0.032	0.022	0.015	0.011	0.008	0.005	0.004	0.003	0.002	0.001	0.001	0.001



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	1%	2%	3%	4%	5%	6%	7%	8%	9%	10%	11%	12%	13%	14%	15%	16%	17%	18%	19%	20%
1	0.990	0.980	0.971	0.962	0.952	0.943	0.933	0.924	0.915	0.906	0.897	0.888	0.879	0.870	0.862	0.853	0.844	0.835	0.826	0.817
2	1.970	1.942	1.913	1.885	1.857	1.830	1.802	1.775	1.748	1.721	1.694	1.667	1.640	1.613	1.586	1.559	1.532	1.505	1.478	1.451
3	2.941	2.884	2.827	2.771	2.715	2.659	2.603	2.547	2.491	2.435	2.379	2.323	2.267	2.211	2.155	2.099	2.043	1.987	1.931	1.875
4	3.902	3.808	3.715	3.622	3.530	3.438	3.346	3.254	3.162	3.070	2.978	2.886	2.794	2.702	2.610	2.518	2.426	2.334	2.242	2.150
5	4.853	4.713	4.580	4.447	4.315	4.183	4.051	3.919	3.787	3.655	3.523	3.391	3.259	3.127	2.995	2.863	2.731	2.599	2.467	2.335
6	5.795	5.601	5.417	5.233	5.050	4.866	4.682	4.498	4.314	4.130	3.946	3.762	3.578	3.394	3.210	3.026	2.842	2.658	2.474	2.290
7	6.728	6.472	6.230	6.002	5.776	5.550	5.324	5.098	4.872	4.646	4.420	4.194	3.968	3.742	3.516	3.290	3.064	2.838	2.612	2.386
8	7.652	7.323	7.000	6.683	6.366	6.049	5.732	5.415	5.098	4.781	4.464	4.147	3.830	3.513	3.196	2.879	2.562	2.245	1.928	1.611
9	8.566	8.162	7.768	7.383	7.000	6.617	6.234	5.851	5.468	5.085	4.702	4.319	3.936	3.553	3.170	2.787	2.404	2.021	1.638	1.255
10	9.471	8.963	8.530	8.111	7.722	7.360	7.024	6.710	6.418	6.145	5.890	5.650	5.424	5.211	5.009	4.818	4.628	4.438	4.248	4.058
11	10.368	9.787	9.323	8.870	8.436	8.020	7.620	7.236	6.867	6.512	6.170	5.841	5.524	5.219	4.924	4.638	4.352	4.066	3.780	3.494
12	11.257	10.575	9.994	9.531	9.083	8.651	8.234	7.831	7.441	7.063	6.706	6.362	6.030	5.709	5.397	5.094	4.791	4.488	4.185	3.882
13	12.134	11.348	10.635	9.986	9.548	9.121	8.704	8.300	7.908	7.527	7.156	6.794	6.441	6.097	5.762	5.436	5.110	4.784	4.458	4.132
14	13.004	12.108	11.296	10.563	9.900	9.295	8.745	8.244	7.786	7.338	6.890	6.442	6.003	5.564	5.125	4.686	4.247	3.808	3.369	2.930
15	13.867	12.849	11.938	11.108	10.380	9.712	9.100	8.539	8.024	7.565	7.106	6.647	6.188	5.729	5.270	4.811	4.352	3.893	3.434	2.975
16	14.719	13.578	12.561	11.632	10.838	10.106	9.447	8.831	8.313	7.824	7.335	6.846	6.357	5.868	5.379	4.890	4.401	3.912	3.423	2.934
17	15.562	14.292	13.166	12.166	11.274	10.477	9.761	9.122	8.544	8.022	7.540	7.058	6.576	6.094	5.612	5.130	4.648	4.166	3.684	3.202
18	16.396	14.992	13.754	12.659	11.690	10.828	10.099	9.372	8.756	8.201	7.702	7.203	6.704	6.205	5.706	5.207	4.708	4.209	3.710	3.211
19	17.226	15.678	14.324	13.134	12.083	11.180	10.180	9.604	9.050	8.566	8.039	7.512	6.985	6.458	5.931	5.404	4.877	4.350	3.823	3.296
20	18.046	16.351	14.907	13.590	12.462	11.470	10.394	9.818	9.229	8.714	8.160	7.606	7.052	6.498	5.944	5.390	4.836	4.282	3.728	3.174
21	18.857	17.013	15.481	14.029	12.821	11.744	10.488	9.847	9.252	8.649	8.073	7.502	6.931	6.360	5.789	5.218	4.647	4.076	3.505	2.934
22	19.660	17.658	15.917	14.471	13.163	12.042	11.061	10.201	9.542	8.922	8.316	7.710	7.104	6.498	5.892	5.286	4.680	4.074	3.468	2.862
23	20.456	18.292	16.444	14.857	13.499	12.303	11.272	10.371	9.580	8.885	8.256	7.578	6.972	6.366	5.760	5.154	4.548	3.942	3.336	2.730
24	21.241	18.914	16.938	15.247	13.799	12.530	11.469	10.529	9.707	8.965	8.348	7.704	7.098	6.492	5.886	5.280	4.674	4.068	3.430	2.824
25	22.023	19.523	17.403	15.622	14.094	12.783	11.654	10.679	9.823	9.077	8.422	7.743	7.130	6.524	5.918	5.312	4.706	4.090	3.414	2.808
26	22.795	20.121	17.877	15.981	14.375	13.003	11.826	10.810	9.929	9.161	8.468	7.782	7.160	6.554	5.948	5.342	4.736	4.130	3.508	2.902
27	23.560	20.707	18.327	16.330	14.643	13.211	11.987	10.933	10.027	9.237	8.516	7.783	7.100	6.494	5.888	5.282	4.676	4.024	3.392	2.846
28	24.318	21.281	18.744	16.660	14.906	13.406	12.137	11.151	10.116	9.307	8.552	7.784	7.041	6.431	5.825	5.219	4.610	3.958	3.326	2.780
29	25.068	21.844	19.188	16.984	15.141	13.591	12.278	11.238	10.199	9.370	8.550	7.802	7.070	6.401	5.780	5.160	4.540	3.888	3.250	2.714
30	25.806	22.396	19.660	17.292	15.372	13.763	12.409	11.258	10.274	9.427	8.604	7.805	7.046	6.350	5.720	5.090	4.470	3.810	3.174	2.648
40	26.342	22.938	20.000	17.588	15.593	13.929	12.532	11.330	10.340	9.479	8.713	7.903	7.120	6.479	5.817	5.187	4.557	3.923	3.279	2.682
50	27.270	23.468	20.399	17.874	15.803	14.084	12.647	11.433	10.406	9.526	8.769	7.912	7.138	6.401	5.740	5.100	4.444	3.743	3.065	2.565
60	27.980	23.989	20.766	18.144	16.001	14.230	12.754	11.514	10.484	9.569	8.801	7.913	7.136	6.400	5.739	5.090	4.443	3.742	3.064	2.564
70	28.701	24.499	21.132	18.431	16.193	14.368	12.854	11.587	10.518	9.609	8.829	7.917	7.127	6.390	5.699	5.049	4.384	3.694	2.994	2.494
80	29.404	24.999	21.487	18.663	16.374	14.498	12.948	11.633	10.587	9.644	8.833	7.916	7.089	6.357	5.657	5.009	4.343	3.643	2.943	2.443
90	30.098	25.489	21.832	18.890	16.547	14.621	13.033	11.713	10.612	9.677	8.879	7.922	7.098	6.315	5.615	4.967	4.292	3.592	2.892	2.392
100	30.780	25.968	22.167	19.143	16.711	14.737	13.117	11.773	10.633	9.706	8.900	7.926	7.060	6.273	5.572	4.920	4.241	3.541	2.841	2.341
110	31.447	26.441	22.492	19.368	16.868	14.846	13.191	11.829	10.650	9.733	8.924	7.921	7.048	6.230	5.529	4.879	4.190	3.490	2.790	2.290
120	32.101	26.900	22.808	19.584	17.017	14.949	13.261	11.879	10.726	9.757	8.938	7.923	7.027	6.188	5.488	4.838	4.139	3.439	2.739	2.239
130	32.835	27.355	23.115	19.793	17.169	15.046	13.332	11.925	10.757	9.779	8.961	7.944	7.044	6.147	5.447	4.797	4.088	3.388	2.688	2.188

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