Management," Kinzai Institute for Financial Affairs, Inc., issued on April 24, 2009, pp. 107-144

[0007]

As mentioned above, a risk weighing device using loss distribution approach generates a frequency distribution and a scale distribution, calculates the total amount of loss occurring per holding period by using the frequency distribution and the scale distribution by Monte Carlo simulation, and finding a VaR. Thus, there is a problem that computation load is heavy though the accuracy is high.

[0008]

In the field of risk analysis, beyond a situation that a highly accurate VaR is required, there is also a case, such as component analysis, that it is desired to obtain a VaR in a short time though the accuracy can be low somewhat.

SUMMARY

[0009]

Embodiments~~An object~~ of the present invention ~~is to~~ provide a risk management device which solves the abovementioned problem, namely, a problem that it is difficult to calculate an approximate value of a VaR in a short time.

[0010]

~~A risk management device according to an exemplary embodiment of the present invention includes:~~

~~a memory for storing loss data each including a loss amount and loss occurrence~~

~~frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter; and~~

~~a processor connected to the memory,~~

~~wherein the processor is programmed to calculate multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data.~~In a first aspect, there is provided a risk management device comprising: a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter; and a processor connected to the memory, wherein the processor is programmed to calculate multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data, wherein: the memory is configured to store the loss data as first scenario data, and also configured to store second scenario data each obtained by changing at least one of the loss amount and the loss occurrence frequency in each of the first scenario data; the processor is programmed to, in calculation of the multiplication values, for each of the first and second scenario data, calculate a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the scenario data and the loss amount included in the scenario data; and the processor is further programmed to, for each

combination of the first scenario data and the second scenario data obtained by changing at least one of the loss amount and the loss occurrence frequency in the first scenario data, calculate a difference value between the multiplication value relating to the first scenario data and the multiplication value relating to the second scenario data.

[0010a]

In a second aspect, there is provided a risk management device comprising: a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter; and a processor connected to the memory, wherein the processor is programmed to calculate multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data, wherein: the memory is configured to store the loss data as first loss data, and also store a first risk amount weighed by a risk weighing device based on the first loss data and second loss data each including a loss amount and loss occurrence frequency; the processor is programmed to, in calculation of the multiplication values, for each of the first and second loss data, calculate a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; and the processor is further programmed to: calculate first and second approximate risk amounts obtained by cumulating the calculated multiplication values for the first and second loss data, respectively; calculate a ratio of the first risk amount to the first approximate risk amount as an approximate ratio; calculate a value obtained by multiplying the second approximate risk

amount by the approximate ratio as a second risk amount; and calculate a difference between the first risk amount and the second risk amount as a risk-amount change resulting from a difference between the first loss data and the second loss data.

[0010b]

In a third aspect, there is provided a risk management device comprising: a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter; and a processor connected to the memory, wherein the processor is programmed to calculate multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data, wherein: the memory is configured to store the loss data as first loss data, and also configured to store a first risk amount weighed by a weighing device based on the first loss data, second loss data each including a loss amount and loss occurrence frequency, and difference factor information between the first loss data and the second loss data; the processor is programmed to, in calculation of the multiplication values, for each of the first loss data and for each of interim loss data obtained by reflecting only a change of the loss amount and the loss occurrence frequency due to a specific factor in each of the second loss data on the first loss data, calculate a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; and the processor is further programmed to: calculate a first approximate risk amount and an interim approximate risk amount obtained by cumulating the calculated multiplication values for the first loss data

and for the interim loss data, respectively; calculate a ratio of the first risk amount to the first approximate risk amount as an approximate ratio; calculate a value obtained by multiplying the interim approximate risk amount by the approximate ratio as an interim risk amount; and calculate a difference between the first risk amount and the interim risk amount as a risk-amount change resulting from the specific factor between the first loss data and the second loss data.

[0011]

~~A risk management method according to another exemplary embodiment of the present invention is a risk management method executed by a risk management device which includes a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter, and which includes a processor connected to the memory,~~

~~the risk management method including:~~

~~by the processor, calculating multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount~~

~~included in the loss data.~~In a fourth aspect, there is provided a risk management method executed by a risk management device which includes a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter, and which includes a processor connected to the memory, the risk management method comprising: by the processor, calculating multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; by the memory, storing the loss data as first scenario data, and also storing second scenario data each obtained by changing at least one of the loss amount and the loss occurrence frequency in each of the first scenario data; and by the processor: in calculation of the multiplication values, for each of the first and second scenario data, calculating a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the scenario data and the loss amount included in the scenario data; and for each combination of the first scenario data and the second scenario data obtained by changing at least one of the loss amount and the loss occurrence frequency in the first scenario data, calculating a difference value between the multiplication value relating to the first scenario data and the multiplication value relating to the second scenario data.

[0011a]

In a fifth aspect, there is provided a risk management method executed by a risk management device which includes a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in

association with the loss occurrence frequency, the coefficient being equal to a value of an occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter, and which includes a processor connected to the memory, the risk management method comprising: by the processor, calculating multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; by the memory, storing the loss data as first loss data, and also storing a first risk amount weighed by a risk weighing device based on the first loss data and second loss data each including a loss amount and loss occurrence frequency; and by the processor: in calculation of the multiplication values, for each of the first and second loss data, calculating a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; calculating first and second approximate risk amounts obtained by cumulating the calculated multiplication values for the first and second loss data, respectively; calculating a ratio of the first risk amount to the first approximate risk amount as an approximate ratio; calculating a value obtained by multiplying the second approximate risk amount by the approximate ratio as a second risk amount; and calculating a difference between the first risk amount and the second risk amount as a risk-amount change resulting from a difference between the first and second loss data.

[0011b]

In a sixth aspect, there is provided a risk management method executed by a risk management device which includes a memory for storing loss data each including a loss amount and loss occurrence frequency and a coefficient table holding a coefficient in association with the loss occurrence frequency, the coefficient being equal to a value of an

occurrence number at a lower α% point (α is a predetermined constant) in a cumulative distribution function of a probability distribution with the loss occurrence frequency as a parameter, and which includes a processor connected to the memory, the risk management method comprising: by the processor, calculating multiplication values, each of which is calculated for each of the loss data and is a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data by the memory, storing the loss data as first loss data, and also storing a first risk amount weighed by a weighing device based on the first loss data, second loss data each including a loss amount and loss occurrence frequency, and difference factor information between the first loss data and the second loss data; by the processor: in calculation of the multiplication values, for each of the first loss data and for each of interim loss data obtained by reflecting only a change of the loss amount and the loss occurrence frequency due to a specific factor in each of the second loss data on the first loss data, calculating a multiplication value of the coefficient held in the coefficient table in association with the loss occurrence frequency included in the loss data and the loss amount included in the loss data; calculating a first approximate risk amount and an interim approximate risk amount obtained by cumulating the calculated multiplication values for the first loss data and for the interim loss data, respectively; calculating a ratio of the first risk amount to the first approximate risk amount as an approximate ratio; calculating a value obtained by multiplying the interim approximate risk amount by the approximate ratio as an interim risk amount; and calculating a difference between the first risk amount and the interim risk amount as a risk-amount change resulting from the specific factor between the first and second loss data.

[0012]

With the aspects~~configurations~~ described above, embodiments of the present invention enables rapid calculation of an approximate value of a VaR.

BRIEF DESCRIPTION OF DRAWINGS

[0013]

Fig. 1 is a block diagram of a risk management device according to a first exemplary embodiment of the present invention;

Fig. 2 shows an example of the configuration of loss data used in the first exemplary embodiment of the present invention;

Fig. 3 shows an example of the configuration of a coefficient table used in the first exemplary embodiment of the present invention;

Fig. 4 shows an example of the configuration of interim information used in the first exemplary embodiment of the present invention;

Fig. 5 is a flowchart showing an example of processing in the first exemplary embodiment of the present invention;

Fig. 6 is a block diagram of a risk management device according to a second exemplary embodiment of the present invention;

Fig. 7 shows an example of the configuration of element-by-element loss data used in the second exemplary embodiment of the present invention;

Fig. 8 shows an example of the configuration of interim information used in the