CENTRAL POINT

Budget Risk Analysis
City of Central Point, Oregon

REMI Northwest
September 26, 2010

REMI Northwest
Consultants in Regional Economic Analysis
4497 Brownridge, Suite 107 ● Medford, Oregon 97504-6124 ● Telephone: (541) 773-8887 ● Fax: (541) 779-0114

Budget Risk Analysis
City of Central Point, Oregon

September 26, 2010

Summary

Risks to the financial performance of an organization may come in many forms. Any event that causes unexpected variation in revenues or expenses may be thought of as a risk. Wildfire, for example, is among many risks that we work hard to avoid. In financial management, the City mitigates some of the most dramatic risks by purchasing insurance, the most common type of risk management. Other risks having to do with variation in revenues and expenses from business activities, population growth or tax revenues are not insurable but present substantial variation for which the City must be prepared. Un-insurable risks are the subject of the following analysis.

The City maintains reserves against unexpected variation in revenues or expenses. According to the 2009 audit, Central point had approximately $8.4 million invested in the Local Government Investment Pool (LGIP) to provide for unexpected variation.

This analysis uses statistical tools to measure the amount of variation in expenses and revenues at Central Point over different periods of time in an effort to better understand the range of negative events that the City may reasonably expect to provide for in its financial planning.

All of the estimates presented below are in 2010 dollars and are based on data which has been adjusted to current dollars using the US CPI from the US Bureau of Labor Statistics.

Sources of Risk

The timing of tax revenue payments is one issue among several that contribute to variation in City expenses and revenues from month to month, and from year to year. Table 1 below shows the approximate level of financial risk from all sources and how that risk is distributed amongst the funds.

Table 1:
The Perfect Storm- 1 in 20 year risk

Fund	Annual Risk
General	$ 757,249
Street	$ 661,301
CIP	$ 405,001
Building	$ 315,067
Water	$ 369,571
Internal Service	$ 471,811
Total	$ 2,980,000

The weather, the pace of development activity and changes in the population are factors which create fluctuations in net revenues shown in Table 1 at the 95% level of confidence. The table shows that, once in 20 years, the City may face circumstances beyond its control requiring it to arrange for as much as $2.98 million dollars to cover operating costs. Such events are usually caused by more than one bad thing happening at once, as in a decline in tax revenue, decline in building activity and an increase in water costs occurring all at the same time. Such events are sometimes referred to as “the perfect storm.”

Other variation in revenue and expense is periodic. For example, water revenue has a peak every summer and a low point every winter as irrigation activity rises and falls. Tax revenues typically arrive in November and December and not during the rest of the year. Other types of payments including grants and revenue sharing are inconsistent as to when during the year they arrive, although they tend to arrive every year.

Risks estimated in this document are intentionally overstated because major capital spending projects are included in this analysis as risks at the request of City staff. This conservative methodology leads to a report of risk approximately $800,000 higher than it otherwise would be if Major Capital expenses were excluded from the data in a more typical analysis.

Payments for principal and interest on capital projects are included as part of routine City expenditures. Since they do not vary, they do not present much risk.

Period of Analysis

The level of risk tends to rise as the period of analysis is lengthened. In this analysis, periodic risks are identified as variation in revenue and expense that occur **within the yea**r. Annual budget risks occur from **year to year**. Taken together, periodic risks and fiscal year risks occur over a rolling 12 month period. The possibility of multiple years of poor budget performance is accounted for with an analysis of a rolling 24 month period. The analysis identifies the worst 24 month periods over the last 10 years. The longer period, 24 months, incorporates the greatest degree of potential budget variation, but the degree of variation is offset by the relatively long time period. The most acute possible risks occur within 12 month periods when annual seasonal fluctuations combine with possible fiscal year deficits.

For periods greater than 24 months, the City Council is assumed to be able to change behavior so as to account for ongoing negative fiscal outcomes. The City Council has a strong track record of managing Central Point finances prudently. During the most recent 10 year period the City has achieved a positive net position, reflecting total revenues over the period that are greater than expenses.

Data used for this analysis from 2000 to 2009 incorporates both the recessions of 2001 and of 2007-9 along with the relative prosperity of the middle part of the decade. Variation during the decade is taken as typical of variation for Central point revenues and expenses. Long term risks are simulated from these data to estimate how often negative revenue and expense outcomes may affect the City.

Variation within the year

Revenues and Expenses do not always occur at the same time, or even during the same months of the year. Consequently, Cities must manage revenues so that adequate cash is in place for the months of the year when expenses exceed revenues.

On average, City revenues are greater than expenses and the average net revenue to the City is about $96,000 per year. Because some City revenues happen only during certain months of the year, the **most likely** monthly net revenue is a negative number, about -$153,000. Routine monthly deficits due to periodic variation in revenues must be provided for in City financial planning. These negative cash flows usually continue for several months at a time. Annual tax revenue payments and summer peak revenues more than make up for more frequent, but smaller monthly deficits.

Figure 1 shows the maximum total negative cash flow in each of the preceding 10 years. Every year the City goes through several months when expenses exceed revenues. Figure 1 represents the total negative cash flow the City has experienced during these months.

Figure 1
Maximum Accumulated Negative Due to Periodic and Seasonal Variation

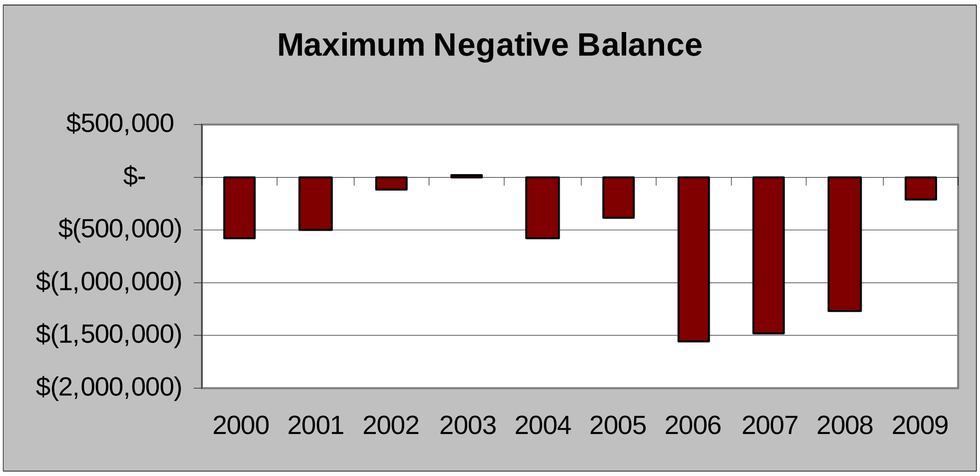
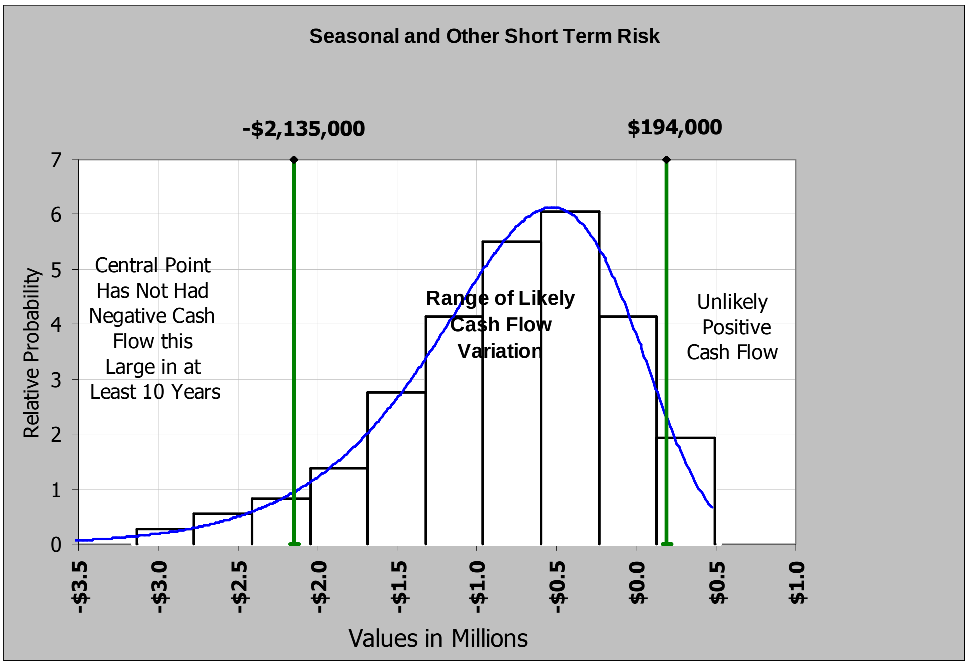


Figure 2 shows results of a simulation based upon actual monthly budget variation from 2000 to 2009. By simulating budgets many thousands of times, the model is able to construct a range of probable budget outcomes consistent with historical budgets. The analysis is based upon the assumption that the best indicator of what may happen in the future is the range of events that have occurred in the past.

Figure 2 shows that periodic negative variation in City revenues are unlikely to be greater than -$2,135,000 in any given year, at the 95% level of confidence.

In the simulation presented in Figure 2, outcomes represented to the left of the green line, -$2.135 million, are likely once in 20 years. The most likely outcomes are represented in the center part of the graph where, during 9 out of 10 years, the City is likely to experience periodic deficits between -$2.135 million and surpluses up to $194,000.

Figure 2
Variation due to seasonal and other periodic factors



Variation from year to year- Surplus and Deficit

Because Cities can't always determine in advance the levels of revenues and expenses to budget for, the end of each fiscal year may leave the City in a position of either surplus or deficit. During the preceding 10 years, Central Point has had 7 years of surplus and three in which the City ended in deficit. Surpluses and deficits did not exceed $3,350,000 in any year between 2000 and 2009.

Figure 3
Annual Surplus/Deficit- excludes major capital, inflation adjusted

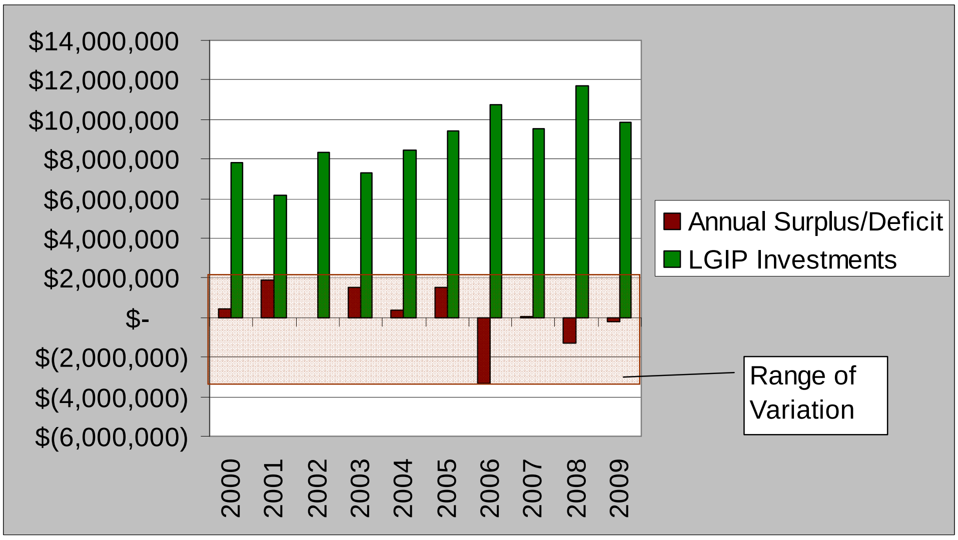
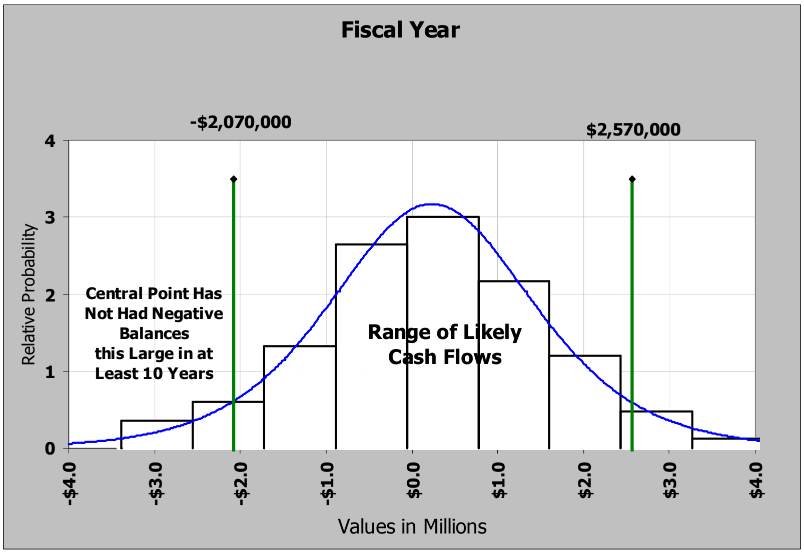


Figure 3 show years of surplus and deficit along with annual balances in the LGIP fund, the City's reserve account. LGIP Balances are much higher than the typical variation in City finances, although the impact of deficits and surpluses on the reserve account balance is clearly evident. The balance declines in years after deficits and increases in the years after surpluses.

The worst years of deficit happened during 2006 and 2008 with deficits of $3.33 million and $1.3 million respectively. The model estimates that the maximum risk of deficit within a given fiscal year is $2.07 million occurring about one time in 20 fiscal years. Because Central Point chooses to included major capital expense in its calculations, capital expenses during any year could sometimes exceed this estimate due to specific spending decisions by the City, as they did during 2006 when purchases of water rights and other projects created additional expense.

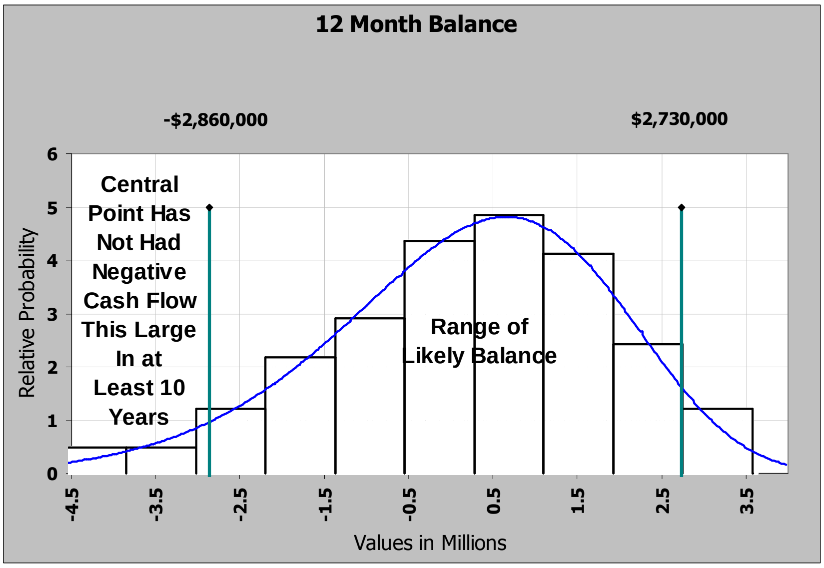
Figure 4
Annual Risk- fiscal year



Combined Fiscal Year and Periodic Variation

By assessing the 12 periods of worst financial performance over the preceding 10 years both the periodic and annual risks are captured. The combination of the two yields a $2.86 million dollar downside risk, once in every 20 years.

Figure 5
Risk Over Any 12 Month Period



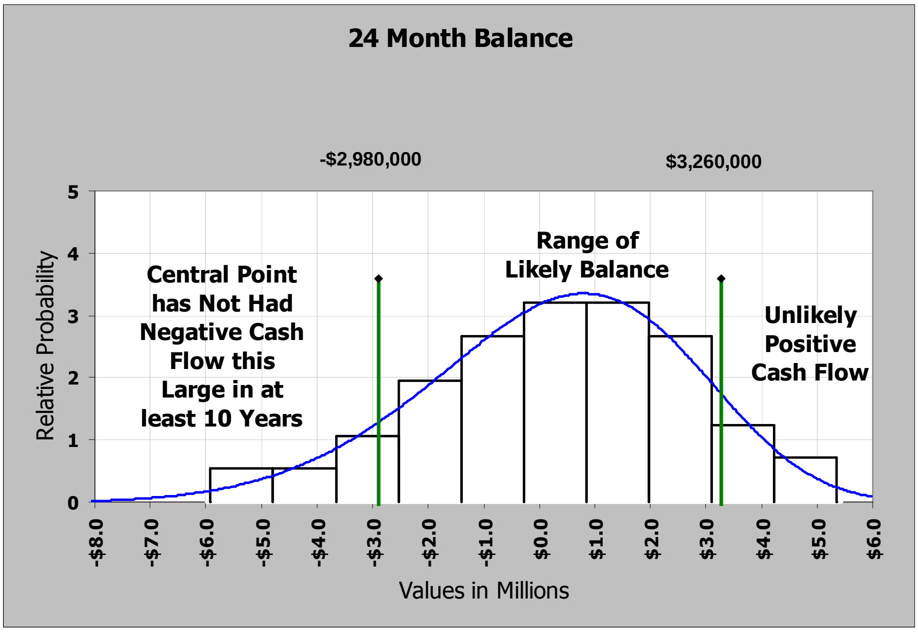
Risks Over Multiple Years

What happens if the City has budget deficits for more than one year in a row? Risk of the City experiencing multiple years of deficit are much lower than for a singe year. This is because the City Council can modify spending from year to year and in certain cases adjust revenues. The Council and administrative staff often make modifications according to changes in the City's financial position from month to month and from year to year. However, over a two year period, the City does have greater risk as a function of the greater length of time over which bad things may happen. In consideration of multiple years, positive and negative events are increasingly likely to offset one another, resulting in declining annual risk as the length of analysis increases.

Over a 2 year period, risks increase only very slightly. This is because even though the potential exists for more negative budget events to happen over the longer term, more offsetting events are also likely and importantly, City staff and Council are prone to alter expenses in response to real world events.

Over even greater periods of time the City's risk profile declines. By 8 years the risk profile declines to zero indicating that over the long run, the City is able to match its expenses with revenues while managing its way through unexpected short term difficulties. Evidence of this can be found in the positive average net revenue over the preceding 10 years.

Figure 6
24 Month Risk Profile



Reserves

The State of Oregon regulates the manner in which local jurisdictions may manage reserves. In general, municipalities may not invest reserves for terms greater than 18 months and may only invest in relatively safe investment vehicles. Most Oregon jurisdictions invest in the Local Government Investment Pool (LGIP) which is a fund managed by the State of Oregon. The City of Central Point had approximately $8.4 million dollars invested with the LGIP at the end of 2009.

Interest rates paid by the LGIP vary from month to month. Currently the annual rate of return for funds invested in LGIP is 0.55%. Over the 12 months ended August 2010, the average rate of return was 0.62%.

Conclusion

According to this analysis of random (stochastic) risk to the City of Central Point, the City faces variation in its revenues and expenses. Once in 20 years, the City is likely to have the need for up to $2.98 million in excess of revenues due to routine variation in revenue and expenses. These risks comprise month to month variation combined with annual and bi-annual changes in the City's financial position.

Risks over different terms make conceptualization of the entire risk profile difficult as periodic risks disappear when considered over longer time horizons while others become more acute. When taken together, the City is likely to be able to insure against its worst eventualities and routine variations together.

Appendix

Logistic Function

Guidelines	***beta*** **must be a positive value.**
Parameters	**α continuous location parameter**
	β continuous scale parameter β > 0
Domain	**-∞ < x < +∞ continuous**
Density and Cumulative Distribution Functions	$\frac{1 + \operatorname{sech}^2\left[\frac{1}{2}\left(\frac{x-\alpha}{\beta}\right)\right]}{4\beta}$
	$\frac{1 + \tanh\left[\frac{1}{2}\left(\frac{x-\alpha}{\beta}\right)\right]}{2}$
	where "sech" is the Hyperbolic Secant Function and "tanh" is the Hyperbolic Tangent Function.
Mean	**α**
Variance	$\frac{\pi^2\beta^2}{3}$
Skewness	**0**
Kurtosis	**4.2**
Mode	**α**

Weibull Function

Description	***RiskWeibull*** (*alpha,beta*) generates a Weibull distribution with the shape parameter *alpha* and a scale parameter *beta*. The Weibull distribution is a continuous distribution whose shape and scale vary greatly depending on the argument values entered. This distribution is often used as a distribution of time to first occurrence for other continuous time processes, where it is desired to have a non-constant intensity of occurrence. This distribution is flexible enough to allow an implicit assumption of constant, increasing or decreasing intensity, according to the choice of its parameter α (α<1, =1, or >1 represent processes of increasing, constant, and decreasing intensity respectively; a constant intensity process is the same as an Exponential distribution). For example in maintenance or lifetime modelling, one may choose to use α<1 to represent that the older something is, the more likely it is to fail.
Examples	**RiskWeibull(10,20)** generates a Weibull distribution with a shape parameter 10 and a scale parameter 20.
	RiskWeibull(D1,D2) generates a Weibull distribution with a shape parameter taken from cell D1 and a scale parameter taken from cell D2.
Guidelines	Both shape parameter *alpha* and scale parameter *beta* must be greater than zero.
Parameters	α continuous shape parameter $\alpha > 0$
	β continuous scale parameter $\beta > 0$
Domain	$0 \le x < +\infty$ continuous
Density and Cumulative Distribution Functions	$f(x) = \frac{\alpha x^{\alpha-1}}{\beta^{\alpha}} e^{-\left(\frac{x}{\beta}\right)^{\alpha}}$
	$F(x) = 1 - e^{-\left(\frac{x}{\beta}\right)^{\alpha}}$
Mean	$\beta\Gamma\left(1+\frac{1}{\alpha}\right)$
	where Γ is the Gamma Function.
Variance	$\beta^2\left[\Gamma\left(1+\frac{2}{\alpha}\right) - \Gamma^2\left(1+\frac{1}{\alpha}\right)\right]$
	where Γ is the Gamma Function.
Skewness	$\frac{\Gamma\left(1+\frac{3}{\alpha}\right) - 3\Gamma\left(1+\frac{2}{\alpha}\right)\Gamma\left(1+\frac{1}{\alpha}\right) + 2\Gamma\left(1+\frac{1}{\alpha}\right)}{\left[\Gamma\left(1+\frac{2}{\alpha}\right) - \Gamma^2\left(1+\frac{1}{\alpha}\right)\right]^{\frac{3}{2}}}$
	where Γ is the Gamma Function.
Kurtosis	$\frac{\Gamma\left(1+\frac{4}{\alpha}\right) - 4\Gamma\left(1+\frac{3}{\alpha}\right)\Gamma\left(1+\frac{1}{\alpha}\right) + 6\Gamma\left(1+\frac{1}{\alpha}\right)\Gamma^2\left(1+\frac{1}{\alpha}\right) - 3\Gamma^4\left(1+\frac{1}{\alpha}\right)}{\left[\Gamma\left(1+\frac{2}{\alpha}\right) - \Gamma^2\left(1+\frac{1}{\alpha}\right)\right]^2}$
	where Γ is the Gamma Function.
Mode	$\beta\left(1+\frac{1}{\alpha}\right)^{\frac{1}{\alpha}}$ for $\alpha > 1$
	0 for $\alpha \le 1$

Normal Function

RiskNormal	
Description	***RiskNormal*** (*mean,standard deviation*) specifies a normal distribution with the entered *mean* and *standard deviation*. This is the traditional "bell shaped" curve applicable to distributions of outcomes in many data sets.
	The Normal distribution is a symmetric continuous distribution which is unbounded on both sides, and described by two parameters (μ and σ i.e. its mean and standard deviation). The use of the Normal distribution can often be justified with reference to a mathematical result called the Central Limit Theorem. This loosely states that if many independent distributions are added together, then the resulting distribution is approximately Normal. The distribution therefore often arises in the real world as the compound effect of more detailed (non-observed) random processes. Such a result applies independently of the shape of the initial distributions being added.
	The Normal distribution is a symmetric continuous distribution which is unbounded on both sides, and described by two parameters (μ and σ i.e. its mean and standard deviation). The use of the Normal distribution can often be justified with reference to a mathematical result called the Central Limit Theorem. This loosely states that if many independent distributions are added together, then the resulting distribution is approximately Normal. The distribution therefore often arises in the real world as the compound effect of more detailed (non-observed) random processes. Such a result applies independently of the shape of the initial distributions being added.
	The distribution can be used to represent the uncertainty of a model's input whenever it is believed that the input is itself the result of many other similar random processes acting together in an additive manner (but where it may be unnecessary, inefficient, or impractical to model theses detailed driving factors individually). Examples could include the total number of goals scored in the a soccer season, the amount of oil in the world, assuming that there are many reservoirs of approximately equal size, but each with an uncertain amount of oil. Where the mean is much larger than the standard deviation (e.g. 4 times or more) then a negative sampled value of the distribution would occur only rarely (so that the number of goals would not be sampled negatively in most practical cases). More generally, the output of many models is approximately normally distributed, because many models have an output which results from adding many other uncertain processes. An example might be the distribution of discounted cash flow in a long-term time series models, which consists of summing the discounted cash flows from the individual years.
Examples	**RiskNormal(10,2)** specifies a normal distribution with a *mean* of 10 and a *standard deviation* of 2.
	RiskNormal(SQRT(C101),B10) specifies a normal distribution with a *mean* equaling the square root of the value in cell C101 and a *standard deviation* taken from cell B10.
Guidelines	The *standard deviation* must be greater than 0.
Parameters	μ continuous location parameter
	σ continuous scale parameter σ > 0 *
	*σ = 0 is supported for modeling convenience, but gives a degenerate distribution with x = μ.
Domain	-∞ < x < +∞ continuous
Density and Cumulative Distribution Functions	$f(x) = \frac{1}{\sqrt{2\pi\sigma}} e^{-\frac{1}{2}\left(\frac{x-\mu}{\sigma}\right)^{20}}$
	$F(x) = \Phi\left(\frac{x-\mu}{\sigma}\right) = \frac{1}{2}\left[\frac{1}{2} erf\left(\frac{x-\mu}{\sqrt{2}\sigma}\right) + 1\right]$
	where Φ is called the Laplace-Gauss Integral and erf is the Error Function.
Mean	μ
Variance	σ^2
Skewness	0
Kurtosis	3
Mode	μ