

CLAIMS:

1. An apparatus for examination of financial credit using reinforcement learning,
the apparatus comprising:

a storage configured to store a financial credit examination program; and

5 a processor configured to load the financial credit examination program from the
storage and execute the financial credit examination program,

wherein the processor is further configured to:

in an environment where first examination basis data and examination criterion
data, for examination of financial credit corresponding to total borrowers, and second
10 examination basis data, individual interest rate data and individual limit data, for
examination of financial credit corresponding to each individual borrower, are
provided, generate, as status data, at least one of a credit examination approval rate
corresponding to the total borrowers, a loan amount corresponding to the total
borrowers, and an expected default rate corresponding to the each individual borrower;

15 generate, as reward data, a rate of change in yields or a rate of change in a yield
rate on credit management according to a change in at least one of the first examination
criterion data for the examination of financial credit corresponding to the total
borrowers, the individual interest rate data corresponding to the each individual
borrower, and the individual limit data corresponding to the each individual borrower;

20 while executing an action based on status recognition using the status data,
generate action data that is learned so as to maximize a value of the reward data; and

adjust at least one of the examination criterion data for the examination of
financial credit corresponding to the total borrowers, the individual interest rate data
corresponding to the each individual borrower, and individual limit data corresponding
25 to the each individual borrower according to the action data,

wherein the processor is further configured to execute the financial credit examination program to:

output a credit examination approval rate corresponding to the total borrowers, when first credit examination data corresponding the each individual borrower is input to a first artificial neural network model, the first artificial neural network model having trained by inputting a first training status data set including training examination criterion data corresponding to the total borrowers, first training examination basis data corresponding to the each individual borrower, training individual interest rate data corresponding to the each individual borrower, and training individual limit data corresponding to the each individual borrower, and credit examination approval rate data as first label data for the first training status dataset, and

output an expected default rate corresponding to the each individual borrower, when second credit examination data corresponding to the each individual borrower is input to a second artificial neural network model, second artificial neural network model having trained by inputting a second training input dataset including second training examination basis data corresponding to the total borrowers, training delinquency rate corresponding to the total borrowers, and the first training examination basis data corresponding to each individual borrower, and default rate data as second label data for the second training input dataset.

2. The apparatus of claim 1, wherein the processor is further configured to execute the financial credit examination program to,

output principal loss data corresponding to a total number of approvals of loan, when third credit examination data the corresponding to each individual borrower is input to a third artificial neural network model, the third artificial neural network model having trained by

inputting a third training input dataset and training principal loss data according to the credit management as third label data for the third training input dataset,

wherein the third training input dataset comprises the training individual interest rate data corresponds to the each individual borrower, the training individual limit data corresponds to each individual borrower, the total number of approvals of loan corresponding to the total borrowers, and a training expected default rate corresponding to the each individual borrower.

3. The apparatus of claim 1,

wherein the training examination criterion data corresponding to the total borrowers and included in the first training input dataset comprises approval data according to an approval cut-off strategy,

wherein the first training examination basis data corresponding to the each individual borrower and included in the first training input dataset comprises data on a score calculated based on financial or non-financial data and data on a credit rating.

4. The apparatus of claim 1,

wherein the second training examination basis data corresponding to the total borrowers and included in the second training input dataset comprises macroeconomic indicator data,

wherein the first training examination basis data corresponding to each individual borrower and included in the second training input dataset comprises financial or non-financial data and data on credit a rating.

5. The apparatus of claim 2,

wherein the first credit examination data comprises the examination criterion data for

examination of financial credit corresponding to the total borrowers, the second examination basis data for examination of financial credit corresponding to the each individual borrower, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower,

5 wherein the second credit examination data comprises the first examination basis data for examination of financial credit corresponding to the total borrowers, the delinquency rate data corresponding to the total borrowers, and the second examination basis data for examination of financial credit corresponding to the each individual borrower,

10 wherein the third credit examination data comprises the individual interest rate data corresponding to the each individual borrower, individual limit data corresponding to the each individual borrower, a total number of approvals of loan corresponding to the total borrowers, and an expected default rate corresponding to the each individual borrower.

6. The apparatus of claim 2, wherein the processor is further configured to
15 execute the credit examination program to,

calculate a rate of change in yields or a rate of change in a yield rate according to the credit management based on the following: a credit examination approval rate corresponding to the total borrowers and output from the first artificial neural network model; an expected default rate corresponding to each individual borrower and output from the second artificial
20 neural network model; principal loss data corresponding to the total number of approvals of loan and output from the third artificial neural network model; and a loan amount corresponding to the total number of approvals of loan.

7. A method for examination of financial credit using reinforcement learning, the
25 method which is performed by an apparatus for examination of financial credit and which

comprises:

generating, as status data, at least one of a credit examination approval rate corresponding to the total borrowers, a loan amount corresponding to the total borrowers, and an expected default rate corresponding to each individual borrower, in an environment where first examination basis data and examination criterion data, for examination of financial credit corresponding to total borrowers, and second examination basis data, individual interest rate data and individual limit data, for examination of financial credit corresponding to each individual borrower, are provided;

generating, as reward data, a rate of change in yields or a rate of change in a yield rate on credit management according to a change in at least one of the first examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower;

generating action data that is learned so as to maximize a value of the reward data, while executing an action based on status recognition using the status data; and

adjusting at least one of the examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower, according to the action data for repeatedly performing the generating of the status data, the generating of the reward data, and the generating of the action data,

wherein the generating the state data comprises:

outputting a credit examination approval rate corresponding to the total borrowers when first credit examination data corresponding the each individual borrower is input to a first artificial neural network model, the first artificial neural network model having trained by inputting a first training status dataset including training examination criterion data

corresponding to the total borrowers, first training examination basis data corresponding to the each individual borrower, training individual interest rate data corresponding to the each individual borrower, and training individual limit data corresponding to the each individual borrower, and credit examination approval rate data as first label data for the first training status dataset; and

outputting an expected default rate corresponding to each individual borrower when second credit examination data corresponding to the each individual borrower is input to a second artificial neural network model, the second artificial neural network model having learned by inputting a second training input dataset including second training examination basis data corresponding to the total borrowers, training delinquency rate corresponding to the total borrowers, and the first training examination basis data corresponding to each individual borrower, and default rate data as second label data for the second training input dataset.

8. The method of claim 7, wherein the generating as the state data further comprises:

outputting principal loss data corresponding to a total number of approvals of loan when third credit examination data corresponding to the each individual borrower is input to a third artificial neural network model, the third artificial neural network model having learned by inputting a third training input dataset and training principal loss data according to the credit management as third label data for the third training input dataset,

wherein the third training input dataset comprises the training individual interest rate data corresponds to each individual borrower, the training individual limit data corresponds to each individual borrower, the total number of approvals of loan corresponding to the total borrowers, and a training expected default rate corresponding to the each individual borrower.

9. The method of claim 7,

wherein the training examination criterion data corresponding to the total borrowers and included in the first training input dataset comprises approval data according to an approval cut-off strategy,

5 wherein the first training examination basis data corresponding to the each individual borrower and included in the first training input dataset comprises data on a score calculated based on financial or non-financial data and data on a credit rating.

10. The method of claim 7,

10 wherein the second training examination basis data corresponding to the total borrowers and included in the second training input dataset comprises macroeconomic indicator data,

wherein the first training examination basis data corresponding to each individual borrower and included in the second training input dataset comprises financial or non-financial data and data on credit a rating.

11. The method of claim 8,

wherein the first credit examination data comprises the examination criterion data for examination of financial credit corresponding to the total borrowers, the second examination basis data for examination of financial credit corresponding to the each individual borrower, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower,

wherein the second credit examination data comprises the first examination basis data for examination of financial credit corresponding to the total borrowers, the delinquency rate data corresponding to the total borrowers, and the second examination basis data for

examination of financial credit corresponding to the each individual borrower,

wherein the third credit examination data comprises the individual interest rate data corresponding to the each individual borrower, individual limit data corresponding to thte each individual borrower, a total number of approvals of loan corresponding to the total borrowers, and an expected default rate corresponding to the each individual borrower.

12. The method of claim 8, wherein a rate of change in yields or a rate of change in a yield rate according to the credit management is calculated based on the following: a credit examination approval rate corresponding to the total borrowers and output from the first artificial neural network model; an expected default rate corresponding to each individual borrower and output from the second artificial neural network model; principal loss data corresponding to the total number of approvals of loan and output from the third artificial neural network model; and a loan amount corresponding to the total number of approvals of loan.

13. A non-transitory computer-readable storage medium including computer executable instructions, wherein the instructions, when executed by a processor, cause the processor to perform a method comprising:

generating, as status data, at least one of a credit examination approval rate corresponding to the total borrowers, a loan amount corresponding to the total borrowers, and an expected default rate corresponding to each individual borrower, in an environment where first examination basis data and examination criterion data, for examination of financial credit corresponding to total borrowers, and second examination basis data, individual interest rate data and individual limit data, for examination of financial credit corresponding to each individual borrower, are provide;

generating, as reward data, a rate of change in yields or a rate of change in a yield rate

on credit management according to a change in at least one of the first examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower;

5 generating action data that is learned so as to maximize a value of the reward data, while executing an action based on status recognition using the status data;

 adjusting at least one of the examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual
10 borrower, according to the action data for repeatedly performing the generating of the status data, the generating of the reward data, and the generating of the action data,

 wherein the generating the state data comprises:

 outputting a credit examination approval rate corresponding to the total borrowers when first credit examination data corresponding the each individual borrower is input to a first
15 artificial neural network model, the first artificial neural network model having trained by inputting a first training status dataset including training examination criterion data corresponding to the total borrowers, first training examination basis data corresponding to the each individual borrower, training individual interest rate data corresponding to the each individual borrower, and training individual limit data corresponding to the each individual
20 borrower, and credit examination approval rate data as first label data for the first training status dataset; and

 outputting an expected default rate corresponding to each individual borrower when second credit examination data corresponding to the each individual borrower is input to a second artificial neural network model, the second artificial neural network model having
25 learned by inputting a second training input dataset including second training examination basis

data corresponding to the total borrowers, training delinquency rate corresponding to the total borrowers, and the first training examination basis data corresponding to each individual borrower, and default rate data as second label data for the second training input dataset.

5 14. A computer program stored in a non-transitory computer-readable storage medium and comprising computer executable instructions, wherein the instructions, when executed by a processor, cause the processor to perform a method comprising:

generating, as status data, at least one of a credit examination approval rate corresponding to the total borrowers, a loan amount corresponding to the total borrowers, and
10 an expected default rate corresponding to each individual borrower, in an environment where first examination basis data and examination criterion data, for examination of financial credit corresponding to total borrowers, and second examination basis data, individual interest rate data and individual limit data, for examination of financial credit corresponding to each individual borrower, are provide;

15 generating, as reward data, a rate of change in yields or a rate of change in a yield rate on credit management according to a change in at least one of the first examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual borrower;

20 generating action data that is learned so as to maximize a value of the reward data, while executing an action based on status recognition using the status data;

adjusting at least one of the examination criterion data for the examination of financial credit corresponding to the total borrowers, the individual interest rate data corresponding to the each individual borrower, and the individual limit data corresponding to the each individual
25 borrower according to the action data for repeatedly performing the generating of the status

data, the generating of the reward data, and the generating of the action data,

wherein the generating the state data comprises:

outputting a credit examination approval rate corresponding to the total borrowers when first credit examination data corresponding the each individual borrower is input to a first artificial neural network model, the first artificial neural network model having trained by inputting a first training status dataset including training examination criterion data corresponding to the total borrowers, first training examination basis data corresponding to the each individual borrower, training individual interest rate data corresponding to the each individual borrower, and training individual limit data corresponding to the each individual borrower, and credit examination approval rate data as first label data for the first training status dataset; and

outputting an expected default rate corresponding to each individual borrower when second credit examination data corresponding to the each individual borrower is input to a second artificial neural network model, the second artificial neural network model having learned by inputting a second training input dataset including second training examination basis data corresponding to the total borrowers, training delinquency rate corresponding to the total borrowers, and the first training examination basis data corresponding to each individual borrower, and default rate data as second label data for the second training input dataset.