

基于多元回归法和机器学习的量化投资研究

摘要

量化投资是指通过数量化方式及计算机程序化发出买卖指令，以获取稳定收益为目的的交易方式。对于量化投资这一新型的投资交易方式，本文建立了基于回归预测和随机动态规划的投资决策模型。

针对问题一：通过 Spearman 相关性分析选取数字经济板块中最具代表性的成交额作为回归量，使用 LASSO 回归建立指标筛选模型，选取回归系数不为零的解释变量作为候选指标，使用 IC 因子分析法对候选指标进行二次筛选从而选出对数字经济板块产生重要影响的外部指标分别为成交量：上证综合指数、俄罗斯 RTS 指数、VMA、VMACD、OBV、KDJ。

对于问题二：通过 OLS 选取成交量的内部预测指标为收盘价、最高价、最低价和成交额。通过对比 BP 神经网络和岭回归的拟合回测效果，选取岭回归模型作为成交量的预测模型，模型的拟合优度为 $R^2 = 0.86$ ，预测结果的平均相对误差为 23.28%。

对于问题三：重新选取内部预测指标为开盘价、最高价、最低价。沿用问题二中建立的 BP 神经网络模型和岭回归模型进行预测，选取效果较优的 BP 神经网络作为收盘价的预测模型，预测结果的评价相对误差为 0.18%。

对于问题四：根据收盘价的预测结果，建立基于随机动态规划的最优投资决策模型。通过计算，总收益率为 16.82%，最后一天的信息比率为 18.45%，最大回撤率为 8.17%

关键字：多元回归方法 IC 值分析法 BP 神经网络 动态规划 量化投资

目录

一、问题重述	4
1.1 问题背景	4
1.2 问题重述	4
二、问题分析	4
2.1 问题一的分析	4
2.2 问题二的分析	5
2.3 问题三的分析	5
2.4 问题四的分析	5
三、模型假设	5
四、符号说明	5
五、数据预处理	6
六、问题一模型的建立和求解	7
6.1 多元线性回归模型的建立	7
6.1.1 古典线性回归模型	7
6.1.2 最小二乘法 (OLS)	8
6.2 LASSO 回归模型	9
6.3 回归法指标筛选模型的建立	9
6.4 IC 因子分析法模型的建立	10
6.5 问题求解	11
七、问题二模型的建立和求解	12
7.1 BP 神经网络模型的建立及预测	13
7.1.1 BP 神经网络模型的建立	13
7.1.2 BP 神经网络的预测	14
7.2 岭回归模型的建立及预测	14
7.2.1 岭回归模型的建立	14
7.2.2 岭回归模型的预测	15
7.3 结果分析	16

八、问题三模型的建立和求解	16
8.1 BP 神经网络的预测	17
8.2 岭回归模型的预测	17
8.3 结果分析	18
九、问题四模型的建立和求解	19
9.1 基于动态规划的模型的投资策略建立	19
9.2 问题求解	20
9.3 模型优缺点	22
9.3.1模型优点	22
9.3.2模型缺点	22
参考文献	23
附录 A 数据预处理	24
附录 B 问题一数据	29
附录 C 问题二的数据代码	32
附录 D 问题三数据与代码	60
附录 E 问题四的数据和代码	87

一、问题重述

1.1 问题背景

量化投资是指通过数量化方式及计算机程序化发出买卖指令，以获取稳定收益为目的的交易方式。投资者通过数据分析探索市场运行规律，并预测市场走势，从而进行决策交易。随着大数据技术的发展，量化投资在全球金融交易市场上的地位愈加重要。但是由于市场信息十分庞杂，同时产品的价格也受到其他诸多因素的影响，如何从海量的市场信息中提取出有效指标，制订交易策略，是一个具有挑战性的工作。

1.2 问题重述

请参赛团队基于 2021 年 7 月 14 日至 2022 年 1 月 28 日每 5 分钟的“数字经济”板块给出的数据信息，完成以下任务：

(1) 提供的各项指标进行分析，从中提取出与“数字经济”板块有关的主要指标。

(2) 以 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟“数字经济”板块指数为训练集，以 2022 年 1 月 4 日至 2022 年 1 月 28 日的每 5 分钟“数字经济”板块指数为测试集。根据问题（1）提取出来的各项指标对“数字经济”板块指数每 5 分钟成交量进行预测。

(3) 以 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟“数字经济”板块指数为训练集，以 2022 年 1 月 4 日至 2022 年 1 月 28 日的每 5 分钟“数字经济”板块指数为测试集。根据（1）和（2）建立模型对每 5 分钟的“数字经济”板块指数（收盘价）进行预测。

(4) 假设以“数字经济”板块指数为交易对象（在实际交易中指数无法交易，只能交易其中的个股），给定初始资金 100 万元，交易佣金为 0.3%，根据（3）得到的结果对“数字经济”板块每 5 分钟频率价格进行买卖交易，计算在 2022 年 1 月 4 日至 2022 年 1 月 28 日期间交易的总收益率、信息比率、最大回撤率。

二、问题分析

2.1 问题一的分析

由于数字经济版块中具有多个指标，因此从外部版块中选取对数字经济版块产生影响的指标时，首先需要在数字经济板块中选取具有数字经济板块特征的指标作为整个数字经济板块的代表。再将选出的指标与外部指标进行分析从而得到相关的指标。

2.2 问题二的分析

股票成交量的预测需要考虑充分内部因素和外部因素的共同作用，因此要从数字经济版块中选取与成交量相关性较强的内部指标，再结合问题一中选取的外部相关指标对成交量进行预测。

2.3 问题三的分析

思路与问题二相似，从数字经济版块中选取与收盘价相关性较强的内部指标，再结合外部指标对收盘价预测。

2.4 问题四的分析

结合问题三的预测结果，选取适当的规划算法得到最优交易决策，再通过决策结果计算总收益率、信息比率和最大回撤率。

三、 模型假设

- (1) 假设未来的行情由现在的行情决定
- (2) 假设“数字经济”中给出的股市稳定健康，不会因为环境因素发生巨大变故
- (3) 假设投资者是理性的，不考虑市场流动风险，劳动收入
- (4) 假设每一阶段投资所获收益不会用于其他而是继续用于剩余阶段的投资
- (5) 假设投资是持续的，即阶段末与阶段初投资者拥有的资金市值状态相同

四、 符号说明

表 1 符号说明

符号	含义
j	股票的期数
r_j	第 j 期股票的收益率
f_j	第 j 期股票的因子值
TV_j	第 j 期股票的成交量
CP_j	第 j 期股票的收盘价
t_j	第 j 阶段初拥有自由资金
s_j	第 j 阶段初拥有股票市值

z_j	第 j 阶段末交易金额
u_j	第 j 阶段收盘价预测值
n_j	第 j 阶段拥有的股数
$Total_{yield}$	总收益率
$Information_{ratio}$	信息比率
$Drawdown$	最大回撤率

五、数据预处理

本问题涉及的数据系统较为复杂，原始数据难以直接使用，于是对原始数据做如下预处理：

Step1：缺失值处理

缺失值的处理有以下几种处理方法：（1）删除缺失个案（2）可能值插补缺失值；其中可能性插补缺失值又包含均值插补，临近值均值插补等方式。使用 SPSS 软件对原始数据进行临近值均值插补的方式。其中均值取其临近两个数的均值作为插补值。

Step2：描述统计

对各个板块进行描述性统计，其中“数字经济”板块的描述性统计结果如下

表 2 数字经济板块描述统计结果

	个案数	最小值	最大值	平均值	标准差
开盘价	6240	1366.4444	1683.697	1536.488	61.1578199
收盘价	6240	1365.188	1683.5848	1536.465	61.1768784
成交量	6240	0	884910620	40198810	38311192.95
最高价	6240	1366.509	1685.5814	1537.844	61.2962091
成交额	6240	0	19089647000	1197317318	900392113.3
最低价	6240	1365.1881	1682.986	1535.107	61.0239678

Step3: 原始数据中除“数字经济”版块数据为每五分钟的高频数据外，其余版块数据大多以“日”为单位来计量，在问题一我们设置基本时间刻度为“日”，对“数字经济”版块的高频数据以“日”为单位进行求和，得到相关数据的每日数据。

在问题二中，由于需要对“数字经济”板块的相关指标进行高频数据预测，所以基本时间刻度要与“数字经济”板块一致，即以每五分钟为基本时间刻度，对需统一

时间指标进行三次样条插值，在保持原有基本变化趋势的情况下补全数据。

令指标数据 x_i 在区间 $[1, n]$ 的三次样条插值函数为 $S(x_i)$ ，满足以下关系：

- $S(x_i)$ 在 $[1, n]$ 上的 0 2 阶导数连续；
- 在每个子区间上 $S_k(x_i)$ 是三次多项式；
- $S(x_i)$ 在每子区间端点的三次样条函数的函数值与已知端点值相等；
- 一阶导数在任意端点的左右极限相等。

Step4: 标准化处理

原始数据的每个指标的单位存在很大差异，为了消除量纲对回归效果的影响，我们对数据进行 z-score 标准化方法进行标准化。

(1) 先求出每组指标样本 x_i 的均值 μ_i 和样本标准差 σ_i

(2) 利用公式 (1) 进行标准化、

$$x'_i = \frac{x_i - \mu_i}{\sigma_i} \quad (1)$$

其中 x'_i 为标准化后的变量。

在公式中采用标准差去度量数据的离散程度而不去使用方差就是为了计算时保持与平均值统一量纲。对数据进行标准化后，各组指标的样本值的平均数都为 0，标准差均为 1，各个指标的成绩集中程度和离散趋势一致。标准化后的数据如附录 A 所示。

六、问题一模型的建立和求解

在本问题中，需要找到与“数字经济”板块有关的主要指标，而多元回归分析不仅可以很好的预测数据，还具有变量解释的能力，在本题中我们先采用多元回归的方式来筛选变量，在通过经济学中的 IC 分析法来检验回归筛选的稳健性 [1]。

6.1 多元线性回归模型的建立

多元线性回归模型是指含有多个解释变量的线性回归模型，用于解释被解释变量与其他多个解释变量之间的线性关系。其中古典线性回归模型是最基本的多元线性回归模型。

6.1.1 古典线性回归模型

在假设回归量与因变量的联系是线性关系的情况下，古典线性回归模型可写成如下形式：

$$y_i = \beta_1 x_{i1} + \beta_2 x_{i2} + \cdots + \beta_K x_{iK} + \varepsilon_i \quad (i = 1, 2, \cdots, n) \quad (2)$$

其中, $\beta_i (i = 1, 2, \dots, n)$ 为回归系数, ε_i 是无法观测的满足一定限制条件的误差项, 该方程又被称为回归方程。

为了简化公式, 我们定义 K 维列向量 \mathbf{X}_i 和 $\boldsymbol{\beta}$ 如下

$$\mathbf{X}_i = \begin{bmatrix} x_{i1} \\ x_{i2} \\ \vdots \\ x_{iK} \end{bmatrix}_{(K \times 1)}, \quad \boldsymbol{\beta} = \begin{bmatrix} \beta_1 \\ \beta_2 \\ \vdots \\ \beta_K \end{bmatrix}_{(K \times 1)}$$

则公式 (2) 可写成如下形式:

$$y_i = \mathbf{X}_i \boldsymbol{\beta} + \varepsilon_i \quad (i = 1, 2, \dots, n) \quad (3)$$

6.1.2 最小二乘法 (OLS)

最小二乘法 (ordinary least squares), 是回归分析最根本的一个形式, 对模型条件要求为使散点图上的所有预测值到回归直线距离的平方和最小。最小二乘法时求解回归系数的一种最常用方式。

对于公式 (3), 我们定义 y_i 的预测值为

$$\hat{y}_i = \mathbf{X}_i \hat{\boldsymbol{\beta}} \quad (4)$$

定义残差 $\hat{\varepsilon}_i$

$$\hat{\varepsilon}_i = y_i - \hat{y}_i = y_i - \mathbf{X}_i \hat{\boldsymbol{\beta}} \quad (5)$$

那么

$$\hat{\boldsymbol{\beta}} = \underset{\boldsymbol{\beta}}{\operatorname{argmin}} \sum_{i=1}^n \left(y_i - \mathbf{X}_i \hat{\boldsymbol{\beta}} \right)^2 \quad (6)$$

令 L 为所有预测值到回归直线距离的平方和, 其又被称为损失函数, 则其可以表示成

$$L^{OLS} = \sum_{i=1}^n \left(y_i - \mathbf{X}_i' \hat{\boldsymbol{\beta}} \right)^2 = (\mathbf{Y} - \mathbf{X} \hat{\boldsymbol{\beta}})' (\mathbf{Y} - \mathbf{X} \hat{\boldsymbol{\beta}}) \quad (7)$$

其中 \mathbf{Y} 为 n 维列向量, $\mathbf{Y} = \begin{bmatrix} y_1 \\ y_2 \\ \vdots \\ y_n \end{bmatrix}_{(n \times 1)}$

当 $\hat{\boldsymbol{\beta}} = (\mathbf{X}'\mathbf{X})^{-1} \mathbf{X}'\mathbf{Y}$ 时 L 取极小值。

通过最小化的 L , OLS 回归能得到最好的线性无偏估计量 $\hat{\boldsymbol{\beta}}$, 但是其会存在一些局限。

(1) 过度拟合

回归模型的预测误差被分解为偏差和方差两个部分，其中偏差指预测值和真实值之间的差异，方差指预测值的离散情况。其通过控制偏差的方式可能导致样本间的方法变大，出现过拟合现象，会导致无关联的冗余变量存在显著的预测作用。

(2) 多重共线性

即在回归模型中多个预测变量存在相关关系的现象，OLS 估计得到的回归系数极易受到样本数据微小波动的影响，估计的稳定性很差。

6.2 LASSO 回归模型

LASSO 回归在 OLS 回归模型的损失函数上加了惩罚项，惩罚项由回归系数的函数构成，加入的惩罚项一方面能够识别模型中不重要的变量，起到简化模型的作用，另一方面，可以消除多重共线性的影响。[2]

LASSO 回归的损失函数 L^{Lasso} 可表示为

$$L^{Lasso} = \sum_{i=1}^n (y_i - \mathbf{X}'\hat{\beta}) + \lambda \sum_{i=1}^k |\hat{\beta}_i| \quad (8)$$

我们使用 K 折交叉验证的方法来选择最佳的调整参数 λ ，将样本数据随机分为 K 个等分。将第 1 个子样本作为“验证集”而保留不用，而使用其余 K-1 个样本作为“训练集”来估计此模型，再以此预测第 1 个子样本，并计算第 1 个子样本的均方预测误差 (MSPE)。其次，将第 2 个子样本作为验证集，而使用其余 K-1 个子样本作为训练集来预测第 2 个子样本，并计算第 2 个子样本的 MSPE。以此类推，将所有子样本的 MSPE 加总，即可得整个样本的 MSPE。最后，选择调整参数，使得整个样本的 MSPE 最小，故具有最佳的预测能力。

LASSO 方法可以直接将冗余预测变量的回归系数压缩到 0 进而发挥变量选择的作用，可以获得精简的变量集，同时也可以减少对重要回归系数的过度压缩，避免了在预测变量过多时采用 OLS 估计带来的过拟合和多重共线性的问题。

6.3 回归法指标筛选模型的建立

由于本问题所含有的指标量过多，直接使用多元线性回归来分析指标对经济板块的解释能力及其容易造成冗余变量存在显著的预测作用，从而降低模型的准确度，而 LASSO 回归具有良好的变量筛选能力，因此在本问题中我们首先对所有变量进行 LASSO 回归进行变量筛选，再进行多元回归从而留下对回归量具有显著预测作用的指标。

Step1: 回归量指标的选取

对“数字经济”板块的所有指标进行相关性分析，分别求两两变量之间的 Spearman 相关系数。

	开盘价	收盘价	最高价	最低价	成交额	成交量
开盘价	1	0.999	1	1	0.353	0.273
收盘价	0.999	1	1	0.999	0.355	0.274
最高价	1	1	1	0.999	0.362	0.28
最低价	1	0.999	0.999	1	0.345	0.267
成交额	0.353	0.355	0.362	0.345	1	0.905
成交量	0.273	0.274	0.28	0.267	0.905	1

图 1 数字经济板块热力图

如图 1 所示，可以看到成交金额和其余若干变量存在显著的相关性，且相关系数较大，最终选取成交金额来作为回归分析的回归量。

Step2: LASSO 回归剔除冗余变量

以数据处理后留下的 47 个指标作 LASSO 回归的解释变量，以“数字经济板块”的成交金额作为被解释变量进行 LASSO 回归，剔除所有回归系数不为 0 的变量。

Step3: OLS 估计选取重要指标

在数据预处理中我们已经对数据进行 z-score 标准化，标准化后的数据的回归系数的绝对值大小即反映变量解释能力的大小。对 LASSO 回归筛选后指标进行 OLS 估计，结果中具有对显著预测能力的变量就是要选取的重要指标。

6.4 IC 因子分析法模型的建立

在经济学选股理论中常用“因子”来表示影响指标，而对于多因子的情况，首先要进行有效因子检验，计算因子的信息系数 IC 值是传统的有效因子检验方法之一。[3]IC 值是因子分析的重要指标，他表示因子值和下一期股票的收益率的相关系数，其具体表示为：

$$Normal \quad IC = corr(f_{j-1} - r_j) \quad (9)$$

其中， f_{j-1} 为 $j-1$ 期股票的因子值， r_j 为 j 期股票的收益率。1 天为 1 期。其中

单股股票的收益率 r_j 又可定义为

$$r_t = \frac{CP_j - CP_{j-1}}{CP_j} \times 100\% \quad (10)$$

将其他板块指标与 t 期股票收益率进行 IC_mean 值分析, 若 IC_mean 值超过 0.03 则代表其通过检验, 视为有效因子。

最后将通过回归法筛选和通过 IC 分析法的因子作为最终的与“数字经济”板块有关的主要指标。

6.5 问题求解

首先通过 LASSO 回归进行第一轮指标筛选, 利用 stata, 设置 K 折交叉验证法的 K 值为 10, 以 47 个标准化后指标作为解释变量, 最终得到的筛选后指标如下表 2 所示。

表 3 Lasso 回归筛选后变量列表

指标名称	指标名称
成交量上证综合指数	VMACD
成交金额上证综指数	OBV
深市股票流通市值	BBI
上证 50 指数	MTM
道琼斯工业平均指数	BIAS
美国证交所	KDJ
东京日经 225 指数	BOLL
伦敦金融时报 10 指数	美国美元兑人民币
法国巴黎 CAC40 指数	美国欧元兑美元
俄罗斯 RTS 指	数字媒体
意大利 MIB 指数	快手概念
VMA	互联网电商
RSI	

再对上表变量进行多元线性回归, 通过 OLS 估计出所有系数, 并通过 F 统计量检验回归系数 $\beta_1 = \beta_2 = \dots = \beta_n$ 联合显著, 说明多元线性回归模型是有效的, 最得到的各指标回归系数如下表所示。

表 4 各指标回归系数表

指标名称	回归系数	指标名称	回归系数
------	------	------	------

成交量上证综合指数	-0.2765144**	OBV	0.2040095*
成交金额上证综合指数	0.7732389***	BBI	0.288675
深市股票流通市值	-0.1270831	MTM	0.0372349
上证 50 指数	-0.0707841	BIAS	0.0467494
道琼斯工业平均指数	-0.0669983	KDJ	-0.2412652 ***
美国证交所	0.331172**	RSI	0.1722588
东京日经 225 指数	-0.0559249	BOLL	0.3349536
伦敦金融时报 100 指数	0.0456685	美国美元兑人民币	0.2279663**
俄罗斯 RTS 指数	0.2992548***	美国欧元兑美元	-0.0281201
意大利 MIB 指数	-0.074159	数字媒体	-0.0894226
VMA	-0.5727171 **	快手概念	-0.1310756
VMACD	0.6570553***	互联网电商	-0.0893824
ARBR	0.1199845		

显著性说明

* 90% 水平上显著

** 95% 水平上显著

*** 99% 水平上显著

再通过 IC 值分分析法进行有效因子检验，最终我们选取的重要指标如下表。

表 5 主要指标信息

指标	回归系数	IC 值
成交量: 上证综合指数	-0.2765	-0.04
俄罗斯 RTS 指数	0.2992	0.14
VMA	-0.5727	0.117
VMACD	0.657	0.104
OBV	0.204	-0.172
KDJ	-0.2412	-0.127

七、问题二模型的建立和求解

股票市场具有模型不稳定、参数不确定和噪声积累等特性。BP 神经网络预测模型则在理论上可以逼近任意非线性函数，有很强的鲁棒性和容错能力。而岭回归的目标函数在一般的线性回归的基础上加入了正则项，在保证最佳拟合误差的同时，使得参

数尽可能的简单，使得模型的泛化能力强，从而减少模型过度拟合和多重共线性的问题，使模型更加稳定。这两种模型都恰好适用于股票数据的分析，因此分别建立 BP 神经网络模型和岭回归模型，通过对比预测效果选取更优的模型对成交量进行预测。[4]

7.1 BP 神经网络模型的建立及预测

7.1.1 BP 神经网络模型的建立

BP 神经网络是一种信息前向传播，误差反向传播的多层网络，它分为输入层、隐含层和输出层，能够通过训练样本反向传播调节网络的阈值和权值，从而使误差的平方最小。在 BP 神经网络模型中，输入层主要负责特征向量的输入，并在完成向量识别后经由神经元传递至隐含层。在隐含层对输入的特征向量进行相应的数据处理，最终也将借助神经元传送至输出层。并与预先设定的期望值进行比较，如果满足输出条件，则将结果输出，如果不满足条件，则需要反向传递，并且不断调整权值，反复循环多次直到满足条件为止。[5]

信息前向传播的过程如下：

(1) 神经网络隐含层的第 i 个节点的输入变量

$$net_i = \sum_{j=1}^M w_{ij}x_j + \theta_i$$

(2) 神经网络隐含层的第 i 个节点的输出变量

$$y_i = \phi(net_i)$$

(3) 神经网络输出层的第 k 个节点的输入变量

$$net_k = \sum_{i=1}^q w_{ki}y_i + a_k$$

(4) 神经网络输出层第 k 个节点的输出变量

$$o_k = \psi(net_k)$$

其中 x_j 表示输入层的第 j 个节点的输入参数，变量 w_{ij} 表示隐含层的第 i 个节点到输入层的第 j 个节点之间的神经网络权值参数；变量 θ_i 表示隐含层第 i 个节点的阈值参数；变量 $\phi(x)$ 表示隐含层的激励函数；变量 w_{ki} 表示输出层的第 k 个节点到隐含层的第 i 个节点之间的权值参数；变量 a_k 表示输出层第 k 个节点的阈值参数；变量 $\psi(x)$ 表示的输出层的激励函数；变量 o_k 表示输出层的第 k 个节点的输出。

7.1.2 BP 神经网络的预测

使用 MATLAB 中的 BP 神经网络拟合工具箱，将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟的内部指标和外部指标作为输入层，成交量作为输出层，对神经网络进行训练，再将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟内部预测指标与外部预测指标对已训练好的神经网络进行输入从而得到预测结果如下图：

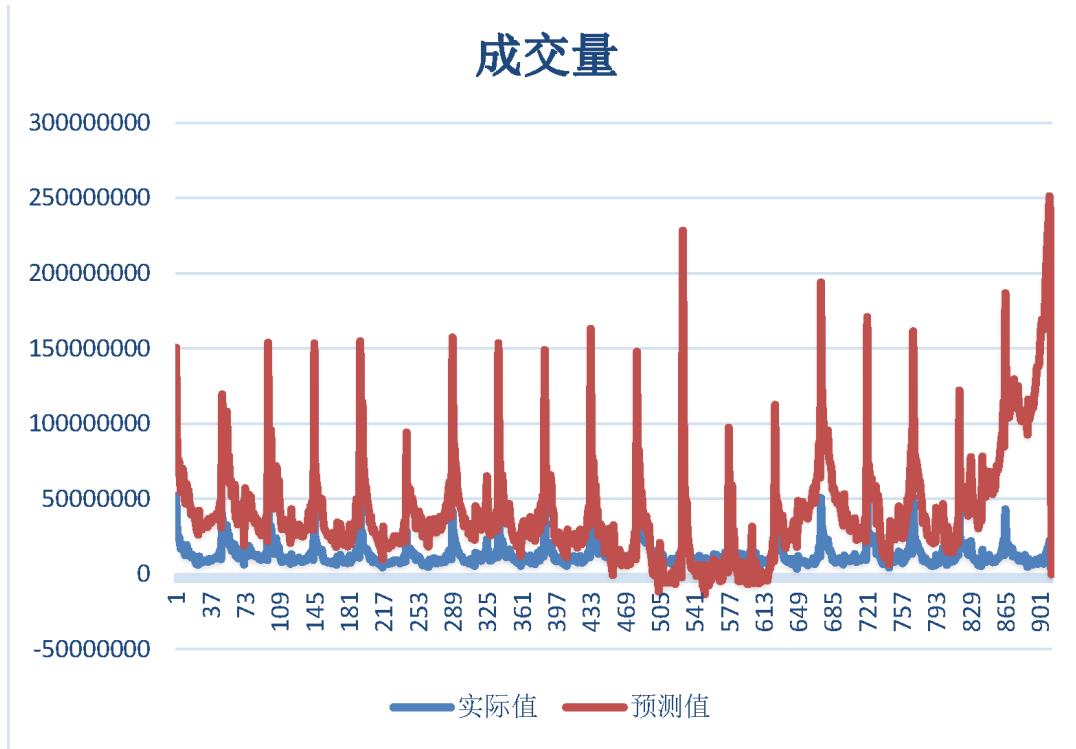


图 2 BP 神经网络成交量预测

由图可以直观看出 BP 神经网络预测结果与实际数据产生的误差较大，其平均相对误差达到 127.8%。

7.2 岭回归模型的建立及预测

7.2.1 岭回归模型的建立

岭回归是一种改良的最小二乘估计法，专用于共线性数据分析，实质上是通过放弃最小二乘法的无偏性，即在最小二乘法拟合模型中引入少量偏差，以损失部分信息、降低精度为代价减少拟合模型的方差，消除自变量间的共线性，使得回归系数更为符合实际，从而得到更可靠的回归方法。[6]

同 LASSO 回归相同，岭回归也在损失函数中加入了一个惩罚项，其损失函数可表示为

$$L^{Rig} = (\mathbf{Y} - \mathbf{X}\hat{\boldsymbol{\beta}})^T(\mathbf{Y} - \mathbf{X}\hat{\boldsymbol{\beta}}) + \lambda\hat{\boldsymbol{\beta}}^T\hat{\boldsymbol{\beta}} \quad (11)$$

对参数 β 求导并令一阶导数为 0，就可以得到岭回归模型的解析解

$$\hat{\beta} = (\mathbf{X}^T \mathbf{X} + \lambda I)^{-1} \mathbf{X}^T \mathbf{Y} \quad (12)$$

使用迭代法计算数值解

$$\hat{\beta}_{k+1} = \hat{\beta}_k - \eta(-2\mathbf{X}^T \mathbf{Y} + 2\mathbf{X}^T \mathbf{X} \hat{\beta}_k + 2\lambda I \hat{\beta}_k) \quad (13)$$

7.2.2 岭回归模型的预测

Step1: 外部指标的选取

选取问题一中得到的主要指标，并进行插值处理从而统一时间刻度。

Step2: 内部指标的选取

将数字经济板块中的成交量作为因变量，其他指标作为自变量进行最小二乘回归，选取通过显著性检验即 $P \leq 0.05$ 的指标作为成交量的内部预测指标。其相关性系数表如下。

表 6 OLS 估计系数表

指标	P 值	回归系数
最低价	0	3.186803***
最高价	0	-4.37317***
开盘价	0.297	0.308972
收盘价	0.005	0.821971***
成交额	0	1.020265***

显著性说明

* 90% 水平上显著

** 95% 水平上显著

*** 99% 水平上显著

即选取收盘价 CP 、最高价 HP 、最低价 LP 以及成交额 VOT 作为内部指标。

Step3: 成交量的预测

将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟内部预测指标与外部预测指标作为岭回归模型的自变量，成交量作为岭回归模型的因变量，使用 Python 实现。求解得到模型拟合优度为 $R^2 = 0.86$ ，模型表现较为优秀。得到拟合公式如下：

$$TV = 156783310.718 - 3135.625CP + 22618.486KDJ + 1129.133ARBR - 4.356OBV + 0.017VMACD + 0.005VMA + 3016.874SZ - 1143.082IM^4 + 0.032 \text{ vot} - 5965.387LP - 2363.615HP \quad (14)$$

将 2022 年 1 月 4 日至 2022 年 1 月 28 日的每 5 分钟内部和外部数据代入岭回归模型的公式进行预测，预测结果与实际结果的平均相对误差为 23.28%，效果良好。

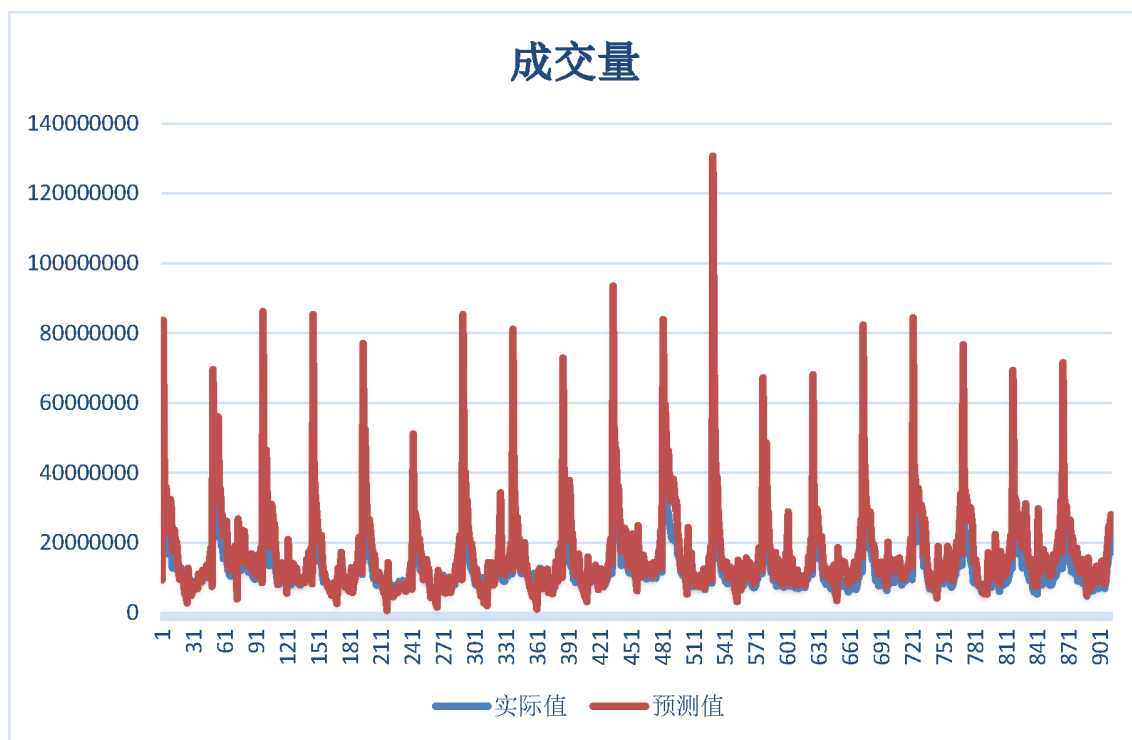


图 3 岭回归成交量预测

7.3 结果分析

对比岭回归模型与 BP 神经网络回归模型的预测结果，不难发现岭回归的预测准确度明显高于 BP 神经网络，因此岭回归模型更适于预测成交量。

八、问题三模型的建立和求解

根据题目要求，继续沿用第一问及第二问所建立的模型。

8.1 BP 神经网络的预测

使用 MATLAB 中的 BP 神经网络拟合工具箱，将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟的内部指标和外部指标作为输入层，收盘价作为输出层，对神经网络进行训练。

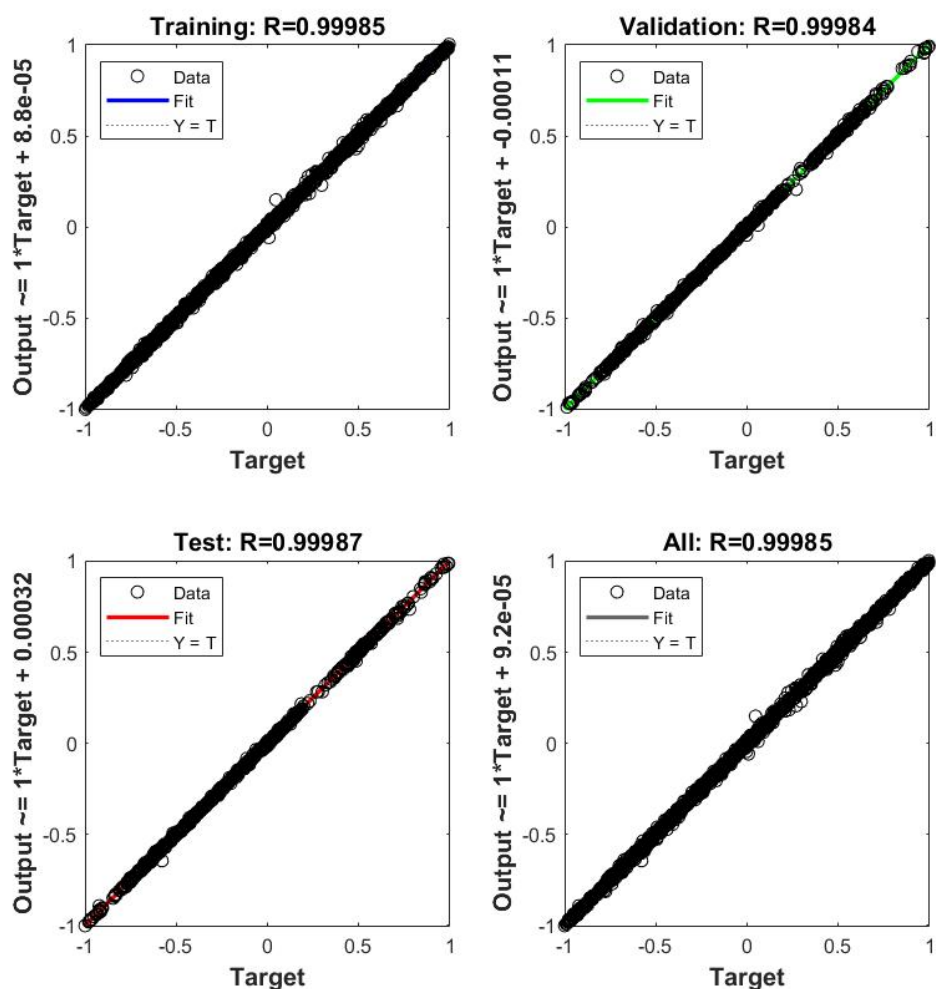


图 4 BP 神经网络拟合度变化图

再将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟内部预测指标与外部预测指标对已训练好的神经网络进行输入，得到预测值与实际值的平均相对误差为 0.18%，预测效果很好。

8.2 岭回归模型的预测

Step1: 外部指标的选取

选取第一问中得到的相关指标，并进行插值处理从而统一时间刻度。

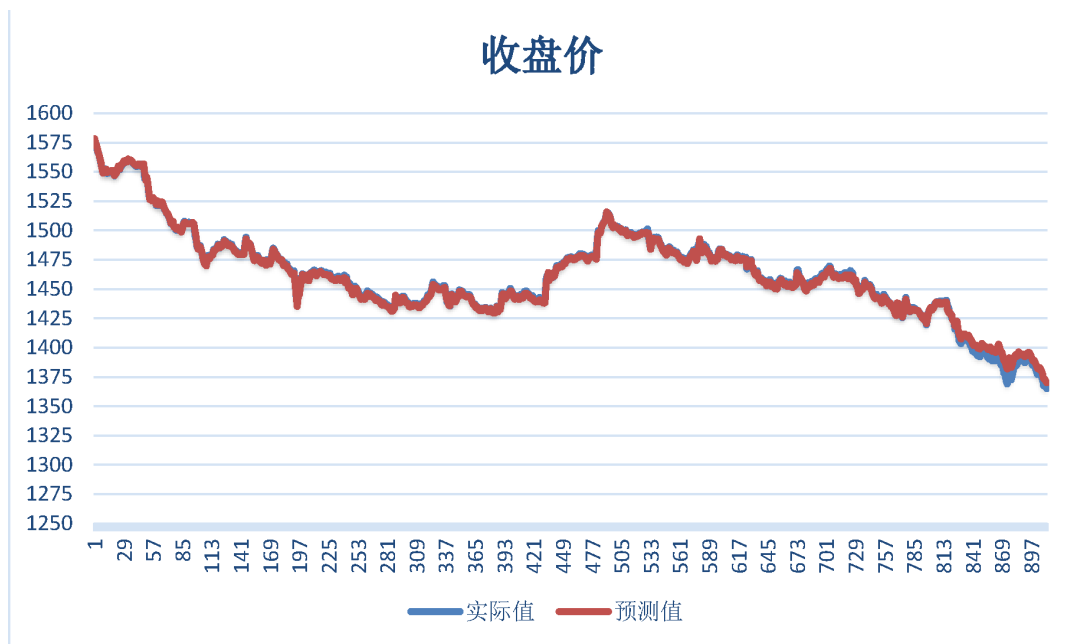


图 5 BP 神经网络收盘价预测曲线图

Step2: 内部指标的选取

将数字经济板块中的收盘价作为因变量，其他指标作为自变量进行最小二乘回归，选取通过显著性检验即，且剔除掉相关系数较小的指标作为收盘价的内部预测指标。

表 7 收盘价 OLS 估计系数表

指标	P 值	回归系数
成交额	-0.00076	0.226
成交量	0.001541***	0.005
最低价	0.829865***	0
最高价	0.873982***	0
开盘价	-0.70415***	0

显著性说明

* 90% 水平上显著

** 95% 水平上显著

*** 99% 水平上显著

由表 7 可以看到，虽然成交量满足显著性要求，但其回归系数极小，因此我们认为其变量解释能力弱，最终剔除选取开盘价 OP 、最高价 HP 、最低价 LP 作为内部预测指标。

Step3: 收盘价的预测

将 2021 年 7 月 14 日至 2021 年 12 月 31 日的每 5 分钟内部预测指标与外部预测指标作为岭回归模型的自变量，收盘价 cp 作为岭回归模型的因变量，使用 Python 实现。求解得到模型拟合优度为 $R^2 = 0.995$ ，模型表现优秀。其预测公式如下：

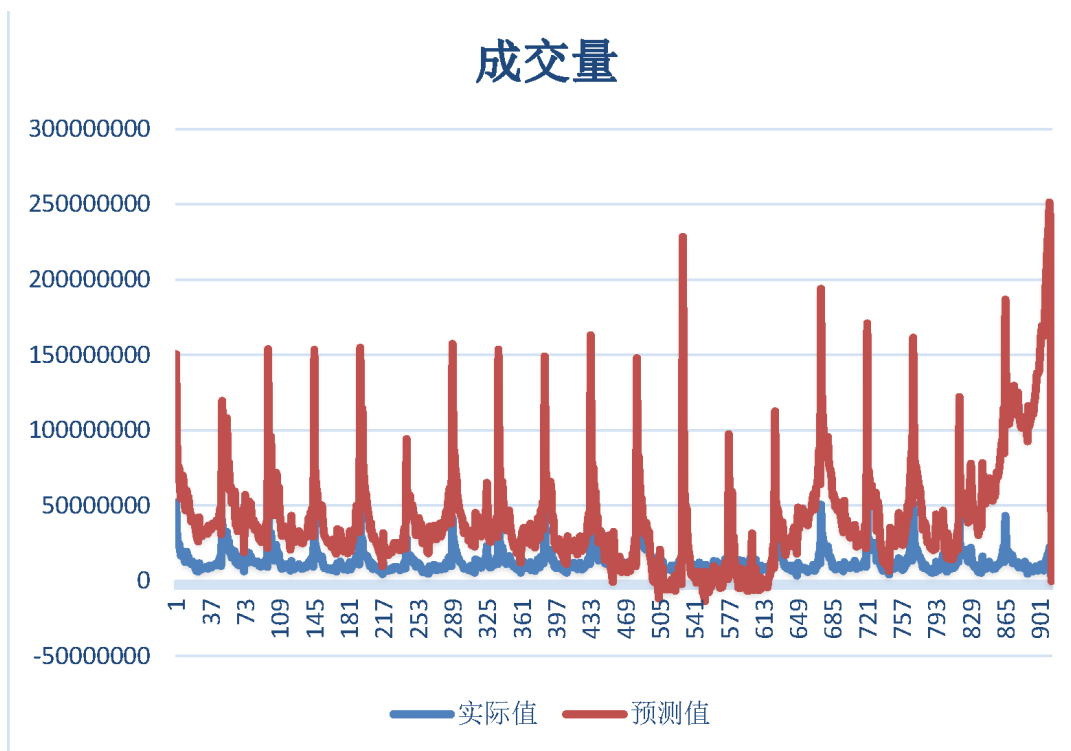


图 6 岭回归收盘价预测

九、问题四模型的建立和求解

9.1 基于动态规划的模型的投资策略建立

题目给定初始资金 100 万元，交易佣金为 0.3%，要求根据问题三得到的结果对“数字经济”板块每 5 分钟频率价格进行买卖交易，考虑到投资者在一定阶段可以对上一阶段末所持有的资金进行股票买卖交易的决策，决定手里的股票或自由资金的去向，投资是持续进行的，为找到投资者的最优投资策略，从而获取最大的收益，建立了基于动态规划模型的投资策略模型 [7]，模型建立过程如下：我们假设 t_j 为第 j 阶段的自由基金， s_j 第 j 阶段初拥有股票市值， z_j 第 j 阶段末交易金额， u_j 第 j 阶段收盘价预测值， n_j 第 j 阶段拥有的股数， r_j 第 j 阶段收益率，同时每 5 分钟为一个阶段。

(1) 对“数字经济”板块每 5 分钟频率价格进行买卖交易，则交易日的每 5 分钟为一个阶段进行排序分成 1 到 912 个阶段，在一月四日 9 点 35 分之前对指数代码为 931582.CSI 的股票持有金额为 0，给定初始资金 100 万元，则初始自由资金 $t_0 = 10^6$ 万元，初始持有股数 $n_0 = 0$ 。

(2) 设置操作因子 p_j ， p_j 为 0 到 1 服从正态分布的随机数，考虑到在实际情况下，投资者做买卖有风险，交易次数肯定小于不交易次数，故在第 j 阶段，若随机产生的 p_j 小于 0.75，则不进行股票交易，此时投资者所持有的股数 $n_j = n_{j-1}$ ，若 p_j 大于 0.75，则进行股票的买卖交易。

考虑到投资者进行相应股票的交易会受上一阶段的收益率是涨还是跌，在上一阶段股票下跌且投资者手里有自有资金时，则进行股票的买入，交易的股票数量为 n_{temp} ，此时所持的股票数为

$$n_j = n_{j-1} + n_{temp} \quad (16)$$

其中 n_{temp} 为介于 0 到投资者手里所持自有资金所能买的股票的最大股数 n_{max} 的随机整数若在上一阶段股票上涨且投资者手里有股票时，则进行股票卖出来获取自由资金，此时所持有的股票数为

$$n_j = n_{j-1} - n_{temp} \quad (17)$$

其中 n_{temp} 为介于 0 到投资者手里所持有的股票数 n_{j-1} 的随机整数

(3) 在第 j 阶段初所拥有的股票市值 s_j 为第 $j-1$ 阶段末所拥有的股数与其收盘价的乘积即：

$$s_j = n_{j-1} u_{j-1} \quad (18)$$

同时， s_j 又与上一阶段拥有的股票市值有关，即

$$s_j = (1 + r_{j-1})(s_{j-1} - z_{j-1}) \quad (19)$$

(4) 在第 j 阶段的交易金额 z_j 为买卖的股数与该阶段收盘价的乘积，即

$$z_j = (n_j - n_{j-1}) u_{j-1} \quad (20)$$

其中若进行了股票的卖出，则交易金额 $z_j < 0$ ，若进行了股票的买入，则交易金额 $z_j > 0$ 。

(5) 在第 j 阶段投资者所持有的自由资金 t_j 为第 $j-1$ 阶段的自由资金在第 j 阶段进行股票交易后省的资金，即

$$t_j = t_{j-1} + z_{j-1} - 0.3\% |z_{j-1}| \quad (21)$$

(6) 根据实际情况可知，在买入股票 ($z_j > 0$) 时，交易金额 $|z_j| \leq t_j$ ，在卖出股票时，所持有的股数 $n_j \geq 0$ 。

(7) 动态规划模型的目标函数即为

$$F = \max(s_j + t_j) \quad (22)$$

9.2 问题求解

将问题三所预测出来的 2022 年 1 月 4 日至 2022 年 1 月 28 日交易日期间每五分钟的收盘价 u_j 以及收益率 r_j 带入所建立的模型中，即

$$\left\{ \begin{array}{l} F = \max(s_j + t_j) \\ s_j = (1 + r_{j-1})(s_{j-1} - z_{j-1}) \\ z_j = (n_j - n_{j-1})u_{j-1} \\ t_j = t_{j-1} + z_{j-1} - 0.3\%|z_{j-1}| \\ n_j = n_{j-1} (p_j \leq 0.75) \\ n_j = n_{j-1} + nn_temp (p_j > 0.75, r_{j-1} < 0) \\ n_j = n_{j-1} - n_temp (p_j > 0.75, r_{j-1}^* > 0) \\ t_0 = 10^6 \\ n_0 = 0 \end{array} \right. \quad (23)$$

通过 MATLAB 动态求解上述模型，即可获得投资者进行股票买卖交易后在第 j 阶段获得最多资金收益，获得投资的整体最优策略，即各个阶段投资者所持有的股票数 n_j 以及各个阶段所持有的自由资金和股票钱的总和，最终决定在 2022 年 1 月 18 日 10 点 35 分将投资者手里的 127 只股票卖出，最终获得 1194114.877327 元。在根据问题三的收盘价的预测值做出每五分钟频率价格进行买卖的最优交易策略后，根据题目要求计算交易期间的总收益率 $Total_{yield}$ 、信息比率 $Information_{ratio}$ 以及最大回撤率 $Drawdown$ ，根据题目中提供的公式：

$$Total_{yield} = [1 \times (1 + R_1) \times (1 + R_2) \times (1 + R_3) \times \dots \times (1 + R_n) - 1] \times 100\% \quad (24)$$

$$R_i = \frac{M_i - M_{i-1}}{M_{i-1}}$$

其中 R_i 为第 i 天的收益率，区别于 r_i ， M_i 为第 i 天收盘时总的资产市值 (包括自有资金和股票)

$$Information_{ratio} = \frac{\overline{E_i}}{S_i} \overline{E_i} = \frac{E_i}{T} E_i = R_i - Z_i \times 90 \quad (25)$$

其中 E_i 为第 i 天的超额收益率， Z_i 为第 i 天中证 500 指数收益率， $\overline{E_i}$ 为到第 i 天为止的日均超额收益率， T 为按交易日计算的天数， S_i 为到第 i 天为止的超额收益率标准差 (T 日内的每日超额收益率序列求得的标准差)

$$Drawdown = \max \frac{D_i - D_j}{D_i} \quad (26)$$

其中 D_i 为第 i 天的产品净值， D_j 是后面第 j 天的净值按照动态规划得出的最佳投资策略，得出从 2022 年 1 月 4 日到 2022 年 1 月 18 日每天下午 15 点所持有的股票数以及总的资产市值作为当日的总资产，并带入上述公式，即可得出总收益率 $Total_{yield} = 16.8209\%$ 、最后一天交易的信息比率 $Information_{ratio} = 18.4779\%$ 、以及最大回撤率 $Drawdown = 8.1708816\%$ 。

9.3 模型优缺点

9.3.1 模型优点

(1) 进行因子提取与保留时，考虑到因子数量巨大，要快速找到各个因素之间的相关程度与拟合程度的高低，减小共线性的影响，运用以成交量为回归量的 Lasso 回归和以收益率为回归量的 IC 因子分析，综合考虑，挑选出最佳的因子。

(2) 第二、三问对于成交量和收盘价的预测都采用了岭回归预测和神经网络预测，然后对比预测结果，成交量则采用岭回归预测结果，收盘价二者的准确度差别不大，则采用神经网络预测的结果，考虑到成交量浮动大，收盘价浮动小，分别采用不同的模型。

(3) 动态规划模型考虑到本题中阶段与阶段之间相关联，不确定因素多，即股票跌了会赔钱，但也可能选择低价买入，股票涨了会赚钱，但也可能选择高价卖出来赚钱，每个阶段都有若干方案可供选择，决策者的任务就是在每个阶段选择一个合理的方案，所以选择动态规划进行决策选择是合理的。

9.3.2 模型缺点

(1) 动态规划模型在建立方程模型时，没有固定的标准，根据题目要求列出目标方程和各种约束条件，股票的买卖不确定因素过大，动态规划容易陷入局部最优解，需要调解学习次数，选择最优解。

(2) 岭回归预测得出的成交量的平均相对误差比 BP 神经网络预测得出的收盘价大的多，还与成交价浮动幅度过大导致，模型仍需要优化。

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附录 A 数据预处理

RMV 社会消费品零售总额当月值/_1=SMEAN社会消费品零售总额当月值() 全国居民消费价格指数当期值/_1=SMEAN全国居民消费价格指数当期值() 股票市场期末市价总值/_1=SMEAN股票市场期末市价总值() .

RMV 道琼斯工业平均指数/_1=MEAN道琼斯工业平均指数(2) 纳斯达克综合指数/_1=MEAN纳斯达克综合指数(2) 纳斯达克综合指数/_2=MEAN纳斯达克综合指数(2) 标准普尔指数/500_1=MEAN标准普尔指数(500 2) 美国证交所/_1=MEAN美国证交所(2) 恒生指数/_1=MEAN恒生指数(2) 东京日经指数/225_1=MEAN东京日经指数(225 2) 伦敦金融时报指数/100_1=MEAN伦敦金融时报指数(100 2) 法国巴黎/指数CAC40_1=MEAN法国巴黎(指数CAC40 2) 荷兰/指数AEX_1=MEAN荷兰(指数AEX 2) 俄罗斯/指数RTS_1=MEAN俄罗斯(指数RTS 2) 意大利/指数MIB_1=MEAN意大利(指数MIB 2) 道琼斯工业平均指数/_1_1=MEAN道琼斯工业平均指数(_1 2) . 标准化

```
GET DATA
/TYPE=XLSX
/FILE='D新建文件夹:\\题补全后数据B_.xlsx'
/SHEET=name 每日成交量''
/CELLRANGE=FULL
/READNAMES=ON
/DATATYPEMIN PERCENTAGE=95.0
/HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME 数据集1 WINDOW=FRONT.
```

```
GET DATA
/TYPE=XLSX
/FILE='D新建文件夹:\\题补全后数据B_.xlsx'
/SHEET=name 每日成交量''
/CELLRANGE=FULL
/READNAMES=ON
/DATATYPEMIN PERCENTAGE=95.0
```



```

/HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME 数据集2 WINDOW=FRONT.

GET DATA
/TYPE=XLSX
/FILE='D新建文件夹:\\题补全后数据B_.xlsx'
/SHEET=name 每日成交量''
/CELLRANGE=FULL
/READNAMES=ON
/DATATYPEMIN PERCENTAGE=95.0
/HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME 数据集3 WINDOW=FRONT.
DESCRIPTIVES VARIABLES 当日成交额= 成交量上证综合指数成交金额上证综合指数沪市股票流通市值深市股票流通市值沪深指数300 上证综合指数中证指数500 创业板指数上证指数
50 上证股指数A 深证成份指数深证综合指数
/SAVE
/STATISTICS=MEAN STDDEV MIN MAX.

GET DATA
/TYPE=XLSX
/FILE='D新建文件夹第一问回归相关性表格:\\.xlsx'
/SHEET=name 每日成交量''
/CELLRANGE=FULL
/READNAMES=ON
/DATATYPEMIN PERCENTAGE=95.0
/HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME 数据集4 WINDOW=FRONT.
RMV 美国美元兑人民币/_1=SMEAN美国美元兑人民币() 美国欧元兑美元/_1=SMEAN美国欧元兑美元().

DESCRIPTIVES VARIABLES 当日成交额= 成交量上证综合指数成交金额上证综合指数沪市股票流通市值深市股票流通市值沪深指数300 上证综合指数中证指数500 创业板指数上证指数

```

```
50 上证股指数A 深证成份指数深证综合指数道琼斯工业平均指数纳斯达克综合指数标准普
    尔指数 500 美国证交所恒生指数东京日经指数 225 伦敦金融时报指数100法国巴黎
    指数
CAC40 荷兰指数AEX 俄罗斯指数RTS 意大利指
    数MIB VMA VMA CD ARBR OBV BBI DMA MA EXPMA MTM MACD BIAS KDJ RSI
BOLL 美国美元兑人民币美国欧元兑美元数字媒体数字孪生快手概念互联网电商互联网
/STATISTICS=MEAN STDDEV MIN MAX.

* 标识异常个案.
DETECTANOMALY
/VARIABLES SCALE当日成交额=
/PRINT ANOMALYLIST
/HANDLEMISSING APPLY=NO
/CRITERIA PCTANOMALOUSCASES=5 ANOMALYCUTPOINT=2 MINNUMPEERS=1
    MAXNUMPEERS=15 NUMREASONS=1.

DATASET ACTIVATE 数据集1.

GET DATA
/TYPE=XLSX
/FILE='D新建文件夹:\\11.xlsx'
/SHEET=name '11'
/CELLRANGE=FULL
/READNAMES=ON
/DATATYPEMIN PERCENTAGE=95.0
/HIDDEN IGNORE=YES.
EXECUTE.
DATASET NAME 数据集5 WINDOW=FRONT.
DESCRIPTIVES VARIABLES收益率=
/SAVE
/STATISTICS=MEAN STDDEV MIN MAX.
```

表 8 指标描述统计

个案数	最小值	最大值	平均值	标准差
-----	-----	-----	-----	-----

成交量:	130.00	275.12	667.28	387.47	79.03
上证综合 指数					
成交金 额: 上 证	130.00	3383.12	8425.29	5129.58	916.39
综合指数					
沪 市: 股 票: 流 通 市值	130.00	3.87E+13	4.37E+13	4.18E+13	1.15E+12
深 市: 股 票: 流 通 市值	130.00	2.74E+13	3.18E+13	3.00E+13	9.69E+11
沪 深 300 指数	130.00	4563.77	5151.75	4899.50	98.42
上证综合 指数	130.00	3361.44	3715.37	3558.45	69.04
中 证 500 指数	130.00	6580.53	7648.75	7127.94	199.29
创业板指 数	130.00	2906.76	3563.13	3312.01	146.11
上 证 50 指数	130.00	3054.02	3411.29	3227.73	70.07
上 证 A 股指数	130.00	3522.48	3894.03	3729.44	72.40
深证成份 指数	130.00	13328.06	1.53E+04	14581.31	340.43
深证综合 指数	130.00	2262.37	2561.91	2451.73	56.79
道琼斯工 业平均指 数	130.00	33843.92	3.68E+04	35348.67	641.37
纳斯达克 综合指数	130.00	13352.78	1.61E+04	15094.78	551.85
标准普尔 500 指数	130.00	4258.49	4793.54	4542.48	132.32

美国证交所	130.00	2856.51	3655.72	3292.01	229.70
恒生指数	130.00	22744.86	28004.68	25021.47	1217.18
东京日经225 指数	130.00	26170.30	30511.71	28586.92	897.01
伦敦金融时报 100 指数	130.00	6844.39	7611.23	7225.70	162.80
法国巴黎CAC40 指数	130.00	6295.97	7376.37	6847.08	229.37
荷兰 AEX 指数	130.00	721.09	827.57	784.02	23.33
俄罗斯 RTS 指数	130.00	1288.17	1919.58	1671.30	135.88
意大利 MIB 指数	130.00	23968.50	28162.67	26480.41	854.45
VMA	130.00	4.68E+08	3.55E+09	1.96E+09	#####
VMACD	129.00	-4.45E+08	2.83E+08	-9.71E+07	#####
ARBR	130.00	48.92	173.41	98.87	30.50
OBV	130.00	2.57E+07	2.89E+07	2.68E+07	628155.31
BBI	130.00	1437.26	1653.16	1543.32	53.80
DMA	130.00	-83.24	61.00	-11.63	46.78
MA	130.00	1417.45	1655.02	1539.33	58.51
EXPMA	130.00	1408.17	1658.96	1539.13	57.68
MTM	130.00	-141.69	95.35	-9.91	47.47
MACD	130.00	-34.49	22.62	-5.14	15.96
BIAS	130.00	-5.95	4.92	-0.55	2.12
KDJ	130.00	8.50	86.56	47.38	20.20
RSI	130.00	13.84	84.09	47.30	15.73
BOLL	130.00	1482.66	1641.88	1551.83	50.32

美国: 美元兑人民币	137.00	6.32	6.51	6.42	0.05
美国: 欧元兑美元	137.00	1.11	1.19	1.16	0.02
数字媒体	130.00	1824.15	2732.50	2210.08	206.67
数字孪生	130.00	916.23	1251.69	1040.10	78.32
快手概念	130.00	877.95	1285.46	1015.35	107.90
互联网电商	130.00	16199.80	22633.81	18359.55	1338.92
互联网	130.00	3122.53	3576.75	3319.53	112.51

附录 B 问题一数据

表 9 LASSO 回归最优参数调整

Lambda	MSPE	st. dev.	Lambda	MSPE	st. dev.
1 218.27172	0.996615	0.139943	51 2.0835093	0.123139	0.013709
2 198.88106	0.90029	0.139797	52 1.8984161	0.121882	0.013503
3 181.21302	0.798744	0.1275	53 1.7297661	0.120602	0.013391
4 165.11455	0.714411	0.116781	54 1.5760984	0.119502	0.013283
5 150.44623	0.64437	0.107419	55 1.4360822	0.11895	0.013121
6 137.081	0.586198	0.099228	56 1.3085046	0.118557	0.013035
7 124.9031	0.53788	0.092051	57 1.1922607	0.118486	0.012967
8 113.80706	0.497842	0.085753	58 1.0863435	0.118765	0.012994
9 103.69675	0.466318	0.080163	59 .98983574	0.119052	0.013035
10 94.484618	0.436867	0.075684	60 .90190146	0.118967	0.013002
11 86.090865	0.402908	0.070409	61 .82177902	0.118301	0.012922
12 78.442789	0.368404	0.064822	62 .74877444	0.117391	0.012889
13 71.474148	0.337599	0.059874	63 .68225538	0.11669	0.012927
14 65.124582	0.310962	0.055127	*64 .62164569	0.116397	0.013026
15 59.339094	0.285935	0.050864	65 .5664204	0.116653	0.013202
16 54.067572	0.2647	0.047173	66 .51610117	0.117129	0.013471
17 49.264358	0.246144	0.043482	67 .47025217	0.117685	0.013673

18	44.887848	0.230734	0.040332	68	.42847626	0.118358	0.013851
19	40.900135	0.217912	0.03764	69	.39041161	0.118839	0.013911
20	37.26668	0.207233	0.035331	70	.35572852	0.119261	0.014037
21	33.956011	0.198335	0.033346	71	.32412658	0.119747	0.014185
22	30.939453	0.191064	0.031615	72	.29533207	0.120334	0.01441
23	28.190877	0.184884	0.03015	73	.26909558	0.121172	0.014637
24	25.686477	0.178959	0.02895	74	.24518987	0.122162	0.014887
25	23.404561	0.172953	0.027729	75	.22340788	0.123399	0.015174
26	21.325365	0.167545	0.026425	76	.20356094	0.124739	0.015419
27	19.430878	0.163155	0.025343	77	.18547715	0.12622	0.015612
28	17.704692	0.158821	0.024375	78	.16899987	0.127782	0.015818
29	16.131856	0.154656	0.023534	79	.15398638	0.129222	0.016003
30	14.698747	0.15146	0.022717	80	.14030666	0.130815	0.016147
31	13.39295	0.148775	0.021976	81	.1278422	0.132372	0.016266
32	12.203158	0.147043	0.021268	82	.11648505	0.133872	0.016358
33	11.119063	0.145668	0.020612	83	.10613684	0.135262	0.016462
34	10.131276	0.144212	0.020007	84	.09670794	0.13604	0.016631
35	9.2312412	0.143024	0.019458	85	.08811667	0.136581	0.016761
36	8.4111632	0.141474	0.018817	86	.08028863	0.136936	0.016734
37	7.6639386	0.14073	0.018414	87	.07315601	0.137461	0.016709
38	6.9830955	0.139909	0.018072	88	.06665703	0.138056	0.016718
39	6.3627365	0.138925	0.017693	89	.0607354	0.138659	0.016731
40	5.7974885	0.137878	0.01736	90	.05533984	0.139287	0.016654
41	5.2824556	0.137197	0.016994	91	.0504236	0.139931	0.016528
42	4.8131768	0.136925	0.016629	92	.04594411	0.14065	0.016404
43	4.3855875	0.136189	0.016169	93	.04186256	0.141399	0.016298
44	3.995984	0.135226	0.015768	94	.0381436	0.142128	0.016196
45	3.6409918	0.134333	0.015432	95	.03475503	0.142827	0.016105
46	3.3175361	0.133308	0.015245	96	.03166749	0.143411	0.016043
47	3.0228153	0.130985	0.014953	97	.02885424	0.143955	0.015995
48	2.7542767	0.12844	0.014591	98	.02629091	0.144461	0.015964
49	2.5095944	0.12648	0.014345	99	.02395529	0.144904	0.015946
50	2.2866489	0.124676	0.014038	100	.02182717	0.145302	0.015936

表 10 OLS 估计参数

Source	SS	df	MS	Number of obs	=	130
				F(25, 104)	=	58
Model	120.3669	25	4.814677	Prob > F	=	0
Residual	8.632928	104	0.083009	R-squared	=	0.9331
				Adj R-squared	=	0.917
Total	128.9999	129	0.999999	Root MSE	=	0.28811

表 11 OLS 估计下的指标数据

当日成交额	Coef.	Std. Err.	t	P>t	[95% Conf. Interval]	
成交量上证综合指数	-0.27651	0.112384	-2.46	0.016	-0.49938	-0.05365
成交金额上证综合指数	0.773239	0.124643	6.2	0	0.526067	1.02041
深市股票流通市值	-0.12708	0.104354	-1.22	0.226	-0.33402	0.079855
上证 50 指数	-0.07078	0.052565	-1.35	0.181	-0.17502	0.033455
道琼斯工业平均指数	-0.067	0.074396	-0.9	0.37	-0.21453	0.080532
美国证交所	0.331172	0.150955	2.19	0.03	0.031824	0.63052
东京日经 225 指数	-0.05592	0.061198	-0.91	0.363	-0.17728	0.065432
伦敦金融时报 100 指数	0.045669	0.166055	0.28	0.784	-0.28362	0.374961
俄罗斯 RTS 指数	0.299255	0.100206	2.99	0.004	0.100543	0.497966
意大利 MIB 指数	-0.07416	0.157054	-0.47	0.638	-0.3856	0.237284
VMA	-0.57272	0.254857	-2.25	0.027	-1.07811	-0.06733
VMACD	0.657055	0.159582	4.12	0	0.340598	0.973513
ARBR	0.119985	0.095436	1.26	0.211	-0.06927	0.309238
OBV	0.20401	0.120878	1.69	0.094	-0.0357	0.443715
BBI	0.288675	0.197581	1.46	0.147	-0.10314	0.680486
MTM	0.037235	0.066517	0.56	0.577	-0.09467	0.16914
BIAS	0.046749	0.17407	0.27	0.789	-0.29844	0.391937
KDJ	-0.24127	0.089587	-2.69	0.008	-0.41892	-0.06361
RSI	0.172259	0.158073	1.09	0.278	-0.14121	0.485724
BOLL	0.334954	0.225918	1.48	0.141	-0.11305	0.782958
美国美元兑人民币	0.227966	0.112854	2.02	0.046	0.004173	0.45176
美国欧元兑美元	-0.02812	0.111919	-0.25	0.802	-0.25006	0.193819
数字媒体	-0.08942	0.119862	-0.75	0.457	-0.32711	0.148268

快手概念	-0.13108	0.14168	-0.93	0.357	-0.41203	0.149882
互联网电商	-0.08938	0.11964	-0.75	0.457	-0.32663	0.147867
_cons	2.72E-07	0.025269	0	1	-0.05011	0.05011

附录 C 问题二的数据代码

```
#岭回归
import pandas as pd
import numpy as np
from sklearn.linear_model import Ridge
import matplotlib.pyplot as plt
from sklearn import model_selection
from sklearn import ensemble
from sklearn import metrics
from sklearn.tree import DecisionTreeClassifier
from sklearn.model_selection import GridSearchCV
plt.rcParams['font.sans-serif']=['KaiTi']
plt.rcParams['axes.unicode_minus']=False
d=pd.read_csv('D:\\B\\END2.csv',encoding="gbk")
d.data=d[['收盘价','最高价','最低价','成交额','成交量','上证综合指数','意大利指数MIB','VMA','VMACD','ARBR','OBV','KDJ']]
d.target=d['成交量']
d.x1=d['时间']
x1=d.x1.iloc[5328:6240]
x_train=d.data.iloc[1:5328,:]
x_test=d.data.iloc[5328:6240,:]
y_train=d.target.iloc[1:5328]
y_test=d.target.iloc[5328:6240]
ridge_regression =
    Ridge(alpha=0.07,normalize=True,max_iter=1000,solver='cholesky')
ridge_regression.fit(x_train,y_train)
y_pred=ridge_regression.predict(x_test)
line1=plt.plot(x1,y_test,color='r',linestyle='-')
line2=plt.plot(x1,y_pred,color='b',linestyle='-.')
y_pred1 = pd.DataFrame(y_pred)
y_test1= pd.DataFrame(y_test)
```



```

writer = pd.ExcelWriter("D:\\B\\0.07.xlsx")
y_pred1.to_excel(writer,'y_pred', float_format='%.5f')
writer.save()

```

```

%神经网络%
input=[];
output=[];
input_train = input(1:5689,:);
output_train =output(1:5689,:);
input_test = input(5690:6240,:);
output_test =output(5690:6240,:);

test_simu=sim(net3, input_test);

%第十步% 真实值与预测值误差比较
figure('units','normalized','position',[0.119 0.2 0.38 0.5])
plot(output_test,'bo-')
hold on
plot(test_simu,'r*-')
hold on
%plot(error,'square','MarkerFaceColor','b')
%legend期望值预测值误差('',' ','')
xlabel('数据组数')
ylabel('样本值')
title('神经网络测试集的预测值与实际值对比图BP')

```

表 12 对成交量的 OLS 估计结果

成交量	Coef.	Std. Err.	t	P>t	Beta
最低价	2000693	203023.2	9.85	0	3.186803
最高价	-2733306	204500.1	-13.37	0	-4.37317
开盘价	193549.6	185538.8	1.04	0.297	0.308972
收盘价	514748.3	183077.1	2.81	0.005	0.821971
成交额	0.043412	0.000275	157.96	0	1.020265
_cons	3.21E+07	4650524	6.89	0	.

表 13 岭回归成交量预测与误差分析

实际值	预测值	绝对误差	相对误差	实际值	预测值	绝对误差	相对误差
11284830	9435554	-1849275.7	-16.3873	19929180	25007295	5078115	25.4808
52261199	83642937	31381737.9	60.04787	13340740	13713680	372940.1	2.795498
32032367	45383438	13351071	41.67994	10810000	13921017	3111017	28.77906
24013795	33505911	9492115.93	39.52776	10237530	10254740	17209.73	0.168104
24464949	35927818	11462869.3	46.85425	10612550	10817741	205191.5	1.933479
21194010	25749122	4555111.96	21.49245	11527490	16509020	4981530	43.21435
16934790	22978516	6043726.2	35.68823	15024250	14784827	-239423	-1.59358
17331600	28745127	11413526.6	65.85385	10734340	12439018	1704678	15.8806
19476130	32473317	12997187.4	66.73393	9696050	11153862	1457812	15.03511
17510690	29647206	12136516.5	69.30918	12641850	12546367	-95482.7	-0.75529
12870860	18704408	5833548.18	45.32369	10181060	11773675	1592615	15.64292
12939260	17607597	4668336.73	36.07885	9986820	11454227	1467407	14.69343
19212680	23528449	4315769.23	22.46313	11475750	13848410	2372660	20.67542
13070790	17446773	4375983.01	33.4791	9995650	11166988	1171338	11.71847
16000880	20157772	4156891.7	25.97914	9915150	10522931	607780.7	6.129819
12114410	15884592	3770181.7	31.12146	11783760	14383280	2599520	22.06019
11926030	12617088	691057.819	5.794534	12028500	12030321	1820.898	0.015138
11315530	9596755	-1718775	-15.1895	9902280	11192570	1290290	13.03023
12868670	11311104	-1557565.5	-12.1035	11678660	14129337	2450677	20.98423
10782520	11432454	649934.204	6.027665	12478330	14657871	2179541	17.46661
10829420	10981756	152335.705	1.406684	15017790	17526079	2508289	16.70212
9052740	7929730	-1123009.6	-12.4052	14820730	18594055	3773325	25.45978
6759740	5422681	-1337059	-19.7797	17531650	23539542	6007892	34.26884
7526240	4767594	-2758645.9	-36.6537	11665070	13040179	1375109	11.78826
6311710	2868936	-3442774.1	-54.5458	64209176	83947312	19738136	30.74037
11682400	12821636	1139236.25	9.751731	39027248	56119999	17092751	43.79697
9394330	6159541	-3234789.1	-34.4334	38679356	59361664	20682308	53.47118
7687200	5732186	-1955013.5	-25.4321	33190780	50941519	17750739	53.48093
7715670	4900942	-2814727.5	-36.4807	29411290	42556559	13145269	44.69464
8322300	5958217	-2364082.5	-28.4066	28427080	46311529	17884449	62.91342
8760420	6504219	-2256200.6	-25.7545	25901470	38387490	12486020	48.20584
8863250	8655735	-207515.07	-2.3413	23831970	32512567	8680597	36.42417
9039730	7753402	-1286328.1	-14.2297	21901720	31935938	10034218	45.81475

8891690	8802714	-88976.018	-1.00066	21065910	32613024	11547114	54.81422
8024420	7013073	-1011346.8	-12.6034	24584040	38227117	13643077	55.49567
8858910	11149186	2290275.63	25.85279	22734300	34071567	11337267	49.86855
10310410	9458294	-852115.62	-8.26461	20433570	29569899	9136329	44.71235
8974110	9126331	152220.963	1.696224	24176670	31817474	7640804	31.60404
8874420	8994466	120046.02	1.35272	16889250	23538408	6649158	39.36917
9584730	12120220	2535489.87	26.45343	16335780	21103813	4768033	29.18766
10185630	11242489	1056859.41	10.37598	15009680	16067944	1058264	7.050542
10685170	10860498	175327.84	1.640852	11842420	12384783	542362.6	4.579829
10710280	11043747	333467.009	3.113523	13016790	12654175	-362615	-2.78575
11376290	13654144	2277853.92	20.02282	10714650	11876517	1161867	10.84372
10145640	11394727	1249087.3	12.31157	11341540	12159342	817801.6	7.210675
11668570	12729056	1060486.08	9.088398	11044060	12048541	1004481	9.095212
13812700	16247488	2434788.16	17.62717	10081090	8629128	-1451962	-14.4028
16128670	18636954	2508283.86	15.55171	6387080	5356001	-1031079	-16.1432
10022840	7531815	-2491025.2	-24.8535	17864570	24385023	6520453	36.49936
39997621	69630212	29632590.6	74.08588	12271080	12905217	634136.7	5.167733
28084358	47616108	19531750.2	69.54672	11870260	13346434	1476174	12.4359
21815622	31899941	10084318.6	46.22522	12941550	17116632	4175082	32.26107
28530765	39529990	10999224.6	38.55215	7517510	9332580	1815070	24.14456
30029604	48691213	18661608.6	62.14404	8183580	11297016	3113436	38.04491
32421500	56053785	23632284.7	72.89078	8187850	10266835	2078985	25.3911
24387630	36102408	11714778.1	48.03574	7616600	8357419	740818.9	9.726373
25895990	35031179	9135189.24	35.27646	7908640	7758900	-149740	-1.89337
19122310	26100608	6978297.81	36.49296	8322490	8360285	37794.59	0.454126
20395470	27980442	7584971.77	37.18949	8682740	9974427	1291687	14.87649
15553060	21954346	6401285.67	41.15773	7508540	7628337	119797	1.595476
20264530	25935107	5670577.34	27.98277	10154380	10863890	709510.1	6.987232
18598950	23664304	5065353.54	27.23462	8349730	9024059	674328.6	8.076053
19557670	26153031	6595361.14	33.72263	8043530	7763439	-280091	-3.48218
12323220	13661993	1338773.22	10.86383	10276430	12504506	2228076	21.68142
12256030	16161254	3905224.16	31.8637	6707230	7101058	393827.9	5.871692
10962120	12248678	1286557.57	11.73639	10076880	11499761	1422881	14.12025
10523680	15603214	5079534.02	48.26766	8485760	10307347	1821587	21.4664
10738870	12632550	1893679.84	17.63388	8996180	9879154	882974.5	9.814993

11067430	13674769	2607338.79	23.55867	12534840	15706760	3171920	25.30483
10639990	12883905	2243915.11	21.08945	12550010	15086586	2536576	20.21174
16740330	19090939	2350609.15	14.04159	15147070	19086839	3939769	26.01011
12001870	14657976	2656106.23	22.13077	8551150	9301526	750375.5	8.775142
6518850	4026229	-2492620.9	-38.2371	80696839	1.31E+08	49964603	61.91643
19383730	26868457	7484726.93	38.61345	40014778	69092415	29077637	72.66725
15479120	18959123	3480003.29	22.48192	28710433	44807658	16097225	56.06751
12052110	14852137	2800027.04	23.23267	24209810	39373480	15163670	62.6344
12261330	15400386	3139055.55	25.60126	22287420	38596174	16308754	73.17471
18585870	23680854	5094984.4	27.41321	15652700	27962468	12309768	78.6431
15803040	21913043	6110003.25	38.66347	15255570	23300202	8044632	52.73242
16205790	23401743	7195953.26	44.40359	15375830	18666908	3291078	21.40423
13441570	15295661	1854091.4	13.79371	11960290	15238674	3278384	27.41057
12606590	14235173	1628582.78	12.9185	10805700	12623970	1818270	16.82695
13443090	16767070	3323979.56	24.72631	10569740	14868566	4298826	40.67106
11654380	13406606	1752225.57	15.03491	10619000	12902092	2283092	21.50006
11770840	15537663	3766822.74	32.00131	8991460	12881846	3890386	43.26757
12163700	13388708	1225008.18	10.07102	10194910	14478654	4283744	42.01846
12922750	16874816	3952065.92	30.58224	8319850	9953172	1633322	19.63163
10594890	12360289	1765398.92	16.66274	8765930	10460344	1694414	19.32954
10055370	11618801	1563431.08	15.54822	10377160	13178489	2801329	26.99514
9590690	11870577	2279886.97	23.77188	12219260	12695197	475937	3.894974
9719290	10768875	1049585.22	10.79899	10258530	12154737	1896207	18.4842
10417140	11723745	1306605.13	12.54284	10169310	11792977	1623667	15.96634
11285550	15433549	4147999.25	36.75496	8355170	9755147	1399977	16.75582
12750140	16747555	3997415.01	31.35193	6720480	6500127	-220353	-3.27883
12425160	14757887	2332727.17	18.77422	5842190	5991828	149638.1	2.561337
14319940	18774041	4454101.14	31.10419	4674120	3251248	-1422872	-30.4415
9346290	8678814	-667475.89	-7.14161	10697490	14994337	4296847	40.16687
50211878	86218026	36006148.5	71.70843	6832940	8258286	1425346	20.85992
24490574	41039693	16549119.4	67.57342	7761420	8368181	606760.7	7.81765
28335322	42918979	14583657.5	51.46812	6851540	6588264	-263276	-3.84259
31721546	46468816	14747270	46.48976	7863130	10946468	3083338	39.2126
23025210	31108906	8083695.57	35.10802	7827470	8762816	935346.1	11.94953
21569620	29666072	8096451.83	37.53637	8443670	10268816	1825146	21.61556

13567060	18989074	5422013.61	39.96454	8741400	10391987	1650587	18.88241
21772920	29153468	7380547.89	33.89783	13058390	15690680	2632290	20.15784
23916690	31084771	7168080.88	29.97104	11674730	13488792	1814062	15.53836
20671480	29731569	9060089.35	43.82893	10798230	12207984	1409754	13.05542
13666860	21613206	7946346.46	58.14318	12880630	14367281	1486651	11.54175
17583370	25463489	7880119.09	44.81575	9695700	11079013	1383313	14.26728
13092800	18649591	5556791.2	42.44158	8293490	10210184	1916694	23.11083
10494960	13879076	3384116.11	32.24515	7664470	10108530	2444060	31.88817
8081930	8201775	119845.226	1.482879	7145020	8403131	1258111	17.60823
9290740	9295870	5129.77396	0.055214	7471600	9007091	1535491	20.55103
8289110	8975623	686513.338	8.282112	7777660	9103044	1325384	17.04091
9825840	11901387	2075546.91	21.12335	9759310	13608342	3849032	39.43959
11018620	14329653	3311033.24	30.04944	9917180	13461181	3544001	35.73597
10187040	11721955	1534915.06	15.06733	14218810	18597210	4378400	30.79301
8730940	10043513	1312573.06	15.03358	13651560	17410446	3758886	27.53448
9480010	9645305	165294.774	1.743614	14631070	18782722	4151652	28.37559
9630280	10879564	1249284.08	12.97246	11279940	12195850	915910	8.119813
6814130	5633654	-1180476.3	-17.3239	40833246	67258864	26425618	64.71594
13074410	20920847	7846436.87	60.0137	24251329	31118342	6867013	28.31603
9285220	10961730	1676509.83	18.05568	20403503	29002361	8598858	42.14403
8512180	9025247	513067.144	6.027447	29285994	48629575	19343581	66.05062
7973570	9288611	1315040.91	16.4925	20437178	29531667	9094489	44.49973
9326320	13085504	3759183.66	40.30726	20629310	28770296	8140986	39.4632
10095760	14075240	3979480.46	39.41734	15078150	19799508	4721358	31.31258
9440170	12976757	3536586.77	37.46317	12608770	17829592	5220822	41.40627
9814190	10653347	839157.398	8.55045	11414290	15015049	3600759	31.54607
10984100	12821133	1837033.24	16.72448	12828450	13163854	335403.9	2.614532
9757600	9659280	-98320.238	-1.00763	9283690	10179785	896095	9.652359
8720370	8349037	-371333.03	-4.25823	13865840	15440493	1574653	11.35635
8022770	8480667	457896.789	5.707465	13223440	17261724	4038284	30.53883
8000370	9037869	1037498.93	12.96814	7639940	10641341	3001401	39.28566
9281520	9540299	258779.405	2.788114	13430830	15402358	1971528	14.67912
9989220	10125357	136137.409	1.362843	11181210	13711152	2529942	22.62673
9120760	8809201	-311558.74	-3.41593	10261770	11946658	1684888	16.41907
8954240	8720365	-233874.72	-2.61189	8375300	8573770	198470.3	2.369709

9909310	10948730	1039419.95	10.48933	9665520	10304549	639028.8	6.611427
12449630	15358139	2908509.37	23.36222	7551050	8088923	537872.7	7.123151
11726670	13417075	1690405.37	14.41505	7337470	7972792	635322	8.658598
13896890	17477485	3580594.59	25.76544	10457360	10836963	379602.5	3.630003
12924610	15537856	2613245.78	20.21915	14145390	16978819	2833429	20.03076
15833720	18511579	2677858.63	16.91238	15847570	16879454	1031884	6.511307
9605760	8266686	-1339073.7	-13.9403	22939230	28923025	5983795	26.08542
50741055	85370201	34629146.4	68.2468	10651960	11860257	1208297	11.34343
25178854	41251708	16072853.8	63.83473	7688130	8535394	847264.5	11.02042
21559191	34520181	12960989.8	60.11816	11609810	12444324	834513.8	7.188005
18860589	29936745	11076155.7	58.72646	14153510	15406991	1253481	8.856326
16697590	25926885	9229294.58	55.27321	8164340	9297101	1132761	13.8745
15723091	21207689	5484597.59	34.88244	7764770	8655757	890986.9	11.47474
14625170	20368822	5743652.18	39.27238	7103550	8001639	898088.9	12.64282
15590840	21213402	5622562.12	36.06324	9354450	10882140	1527690	16.33115
16219680	22144507	5924826.75	36.52863	10204380	12196119	1991739	19.51847
10867600	14013928	3146327.87	28.95145	6965820	8083294	1117474	16.04225
8767550	11217204	2449653.82	27.94	7656820	8855187	1198367	15.65098
8900610	11356945	2456335.02	27.59738	9035560	10511244	1475684	16.33196
8795580	9440240	644659.87	7.329362	8297900	8767877	469977.3	5.66381
8683530	9244696	561165.729	6.462415	9301190	9790966	489776	5.265735
7931610	7368816	-562794.11	-7.09558	8766210	9453211	687000.8	7.836919
8439800	8241498	-198301.56	-2.3496	7264530	7942755	678225.1	9.336119
7571740	6078062	-1493677.5	-19.727	9157200	10026928	869727.6	9.497746
8174780	7620025	-554754.71	-6.78617	9448810	11373003	1924193	20.36439
7492500	5023724	-2468776.2	-32.95	9978260	11507437	1529177	15.32508
7372280	6385551	-986728.74	-13.3843	12252920	16170248	3917328	31.97056
8567290	8339708	-227581.71	-2.6564	12530620	16407455	3876835	30.9389
7139000	5663023	-1475976.8	-20.6748	16136650	21163977	5027327	31.15471
6653800	3981425	-2672374.7	-40.1631	10987740	12680872	1693132	15.40928
6285670	2681076	-3604593.6	-57.3462	41789180	68071230	26282050	62.892
11657400	12744015	1086615.5	9.321251	21754059	30892051	9137992	42.00592
8352310	8196162	-156147.96	-1.86952	18971592	26777766	7806174	41.14665
9347790	12023705	2675915.03	28.62618	24766412	29817182	5050770	20.39363
12902000	17246926	4344926.03	33.67638	20742130	29207996	8465866	40.81483

10258490	13071926	2813435.58	27.42544	17376507	24744501	7367994	42.40204
9302060	10386009	1083948.7	11.65278	15432790	20059192	4626402	29.97774
8127130	8251569	124438.792	1.531153	18450510	20351344	1900834	10.30234
7664390	7324359	-340031.41	-4.43651	19134130	21736889	2602759	13.6027
9570750	9518543	-52207.288	-0.54549	12352840	17084355	4731515	38.30306
8756440	7928367	-828072.84	-9.45673	9561570	13233627	3672057	38.40433
7671090	6492111	-1178978.7	-15.3691	10006650	10673314	666664.2	6.662211
7295590	6258002	-1037587.6	-14.2221	8535550	13022948	4487398	52.57304
9952790	10362858	410068.408	4.120135	8109730	11895021	3785291	46.67592
12364890	12979208	614318.367	4.968248	8376710	11474331	3097621	36.97897
7738850	5891025	-1847825	-23.8773	9266910	10421571	1154661	12.46004
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16163170	21769568	5606397.66	34.68625	4930700	5976077	1045377	21.2014
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10984450	11598194	613744	5.587389	11968470	18688243	6719773	56.14563
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6260090	5318824	-941266.36	-15.036	27794606	39283038	11488432	41.33332
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14675382	20898226	6222843.69	42.40328	12017410	18148950	6131540	51.02215
16233563	25451685	9218121.73	56.78434	10000350	14110300	4109950	41.09806
20499086	37889816	17390729.6	84.83661	12711710	16541385	3829675	30.12714
20540520	33553512	13012991.6	63.35279	11228150	15634380	4406230	39.24271
13283630	21569416	8285786.3	62.37592	8897970	13548024	4650054	52.25972
14437240	22709300	8272060.3	57.29669	8519420	12577151	4057731	47.62919
9594000	12952273	3358272.84	35.00389	7889800	10664868	2775068	35.17286
10452490	14243048	3790558.36	36.26464	8510180	12277982	3767802	44.27406
8698240	10772414	2074174.04	23.8459	8029700	10824298	2794598	34.80327
9956920	12630010	2673089.8	26.84655	9005840	15609226	6603386	73.32338
10386460	14755138	4368677.99	42.06128	10760950	16589193	5828243	54.16105
10875830	16833078	5957247.72	54.77511	10185550	14188998	4003448	39.30517
8538610	10790801	2252190.56	26.37655	10636800	16067501	5430701	51.05578
8151100	9589364	1438264.49	17.64504	11846260	18195611	6349351	53.59794
7896230	7630945	-265285.43	-3.35965	13105030	20204377	7099347	54.17268
7062160	6652450	-409710.39	-5.80149	14498220	23228481	8730261	60.21609
7171020	5976309	-1194710.9	-16.6603	17904860	23421718	5516858	30.81207
6137790	4563142	-1574648.1	-25.655	22725890	32351876	9625986	42.35692
6913040	5655885	-1257154.7	-18.1853	12656360	17406662	4750302	37.53293
5385940	3252349	-2133591	-39.6141	43099625	71544567	28444942	65.99812
10301230	15947959	5646729.29	54.81607	21903580	34342002	12438422	56.78717
8532200	9965715	1433515.19	16.80124	19301382	29967557	10666175	55.2612
8779100	9042464	263363.698	2.999894	19917294	30587519	10670225	53.57267
10004670	10979832	975161.931	9.747067	15118169	24402251	9284082	61.41009
9133020	12865539	3732518.6	40.86839	14696181	26113700	11417519	77.69038
9169620	10575550	1405929.71	15.33248	17429959	25599172	8169213	46.8688
11980500	11939667	-40833.08	-0.34083	16943010	26532692	9589682	56.59964
11601530	13641028	2039497.92	17.57956	11766810	17581243	5814433	49.41384
10253600	10572117	318517.278	3.106395	13304990	21514173	8209183	61.70003

9924290	10470938	546648.026	5.508183	11713060	18336808	6623748	56.55011
7938880	6716986	-1221894.3	-15.3913	11406260	17025858	5619598	49.26767
9348100	9089323	-258776.73	-2.76823	11187480	15309781	4122301	36.84745
11628640	12634906	1006265.57	8.653338	12336660	18528790	6192130	50.19292
11947520	12427736	480216.138	4.019379	9181810	12887523	3705713	40.35929
10543830	12150205	1606374.85	15.23521	9274900	12769761	3494861	37.68085
7541560	7547239	5678.98858	0.075303	9114150	11507858	2393708	26.26365
8043770	8592837	549067.433	6.825996	9728100	12699044	2970944	30.53982
8843010	9551988	708977.625	8.017379	10086440	15341519	5255079	52.10044
9579580	10008841	429260.838	4.480999	8424380	11798229	3373849	40.04863
11043640	13622927	2579287.01	23.35541	12590560	14890814	2300254	18.26967
10758500	14103205	3344705.05	31.08895	8573770	12408434	3834664	44.72552
13613880	18698842	5084962.15	37.35131	7666520	11414929	3748409	48.89323
15352730	21226029	5873299.34	38.25573	4844510	5231164	386653.9	7.981281
11328170	14138663	2810492.8	24.80977	10378280	15686115	5307835	51.14369
53808675	93449084	39640409.3	73.66918	6133300	8071298	1937998	31.59797
29840860	51007586	21166725.6	70.93202	6449210	7625099	1175889	18.23307
27987554	47297201	19309647.3	68.99369	6244810	7236305	991495.2	15.87711
29784291	46467240	16682948.9	56.01258	6632970	8655134	2022164	30.48655
22433560	32169330	9735770.42	43.39824	6368130	8549891	2181761	34.26062
27624900	36148848	8523947.62	30.85603	7848990	10957782	3108792	39.60754
20684390	27277690	6593299.53	31.87573	8758490	10610534	1852044	21.1457
22571350	25410038	2838687.5	12.57651	9670470	13393399	3722929	38.49791
13645860	17698245	4052385.42	29.69681	9671520	12710285	3038765	31.41973
15707760	21474349	5766589.42	36.71172	7015300	10012126	2996826	42.71843
18639010	23301539	4662528.75	25.01489	7390180	8950724	1560544	21.11646
16765480	24208951	7443471.4	44.3976	8079460	11193841	3114381	38.54689
15650210	23462953	7812743.01	49.92101	10909500	14533210	3623710	33.2161
15157050	22658840	7501790.39	49.49374	10468130	14821497	4353367	41.58686
13669640	16543013	2873373.5	21.02011	7421220	9309791	1888571	25.44825
11752300	12946506	1194206.21	10.16147	6960770	8327217	1366447	19.63069
11424510	13341957	1917447.21	16.78363	8956680	10850147	1893467	21.14027
12459530	15921514	3461984.28	27.78583	12863850	17291380	4427530	34.41839
13915430	15984481	2069050.97	14.86875	14261440	20362270	6100830	42.7785
18849360	22518580	3669220	19.46602	17410100	24727073	7316973	42.02717

15584500	16913608	1329108.11	8.528397	16963480	23170365	6206885	36.58969
10246080	11863210	1617129.86	15.78291	22079060	28042914	5963854	27.01136
9858410	8927582	-930827.94	-9.44197	15251620	18758690	3507070	22.99474
6994200	6347243	-646956.99	-9.24991				

表 14 BP 神经网络成交量预测和误差分析

实际值	预测值	绝对误差	相对误差	实际值	预测值	绝对误差	相对误差
52261199	98145639	45884439.9	87.79829	19929180	12610855	-7318325	-36.7217
32032367	59124994	27092626.6	84.57891	13340740	-269360	-1.4E+07	-102.019
24013795	47928934	23915139.4	99.58917	10810000	932454.5	-9877546	-91.3741
24464949	50760319	26295369.5	107.4818	10237530	-3116779	-1.3E+07	-130.445
21194010	41897400	20703389.7	97.6851	10612550	-2717379	-1.3E+07	-125.605
16934790	37787205	20852415.2	123.1336	11527490	3019483	-8508007	-73.8062
17331600	44002329	26670728.6	153.885	15024250	970579.5	-1.4E+07	-93.5399
19476130	50659194	31183064.3	160.1091	10734340	-1582963	-1.2E+07	-114.747
17510690	47225707	29715016.9	169.6964	9696050	-3683398	-1.3E+07	-137.989
12870860	37023047	24152186.7	187.6501	12641850	-2219807	-1.5E+07	-117.559
12939260	34085604	21146344.4	163.4278	10181060	-3022367	-1.3E+07	-129.686
19212680	40716073	21503392.9	111.9229	9986820	-3584445	-1.4E+07	-135.892
13070790	36491048	23420258.1	179.1801	11475750	-624956	-1.2E+07	-105.446
16000880	39547350	23546470.2	147.1573	9995650	-3724321	-1.4E+07	-137.259
12114410	35193517	23079106.5	190.5095	9915150	-4113576	-1.4E+07	-141.488
11926030	32374353	20448322.5	171.4596	11783760	510280.1	-1.1E+07	-95.6696
11315530	28235436	16919906.2	149.5282	12028500	-1216647	-1.3E+07	-110.115
12868670	29842360	16973689.8	131.8993	9902280	-3301044	-1.3E+07	-133.336
10782520	29951535	19169015.4	177.7786	11678660	-182841	-1.2E+07	-101.566
10829420	30073391	19243970.9	177.7008	12478330	192078.4	-1.2E+07	-98.4607
9052740	27029199	17976458.9	198.5748	15017790	3290007	-1.2E+07	-78.0926
6759740	24235970	17476229.6	258.5341	14820730	4418463	-1E+07	-70.1873
7526240	21366077	13839837.1	183.8878	17531650	10193135	-7338515	-41.8587
6311710	19906736	13595025.7	215.3937	11665070	-1816545	-1.3E+07	-115.573
11682400	30530023	18847622.7	161.3335	64209176	83635618	19426442	30.25493
9394330	22794391	13400060.7	142.6399	39027248	42067064	3039816	7.788958
7687200	23877526	16190326.5	210.6141	38679356	43882985	5203629	13.45325

7715670	22123026	14407355.5	186.7285	33190780	33662160	471380.1	1.420214
8322300	23083817	14761517.4	177.3731	29411290	23714835	-5696455	-19.3683
8760420	23623757	14863336.7	169.6647	28427080	26368057	-2059023	-7.24317
8863250	25030603	16167353.2	182.4089	25901470	17415707	-8485763	-32.7617
9039730	25036800	15997070	176.964	23831970	10243511	-1.4E+07	-57.0178
8891690	24324653	15432963	173.5661	21901720	9276188	-1.3E+07	-57.6463
8024420	23390103	15365683.4	191.4865	21065910	9609103	-1.1E+07	-54.3855
8858910	27875306	19016396.5	214.6584	24584040	14090401	-1E+07	-42.6848
10310410	26038993	15728583.4	152.5505	22734300	10110417	-1.3E+07	-55.5279
8974110	24934990	15960880	177.8547	20433570	5430702	-1.5E+07	-73.4226
8874420	25409569	16535148.6	186.3237	24176670	8199384	-1.6E+07	-66.0856
9584730	28265873	18681142.8	194.9053	16889250	-696184	-1.8E+07	-104.122
10185630	27286390	17100760	167.891	16335780	-3143093	-1.9E+07	-119.241
10685170	26778216	16093046.3	150.611	15009680	-7146193	-2.2E+07	-147.611
10710280	26361706	15651425.9	146.1346	11842420	-1.2E+07	-2.4E+07	-199.301
11376290	28687630	17311340	152.1703	13016790	-1.1E+07	-2.4E+07	-186.814
10145640	26045899	15900259	156.7201	10714650	-1.2E+07	-2.2E+07	-209.422
11668570	27136807	15468236.6	132.5633	11341540	-1.1E+07	-2.2E+07	-198.063
13812700	29839851	16027151.4	116.032	11044060	-1.1E+07	-2.2E+07	-201.454
16128670	32323562	16194892.3	100.4106	10081090	-1.5E+07	-2.5E+07	-246.775
10022840	21016089	10993249	109.682	6387080	-1.8E+07	-2.5E+07	-384.528
39997621	79449805	39452184.4	98.63633	17864570	3004779	-1.5E+07	-83.1802
28084358	62834058	34749700	123.7333	12271080	-9556928	-2.2E+07	-177.882
21815622	46382669	24567046.9	112.6122	11870260	-8672599	-2.1E+07	-173.062
28530765	53870237	25339471.8	88.81455	12941550	-4386112	-1.7E+07	-133.892
30029604	60400441	30370836.8	101.1363	7517510	-1.3E+07	-2.1E+07	-274.204
32421500	75695127	43273626.6	133.472	8183580	-1.1E+07	-1.9E+07	-235.072
24387630	53634254	29246624.4	119.924	8187850	-1.1E+07	-1.9E+07	-235.559
25895990	52566971	26670981.5	102.9927	7616600	-1.3E+07	-2.1E+07	-272.029
19122310	41249039	22126729.1	115.7116	7908640	-1.4E+07	-2.1E+07	-271.545
20395470	42269300	21873829.9	107.2485	8322490	-1.3E+07	-2.1E+07	-257.346
15553060	36310738	20757677.5	133.4636	8682740	-1.1E+07	-2E+07	-229.263
20264530	39714854	19450324.4	95.98211	7508540	-1.3E+07	-2.1E+07	-275.986
18598950	36015728	17416778.4	93.64388	10154380	-9511652	-2E+07	-193.67
19557670	39861389	20303719.2	103.8146	8349730	-1.2E+07	-2E+07	-240.126

12323220	25410142	13086922.3	106.1973	8043530	-1.3E+07	-2.1E+07	-255.55
12256030	27996289	15740258.6	128.4287	10276430	-7234313	-1.8E+07	-170.397
10962120	22072500	11110380	101.3525	6707230	-1.3E+07	-2E+07	-295.778
10523680	25588681	15065001.1	143.1534	10076880	-8600682	-1.9E+07	-185.351
10738870	22861646	12122775.8	112.8869	8485760	-9706415	-1.8E+07	-214.385
11067430	22274215	11206785.1	101.2591	8996180	-1E+07	-1.9E+07	-212.474
10639990	23572747	12932756.8	121.5486	12534840	-3794428	-1.6E+07	-130.271
16740330	29910222	13169892.3	78.67164	12550010	-4337302	-1.7E+07	-134.56
12001870	25080545	13078675.4	108.972	15147070	298100.6	-1.5E+07	-98.032
6518850	12499423	5980573.35	91.74277	8551150	-1.1E+07	-1.9E+07	-223.808
19383730	37556294	18172563.6	93.75163	80696839	1.48E+08	67005909	83.03412
15479120	30039019	14559899.2	94.06154	40014778	59722617	19707839	49.2514
12052110	25115027	13062917.4	108.387	28710433	27854099	-856334	-2.98266
12261330	25304419	13043089.2	106.3758	24209810	23670999	-538811	-2.22559
18585870	34011339	15425468.5	82.99568	22287420	25573797	3286377	14.74543
15803040	33168866	17365826.5	109.8892	15652700	11815192	-3837508	-24.5166
16205790	34979747	18773956.7	115.8472	15255570	5320015	-9935555	-65.1274
13441570	25333857	11892287.4	88.47395	15375830	385271	-1.5E+07	-97.4943
12606590	23889326	11282735.8	89.49871	11960290	-3810034	-1.6E+07	-131.856
13443090	26896151	13453061.2	100.0742	10805700	-6874540	-1.8E+07	-163.62
11654380	22571293	10916913.2	93.67219	10569740	-4815980	-1.5E+07	-145.564
11770840	25694792	13923952.4	118.2919	10619000	-6946548	-1.8E+07	-165.416
12163700	20928588	8764888.02	72.05775	8991460	-7153724	-1.6E+07	-179.561
12922750	22750691	9827941.28	76.05147	10194910	-4721610	-1.5E+07	-146.313
10594890	17809604	7214714.13	68.09617	8319850	-9569503	-1.8E+07	-215.02
10055370	17265129	7209759.33	71.70059	8765930	-8879711	-1.8E+07	-201.298
9590690	17531776	7941086.19	82.79995	10377160	-5150820	-1.6E+07	-149.636
9719290	15994941	6275651.09	64.56903	12219260	-5904916	-1.8E+07	-148.325
10417140	16576965	6159824.79	59.13163	10258530	-5977849	-1.6E+07	-158.272
11285550	20387687	9102136.51	80.65302	10169310	-6343897	-1.7E+07	-162.383
12750140	22254626	9504485.97	74.54417	8355170	-1E+07	-1.8E+07	-220.174
12425160	19447422	7022261.62	56.51647	6720480	-1.4E+07	-2.1E+07	-315.665
14319940	24018183	9698243.05	67.72544	5842190	-1.5E+07	-2.1E+07	-355.313
9346290	12529704	3183414.45	34.06073	4674120	-1.8E+07	-2.3E+07	-486.565
50211878	1.04E+08	53443351	106.4357	10697490	-4731887	-1.5E+07	-144.234

24490574	50186027	25695452.5	104.9198	6832940	-1.2E+07	-1.9E+07	-276.058
28335322	53933055	25597732.9	90.3386	7761420	-1.2E+07	-2E+07	-259.737
31721546	63861282	32139735.9	101.3183	6851540	-1.4E+07	-2.1E+07	-311.185
23025210	44583859	21558649.3	93.63063	7863130	-9895054	-1.8E+07	-225.841
21569620	42987499	21417879.5	99.29651	7827470	-1.2E+07	-2E+07	-255.889
13567060	30049193	16482133	121.4864	8443670	-1.1E+07	-1.9E+07	-225.866
21772920	42983784	21210863.5	97.41855	8741400	-1E+07	-1.9E+07	-218.641
23916690	47943809	24027119.4	100.4617	13058390	-3298968	-1.6E+07	-125.263
20671480	50220068	29548587.9	142.9437	11674730	-6224384	-1.8E+07	-153.315
13666860	39547041	25880181.3	189.3645	10798230	-7498042	-1.8E+07	-169.438
17583370	44742133	27158762.8	154.4571	12880630	-5051572	-1.8E+07	-139.218
13092800	32354768	19261967.8	147.1188	9695700	-8845552	-1.9E+07	-191.232
10494960	28117263	17622302.8	167.9121	8293490	-1E+07	-1.9E+07	-223.533
8081930	21931408	13849477.7	171.3635	7664470	-1E+07	-1.8E+07	-231.553
9290740	21688515	12397774.9	133.4423	7145020	-1.2E+07	-1.9E+07	-262.834
8289110	21756608	13467497.9	162.4722	7471600	-1.2E+07	-1.9E+07	-257.469
9825840	25403424	15577584.4	158.5369	7777660	-1.2E+07	-2E+07	-253.056
11018620	24970075	13951455	126.6171	9759310	-7905110	-1.8E+07	-181.001
10187040	22448314	12261273.7	120.3615	9917180	-8028774	-1.8E+07	-180.958
8730940	20906314	12175374.4	139.4509	14218810	-2305606	-1.7E+07	-116.215
9480010	20162396	10682386.1	112.6833	13651560	-4360069	-1.8E+07	-131.938
9630280	19134747	9504467.28	98.69357	14631070	-2309073	-1.7E+07	-115.782
6814130	14023141	7209010.71	105.795	11279940	-1E+07	-2.1E+07	-188.881
13074410	30087598	17013187.7	130.1259	40833246	56518208	15684962	38.41223
9285220	19945831	10660611	114.8127	24251329	10123444	-1.4E+07	-58.2561
8512180	18343711	9831530.79	115.4996	20403503	7497788	-1.3E+07	-63.2524
7973570	17757818	9784247.77	122.7085	29285994	29805275	519280.6	1.773136
9326320	20356719	11030398.8	118.2717	20437178	7438831	-1.3E+07	-63.6015
10095760	21774632	11678871.7	115.681	20629310	8580752	-1.2E+07	-58.405
9440170	20825103	11384933.4	120.6009	15078150	-3010641	-1.8E+07	-119.967
9814190	18706260	8892070.44	90.60422	12608770	-5804634	-1.8E+07	-146.036
10984100	22030185	11046084.5	100.5643	11414290	-8791397	-2E+07	-177.021
9757600	18476619	8719019.21	89.35619	12828450	-1E+07	-2.3E+07	-179.114
8720370	16806408	8086038.16	92.72586	9283690	-1.4E+07	-2.3E+07	-249.469
8022770	17519235	9496465.21	118.3689	13865840	-7737458	-2.2E+07	-155.802

8000370	17148225	9147855.36	114.3429	13223440	-5111483	-1.8E+07	-138.655
9281520	19836668	10555147.5	113.7222	7639940	-1.2E+07	-2E+07	-258.716
9989220	20671039	10681818.5	106.9335	13430830	-5698846	-1.9E+07	-142.431
9120760	20176127	11055367.3	121.211	11181210	-7331595	-1.9E+07	-165.571
8954240	20425619	11471379.4	128.1111	10261770	-1E+07	-2E+07	-198.962
9909310	22953438	13044128.3	131.6351	8375300	-1.3E+07	-2.1E+07	-256.585
12449630	28944358	16494727.8	132.4917	9665520	-1.1E+07	-2E+07	-210.242
11726670	26531380	14804709.9	126.2482	7551050	-1.4E+07	-2.1E+07	-282.595
13896890	31105665	17208775.5	123.8318	7337470	-1.4E+07	-2.1E+07	-290.177
12924610	28655470	15730859.9	121.7125	10457360	-1.2E+07	-2.3E+07	-217.337
15833720	32270324	16436603.9	103.8076	14145390	-5685763	-2E+07	-140.195
9605760	20025373	10419613.4	108.4726	15847570	-5848041	-2.2E+07	-136.902
50741055	1.03E+08	51963491.9	102.4092	22939230	8559929	-1.4E+07	-62.6843
25178854	48272385	23093530.7	91.71796	10651960	-1.1E+07	-2.2E+07	-203.238
21559191	40534931	18975739.9	88.01694	7688130	-1.4E+07	-2.1E+07	-276
18860589	39296916	20436327.3	108.3547	11609810	-8980058	-2.1E+07	-177.349
16697590	33579177	16881587.1	101.1019	14153510	-5709812	-2E+07	-140.342
15723091	28625434	12902342.7	82.05984	8164340	-1.2E+07	-2E+07	-249.597
14625170	27861666	13236496.4	90.50491	7764770	-1.3E+07	-2E+07	-262.355
15590840	30156466	14565626.4	93.42426	7103550	-1.3E+07	-2E+07	-285.973
16219680	33922880	17703200.4	109.1464	9354450	-9865040	-1.9E+07	-205.458
10867600	26479588	15611987.7	143.6563	10204380	-7973860	-1.8E+07	-178.142
8767550	21812750	13045200.5	148.7896	6965820	-1.2E+07	-1.9E+07	-271.838
8900610	20952619	12052009.5	135.4066	7656820	-1.1E+07	-1.9E+07	-242.145
8795580	19448709	10653129.3	121.1191	9035560	-8548172	-1.8E+07	-194.606
8683530	18492526	9808996.22	112.9609	8297900	-1E+07	-1.9E+07	-225.384
7931610	17653564	9721954.42	122.5723	9301190	-8880322	-1.8E+07	-195.475
8439800	18832570	10392770.3	123.14	8766210	-1E+07	-1.9E+07	-217.454
7571740	17405207	9833467.48	129.8706	7264530	-1.1E+07	-1.9E+07	-257.985
8174780	17346951	9172170.58	112.2008	9157200	-8329605	-1.7E+07	-190.962
7492500	15224703	7732202.92	103.1992	9448810	-6248821	-1.6E+07	-166.133
7372280	16581450	9209169.7	124.9162	9978260	-5452671	-1.5E+07	-154.646
8567290	18902897	10335607.3	120.6403	12252920	109402.4	-1.2E+07	-99.1071
7139000	14054226	6915225.88	96.86547	12530620	818395.6	-1.2E+07	-93.4688
6653800	12240203	5586403.21	83.95809	16136650	7250552	-8886098	-55.0678

6285670	11737997	5452327.08	86.74218	10987740	-2369702	-1.3E+07	-121.567
11657400	22705483	11048082.7	94.77313	41789180	70673463	28884283	69.11905
8352310	14399599	6047289.47	72.4026	21754059	20393254	-1360805	-6.25541
9347790	15577709	6229918.71	66.6459	18971592	15849381	-3122211	-16.4573
12902000	20563031	7661030.89	59.37863	24766412	22626091	-2140321	-8.64203
10258490	16147103	5888613.07	57.40234	20742130	19751331	-990799	-4.77674
9302060	13491963	4189902.6	45.04274	17376507	15408680	-1967827	-11.3246
8127130	11585233	3458102.77	42.55011	15432790	12759355	-2673435	-17.3231
7664390	11817845	4153455.31	54.1916	18450510	16278226	-2172284	-11.7736
9570750	14198666	4627916.12	48.35479	19134130	19756198	622067.9	3.25109
8756440	13659902	4903461.56	55.99835	12352840	15357348	3004508	24.32241
7671090	11942268	4271177.88	55.67889	9561570	9646506	84936.21	0.888308
7295590	11169771	3874180.85	53.10305	10006650	7215100	-2791550	-27.8969
9952790	15438679	5485889.48	55.11911	8535550	14107167	5571617	65.27543
12364890	20618149	8253259.37	66.74754	8109730	14098101	5988371	73.84181
7738850	11963813	4224962.53	54.59419	8376710	14726418	6349708	75.80194
9279680	15090912	5811232.36	62.6232	9266910	15003827	5736917	61.90755
10166130	16008081	5841951.3	57.46485	10330580	18321628	7991048	77.35334
11647090	19585732	7938642.03	68.15988	6965620	16082695	9117075	130.8868
11547350	23136542	11589192.3	100.3624	7707580	18551402	10843822	140.6904
12079440	22584841	10505400.9	86.96927	9838010	24053781	14215771	144.4984
16967290	32824697	15857406.8	93.45869	10196700	25340073	15143373	148.5125
16163170	33387668	17224497.8	106.5663	5836970	17828257	11991287	205.4368
16741930	33805625	17063694.6	101.9219	4930700	16439450	11508750	233.4101
10984450	21521810	10537359.6	95.92979	3553470	14550162	10996692	309.4635
45205310	1.1E+08	64344772.9	142.339	11968470	36706676	24738206	206.6948
24764877	63292918	38528041	155.5753	7916870	26694981	18778111	237.1911
27779352	86453596	58674243.9	211.2153	7799490	30730847	22931357	294.011
19381888	58106706	38724817.6	199.799	9237680	37620585	28382905	307.2514
16991746	48964351	31972604.5	188.1655	7735090	34891656	27156566	351.0827
16203047	40463859	24260812.3	149.7299	7626370	40273425	32647055	428.0812
16629820	41436084	24806264.4	149.1674	8894490	36818180	27923690	313.9437
16497720	33097668	16599948.2	100.6197	8207790	33771478	25563688	311.4564
14363840	30905878	16542038.4	115.1645	8411120	34229562	25818442	306.9561
13056680	28438029	15381349.4	117.8044	6909830	31495178	24585348	355.8025

9840380	23972211	14131831.2	143.6106	5957960	31022664	25064704	420.6927
12324360	26158332	13833972.4	112.249	6626050	36267632	29641582	447.3492
9963240	20612201	10648960.8	106.8825	6894590	38042167	31147577	451.7684
7960380	19845142	11884762.1	149.2989	7265430	38550596	31285166	430.6031
10420890	19699424	9278533.74	89.03782	7632080	39801606	32169526	421.5041
8629760	18815097	10185336.8	118.0257	8685870	44091874	35406004	407.6276
8882080	18141285	9259204.78	104.2459	10626170	46994606	36368436	342.2535
8431080	16181038	7749957.53	91.92129	6684530	40720827	34036297	509.1801
7410550	15862239	8451689.03	114.0494	7474350	41578706	34104356	456.2852
6887210	14158120	7270910.34	105.5712	9912210	52334892	42422682	427.9841
6351180	12558290	6207109.57	97.7316	10054470	53733472	43679002	434.4237
6081450	11479683	5398233.33	88.76556	12279160	58174515	45895355	373.7662
5582450	9540975	3958525.16	70.91018	18463040	68731426	50268386	272.2649
4498580	5251491	752910.923	16.73664	11713690	52555076	40841386	348.6637
11660670	20082324	8421654.23	72.22273	50628831	1.43E+08	92533249	182.7679
6260090	10546838	4286748.04	68.47742	30463973	87086378	56622405	185.8668
7991000	11448266	3457265.58	43.26449	27794606	77638355	49843749	179.3289
7041180	12126862	5085681.9	72.22769	23260601	70728106	47467505	204.0683
6976730	10797373	3820642.6	54.76266	22078679	65076820	42998141	194.7496
6779840	10504492	3724652.01	54.93717	21917250	65081772	43164522	196.9431
7407530	11538171	4130640.69	55.76273	18439840	63464622	45024782	244.1712
7168730	11220470	4051740.02	56.51963	22808210	72841018	50032808	219.3631
8004400	13226092	5221692.31	65.23527	17587150	61596540	44009390	250.2361
7351640	11842526	4490885.84	61.08686	15202690	59904434	44701744	294.0384
7556020	12996690	5440669.7	72.00444	15707120	57770809	42063689	267.8001
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8787410	14623975	5836564.56	66.41962	9263430	47009608	37746178	407.4752
8883370	16193369	7309999.44	82.28858	10202470	47827792	37625322	368.7864
9212470	16184108	6971638.23	75.6761	10378340	44688163	34309823	330.5907
8544280	16197196	7652915.8	89.56771	7694130	41522763	33828633	439.6681
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7079610	13123442	6043831.55	85.36955	8377300	38564243	30186943	360.3422
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10417160	20235954	9818794.12	94.25596	7736750	32438304	24701554	319.2756
12326830	22513751	10186920.9	82.64023	7299860	29617950	22318090	305.7331
8256090	13154784	4898694.02	59.33431	6430630	25926933	19496303	303.1787
28277695	65948521	37670826.4	133.2175	12476690	40823801	28347111	227.2006
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16814282	38964143	22149861.4	131.7324	10719390	29520083	18800693	175.3896
16717476	40062029	23344553.4	139.6416	9991550	30362691	20371141	203.8837
16992368	39302432	22310063.6	131.2946	9482650	25923103	16440453	173.374
13874438	28733129	14858691.1	107.094	9762570	23392881	13630311	139.6181
15058830	35306343	20247512.7	134.4561	8634680	20207259	11572579	134.0244
12264185	34211791	21947606.5	178.9569	10105670	21684115	11578445	114.5738
13126270	29694598	16568328.3	126.2227	10906290	21151623	10245333	93.93967
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7531680	23576468	16044787.9	213.0307	9550200	16162262	6612062	69.2348
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6557970	22977493	16419523.2	250.3751	10287880	15134076	4846196	47.10587
6756770	22413232	15656462.2	231.7152	9861030	16654207	6793177	68.88912
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6599640	18654948	12055308.3	182.6661	13005840	19608227	6602387	50.76479
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4711110	13654304	8943194.16	189.832	9473990	12169714	2695724	28.45395
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7525280	20759271	13233990.5	175.8604	20472720	29221535	8748815	42.73401
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8223660	21281486	13057825.5	158.7836	23342460	34218992	10876532	46.59548
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9668770	28458476	18789705.6	194.334	4255070	2482328	-1772742	-41.6619
41469378	1.16E+08	74391023.7	179.3878	12905660	22368885	9463225	73.32616
22216084	60115757	37899673	170.5957	11357070	16619579	5262509	46.33686
25353265	60927666	35574400.9	140.3149	10801820	19904665	9102845	84.2714
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19575441	50047176	30471735.3	155.6631	8372910	15132972	6760062	80.73731
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15425200	37166441	21741240.6	140.9462	10124580	18571896	8447316	83.43374
13414920	33317504	19902583.8	148.3616	10888520	19499701	8611181	79.08496
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11886900	31632837	19745937.5	166.1151	15013080	30030764	15017684	100.0307
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10210940	27260947	17050006.8	166.9778	11047700	21211772	10164072	92.00171
8021810	23596830	15575019.7	194.1584	7974880	16595065	8620185	108.0917
8686070	28213801	19527731.2	224.8166	7397550	16357211	8959661	121.1166
8322720	25183065	16860345.4	202.5822	7912950	16959440	9046490	114.3251
8560970	24857499	16296529.3	190.3584	9332360	20006634	10674274	114.3791
7958920	23431857	15472937	194.41	10711470	23498842	12787372	119.3802
7106190	19719228	12613037.7	177.4937	10867800	25648908	14781108	136.0083
8920460	21951643	13031182.9	146.082	15398630	34500430	19101800	124.0487

10037420	23447957	13410537.3	133.6054	12941470	30214669	17273199	133.4717
6538200	17244462	10706261.6	163.7494	17196360	38352796	21156436	123.0286
7723220	19570305	11847085	153.3957	21314210	46949369	25635159	120.2726
7701290	20662503	12961213	168.2992	27637870	57493531	29855661	108.0245
5558000	17234429	11676428.9	210.0833	13633660	37146448	23512788	172.4613
14426460	30568642	16142182.1	111.8929	51418353	1.1E+08	58541669	113.8536
10362600	23501833	13139233.1	126.7948	28410617	58425681	30015064	105.6473
9907670	23179499	13271828.7	133.9551	20727247	49683844	28956597	139.7031
13270080	29263586	15993506.2	120.5231	21604489	54532522	32928033	152.4129
9700750	24546632	14845881.6	153.0385	20709144	50753364	30044220	145.0771
9215370	21009639	11794268.6	127.9848	18210030	48244384	30034354	164.933
8747290	20757043	12009753.2	137.2968	16578250	46459419	29881169	180.2432
10142560	22316102	12173542.3	120.0244	15782160	45635137	29852977	189.1565
11062820	25622190	14559370	131.6063	13958680	38072734	24114054	172.7531
10742020	23598880	12856859.9	119.6875	13029180	34832245	21803065	167.3403
11626730	27131664	15504934	133.3559	8970320	25048934	16078614	179.2424
17356520	32196118	14839597.7	85.49869	8601670	25841739	17240069	200.427
23215490	42001727	18786236.7	80.92113	10295470	28472753	18177283	176.5561
12265690	23797733	11532042.8	94.0187	10243650	26402477	16158827	157.7448
9542280	18832389	9290108.8	97.35733	8142900	20757285	12614385	154.9127
9088830	17034026	7945196.33	87.41715	7707590	17887324	10179734	132.0741
9084770	17017255	7932484.74	87.3163	8185220	17148339	8963119	109.5037
11615360	22551943	10936583.4	94.15622	7059300	17509919	10450619	148.0404
11411810	22086315	10674504.5	93.5391	5929370	15958750	10029380	169.1475
10418170	19504107	9085936.78	87.21241	6520950	15009075	8488125	130.167
11603510	21062690	9459179.74	81.51999	5543910	15332070	9788160	176.557
13684040	24455671	10771630.8	78.71674	5754420	14748784	8994364	156.3036
15401140	26634857	11233717.4	72.94082	6479160	16272506	9793346	151.1515
11213150	17885650	6672500.01	59.50603	5894950	15391545	9496595	161.0971
56299684	97373972	41074288.3	72.95652	12570270	31537984	18967714	150.8934
27715708	51383847	23668138.6	85.39612	7805370	21281700	13476330	172.6546
22646770	43965258	21318487.9	94.13478	9538360	26452512	16914152	177.3277
18089198	37818567	19729368.6	109.0671	7315260	22594627	15279367	208.8698
22163960	43777977	21614017.5	97.51875	10885670	30991935	20106265	184.704
15997180	34739509	18742328.9	117.1602	8450300	24434104	15983804	189.1507

14234790	30698160	16463370.4	115.6559	10223250	21119424	10896174	106.5823
12281300	22033329	9752029.31	79.40551	17433300	29061629	11628329	66.70182
11226530	22511300	11284769.8	100.5188	11701440	18683591	6982151	59.66916
13793190	26784449	12991258.9	94.18604	8271100	12473862	4202762	50.81261
12032130	25283153	13251023.1	110.1303	7831770	11810814	3979044	50.80645
16495550	30305655	13810104.8	83.72018	6100820	9189190	3088370	50.6222
13556700	22972471	9415771.13	69.45474	13825950	17756263	3930313	28.42707
13315000	19974545	6659545.42	50.01536	12034010	13716588	1682578	13.98185
10865960	16690921	5824960.77	53.60742	7814400	6669616	-1144784	-14.6497
10430930	14651839	4220908.94	40.46532	10519970	10193142	-326828	-3.10674
9188960	13177416	3988456.06	43.40487	9561780	7930388	-1631392	-17.0616
11057870	12717093	1659222.92	15.00491	8425620	5889324	-2536296	-30.1022
10603060	11572429	969369.201	9.142353	9614770	8203488	-1411282	-14.6783
7802900	10814844	3011944.06	38.60032	9053910	8875496	-178414	-1.97058
11265280	14599168	3333887.76	29.59436	10594980	10660681	65701.39	0.620118
8019480	11009363	2989882.51	37.28275	12305120	13888647	1583527	12.86885
7788700	10259010	2470309.87	31.71659	15852480	16825154	972674.5	6.135787
5463200	6776542	1313342.42	24.0398	12565690	8486458	-4079232	-32.4633
10721240	18646552	7925311.75	73.9216	40824396	81252161	40427765	99.02845
12321940	20600409	8278469.48	67.18479	20943427	35629782	14686355	70.12394
12769850	22348128	9578278.36	75.00698	21050594	34236212	13185618	62.63775
11936460	21378359	9441898.93	79.10133	19435841	35583844	16148003	83.08364
8425530	16747299	8321769.15	98.76849	20325097	28748578	8423481	41.44374
11647280	23448763	11801482.6	101.3239	19952425	35016013	15063588	75.49753
10113740	21942645	11828904.8	116.9588	16760640	27302885	10542245	62.89882
11744480	23945833	12201352.9	103.8901	20530360	37472873	16942513	82.52419
11185080	23108205	11923124.7	106.5985	17199760	33481783	16282023	94.66425
12378870	25601498	13222627.8	106.8161	12857110	26081632	13224522	102.8577
7125380	16868317	9742937.07	136.7357	15963620	30301214	14337594	89.81417
7057660	16942359	9884698.86	140.0563	19219930	42928200	23708270	123.3525
7110840	18504379	11393539.2	160.2278	21953960	55683773	33729813	153.6389
7859120	18482779	10623658.7	135.1762	15754880	48629424	32874544	208.6626
6635030	15593627	8958597.44	135.0197	11279490	36228263	24948773	221.1871
9595410	21282510	11687100	121.7989	10348490	34985292	24636802	238.0715
8241370	18311613	10070243.1	122.1914	9244520	31098872	21854352	236.4033

14333900	27256600	12922699.9	90.15481	10603860	32351103	21747243	205.088
11052030	23048608	11996578.2	108.5464	9710230	32015841	22305611	229.7125
9063200	19556860	10493660	115.7832	7012950	28396400	21383450	304.9138
15930660	30561107	14630447.2	91.8383	5972430	24472708	18500278	309.7613
13496090	29195043	15698953.4	116.3222	7405540	28136082	20730542	279.9329
16788710	34875194	18086484.3	107.73	9744750	37985476	28240726	289.8045
11651340	22805939	11154598.9	95.73662	5409090	29986591	24577501	454.374
46672755	1.02E+08	55739489.8	119.4262	16134820	62119798	45984978	285.0046
20364514	53365835	33001321.5	162.0531	10335330	49885676	39550346	382.6713
19305894	42670466	23364571.7	121.023	10933380	46911406	35978026	329.0659
16055036	34280910	18225874.4	113.5212	8408040	42880906	34472866	409.9988
14675382	33157667	18482285.4	125.9407	7995540	45308603	37313063	466.6735
16233563	35135119	18901556.5	116.435	12017410	55359143	43341733	360.6579
20499086	45229800	24730714.1	120.643	10000350	50616594	40616244	406.1482
20540520	38477291	17936770.6	87.32384	12711710	55423635	42711925	336.0046
13283630	26298067	13014437.4	97.9735	11228150	52964427	41736277	371.7111
14437240	27952462	13515222.4	93.61362	8897970	46312466	37414496	420.4835
9594000	15982589	6388589.35	66.58942	8519420	45041848	36522428	428.6962
10452490	17120388	6667898.2	63.79244	7889800	45443586	37553786	475.9789
8698240	12715545	4017305.41	46.18527	8510180	49759800	41249620	484.7091
9956920	13602639	3645719.25	36.61493	8029700	48227276	40197576	500.6112
10386460	15115845	4729384.89	45.53414	9005840	56652855	47647015	529.068
10875830	16691366	5815536.16	53.47211	10760950	61168777	50407827	468.4329
8538610	11475673	2937063.42	34.39744	10185550	58883023	48697473	478.1035
8151100	11441223	3290123.38	40.36416	10636800	60905447	50268647	472.5918
7896230	10499203	2602972.68	32.96475	11846260	65058063	53211803	449.1865
7062160	9173431	2111270.62	29.89554	13105030	71608920	58503890	446.4232
7171020	7946751	775731.082	10.81758	14498220	75715014	61216794	422.2366
6137790	6265924	128134.398	2.087631	17904860	76379503	58474643	326.5853
6913040	8291543	1378503.13	19.94062	22725890	91660400	68934510	303.3303
5385940	5864841	478900.766	8.891684	12656360	72265607	59609247	470.9825
10301230	19255541	8954310.54	86.92467	43099625	1.44E+08	1.01E+08	233.3456
8532200	12067869	3535668.87	41.43912	21903580	85399636	63496056	289.8889
8779100	11653467	2874366.51	32.74102	19301382	84505089	65203707	337.8189
10004670	12272528	2267857.6	22.66799	19917294	93903179	73985885	371.4655

9133020	13846886	4713865.83	51.61344	15118169	89370975	74252806	491.1495
9169620	11300668	2131048.1	23.24031	14696181	97804941	83108760	565.5126
11980500	12738154	757653.587	6.324056	17429959	1.02E+08	84793743	486.4827
11601530	15146726	3545195.52	30.558	16943010	1.09E+08	91608302	540.6849
10253600	12621251	2367651.22	23.09093	11766810	1.02E+08	89951815	764.4537
9924290	13408042	3483752.39	35.10329	13304990	1.16E+08	1.03E+08	773.6784
7938880	9642042	1703162.35	21.45343	11713060	1.09E+08	97772370	834.7295
9348100	12240237	2892136.89	30.93823	11406260	99501728	88095468	772.3432
11628640	16675444	5046804.5	43.39978	11187480	99743022	88555542	791.5593
11947520	17549692	5602172.04	46.88983	12336660	1.13E+08	1E+08	812.5561
10543830	18196914	7653083.69	72.58353	9181810	1.04E+08	94771147	1032.162
7541560	12566078	5024518.07	66.62439	9274900	98334940	89060040	960.2264
8043770	13677186	5633415.97	70.03452	9114150	93792797	84678647	929.0899
8843010	14659595	5816584.54	65.77607	9728100	92092565	82364465	846.6655
9579580	14755924	5176344.03	54.03519	10086440	96939645	86853205	861.0888
11043640	18957457	7913817.48	71.6595	8424380	94980906	86556526	1027.453
10758500	20068951	9310451.27	86.54042	12590560	96188377	83597817	663.9722
13613880	26005653	12391773.5	91.02308	8573770	92622755	84048985	980.3037
15352730	29378658	14025927.7	91.35787	7666520	93402772	85736252	1118.32
11328170	21197666	9869495.58	87.12348	4844510	87833984	82989474	1713.062
53808675	1.09E+08	55592166.4	103.3145	10378280	1.06E+08	95313918	918.398
29840860	50632855	20791995.2	69.67626	6133300	96941950	90808650	1480.584
27987554	43728858	15741303.5	56.24394	6449210	1E+08	93765868	1453.912
29784291	44939103	15154812.5	50.8819	6244810	1.03E+08	96342355	1542.759
22433560	28689364	6255803.55	27.88592	6632970	1.05E+08	98006105	1477.56
27624900	31400682	3775781.72	13.66804	6368130	1.04E+08	98122116	1540.831
20684390	22538693	1854302.77	8.964745	7848990	1.1E+08	1.02E+08	1302.241
22571350	20008047	-2563303.2	-11.3564	8758490	1.13E+08	1.04E+08	1190.357
13645860	11926829	-1719031.1	-12.5975	9670470	1.21E+08	1.12E+08	1154.901
15707760	14343006	-1364753.6	-8.6884	9671520	1.28E+08	1.18E+08	1224.676
18639010	14396873	-4242137.1	-22.7595	7015300	1.31E+08	1.24E+08	1761.836
16765480	15377406	-1388073.7	-8.27936	7390180	1.32E+08	1.24E+08	1683.603
15650210	14739282	-910927.68	-5.82055	8079460	1.4E+08	1.32E+08	1630.881
15157050	13038546	-2118504	-13.977	10909500	1.51E+08	1.41E+08	1288.183
13669640	6223215	-7446424.9	-54.4742	10468130	1.59E+08	1.48E+08	1416.876

11752300	2434844	-9317455.6	-79.282	7421220	1.55E+08	1.48E+08	1994.549
11424510	2612451	-8812058.9	-77.1329	6960770	1.56E+08	1.49E+08	2137.009
12459530	4475998	-7983531.7	-64.0757	8956680	1.64E+08	1.55E+08	1731.864
13915430	4676574	-9238855.8	-66.3929	12863850	1.8E+08	1.67E+08	1299.104
18849360	11183686	-7665674.3	-40.6681	14261440	1.95E+08	1.81E+08	1268.758
15584500	4004653	-11579847	-74.3036	17410100	2.09E+08	1.92E+08	1101.611
10246080	-1418304	-11664384	-113.842	16963480	2.15E+08	1.98E+08	1170.06
9858410	-4580215	-14438625	-146.46	22079060	2.29E+08	2.07E+08	938.1369
6994200	-7789968	-14784168	-211.378	15251620	2.2E+08	2.05E+08	1341.446

附录 D 问题三数据与代码

表 15 对收盘价的 OLS 估计指标选取

收盘价	Coef.	Std. Err.	t	P>t	Beta
成交额	-5.15E-11	4.25E-11	-1.21	0.226	-0.00076
成交量	2.46E-09	8.75E-10	2.81	0.005	0.001541
最低价	0.8319439	0.009437	88.16	0	0.829865
最高价	0.8722805	0.009142	95.42	0	0.873982
开盘价	-0.7043738	0.009219	-76.41	0	-0.70415
_cons	0.1353083	0.32274	0.42	0.675	.

表 16 收盘价的 BP 神经网络预测值和误差分析

实际值	预测值	相对误差	绝对误差	实际值	预测值	相对误差	绝对误差
1575.84	1578.439	2.599257	0.164944	1477.65	1476.214	-1.43585	-0.09717
1572.62	1574.583	1.962569	0.124796	1475.83	1476.055	0.224861	0.015236
1570.88	1572.962	2.081535	0.132508	1476.49	1475.214	-1.27607	-0.08643
1566.62	1567.952	1.331947	0.08502	1476.47	1475.001	-1.46904	-0.0995
1565.71	1565.352	-0.35777	-0.02285	1476.87	1475.535	-1.3353	-0.09041
1562.21	1562.379	0.168843	0.010808	1477.47	1477.065	-0.40459	-0.02738
1557.36	1558.541	1.181351	0.075856	1478.14	1477.267	-0.87255	-0.05903
1553.42	1553.615	0.194917	0.012548	1478.53	1477.206	-1.32412	-0.08956
1548.91	1549.083	0.173382	0.011194	1480.21	1478.532	-1.67763	-0.11334

1549.36	1551.62	2.260401	0.145893	1479.08	1478.073	-1.00705	-0.06809
1552.61	1551.536	-1.07376	-0.06916	1480.07	1478.744	-1.32604	-0.08959
1550.43	1552.566	2.135791	0.137755	1479.82	1478.853	-0.96683	-0.06533
1548.79	1549.58	0.79029	0.051026	1479.67	1478.001	-1.66905	-0.1128
1549.12	1550.556	1.436247	0.092714	1479.1	1478.059	-1.04121	-0.0704
1549.73	1550.63	0.900484	0.058106	1478.04	1476.395	-1.64467	-0.11127
1550.75	1550.738	-0.01174	-0.00076	1475.77	1474.822	-0.94833	-0.06426
1549.6	1550.188	0.587882	0.037938	1475.69	1474.088	-1.60214	-0.10857
1551.09	1551.445	0.354776	0.022873	1477.91	1476.316	-1.59441	-0.10788
1548.98	1549.402	0.422102	0.02725	1478.03	1476.957	-1.07314	-0.07261
1546.62	1546.871	0.250687	0.016209	1478.73	1477.644	-1.08641	-0.07347
1547.94	1548.348	0.407784	0.026344	1479.23	1478.026	-1.2042	-0.08141
1549.57	1549.574	0.003788	0.000244	1479.34	1477.91	-1.43026	-0.09668
1552.6	1553.097	0.496588	0.031984	1478.87	1476.981	-1.88944	-0.12776
1555.06	1555.163	0.103004	0.006624	1478.33	1477.114	-1.2159	-0.08225
1551.92	1552.399	0.47856	0.030837	1483.22	1475.614	-7.60641	-0.51283
1554.73	1555.068	0.338059	0.021744	1493.54	1491.705	-1.83521	-0.12288
1555.46	1556.288	0.827808	0.05322	1500.05	1498.175	-1.87491	-0.12499
1557.31	1557.205	-0.10478	-0.00673	1499.17	1497.546	-1.62424	-0.10834
1557.43	1559.153	1.723318	0.110651	1499.38	1498.007	-1.37276	-0.09156
1557.93	1558.276	0.346419	0.022236	1503.56	1503.964	0.404309	0.02689
1559.37	1560.063	0.692549	0.044412	1505.59	1505.134	-0.45558	-0.03026
1558.46	1558.55	0.089669	0.005754	1506.94	1506.355	-0.58472	-0.0388
1560.58	1561.071	0.490841	0.031452	1508.27	1507.782	-0.4881	-0.03236
1559.88	1560.184	0.304145	0.019498	1511.18	1510.066	-1.11447	-0.07375
1558.97	1559.291	0.320963	0.020588	1515.93	1515.83	-0.09976	-0.00658
1560.09	1560.15	0.059776	0.003832	1515.34	1514.325	-1.01471	-0.06696
1558.23	1558.759	0.528572	0.033921	1514.05	1513.684	-0.3665	-0.02421
1557.28	1557.472	0.191547	0.0123	1511.8	1511.294	-0.50614	-0.03348
1556.13	1556.648	0.51772	0.03327	1509.06	1508.617	-0.44267	-0.02933
1555.64	1556.047	0.406798	0.02615	1504.43	1504.174	-0.25645	-0.01705
1554.66	1555.21	0.550197	0.03539	1503.76	1502.437	-1.32328	-0.088
1555.78	1555.984	0.20372	0.013094	1504.7	1504.695	-0.00509	-0.00034
1555.72	1556.912	1.191879	0.076613	1503.07	1503.256	0.186315	0.012396
1556.04	1556.914	0.873731	0.056151	1503.74	1503.133	-0.6074	-0.04039

1554.88	1555.423	0.54279	0.034909	1503.83	1502.625	-1.20504	-0.08013
1556.25	1556.283	0.033079	0.002126	1503.06	1501.541	-1.51882	-0.10105
1556.82	1556.564	-0.25558	-0.01642	1501.63	1500.492	-1.13782	-0.07577
1556.85	1556.967	0.116898	0.007509	1501.97	1501.813	-0.15747	-0.01048
1544.06	1548.946	4.886274	0.316456	1501.06	1499.02	-2.04	-0.1359
1543.43	1542.815	-0.61547	-0.03988	1500.26	1498.927	-1.33283	-0.08884
1543.73	1545.479	1.749205	0.11331	1499.32	1498.918	-0.40173	-0.02679
1540.43	1540.76	0.330398	0.021448	1499.57	1498.235	-1.33463	-0.089
1529.88	1532.265	2.384956	0.155892	1500.67	1500.029	-0.64072	-0.0427
1528.49	1526.426	-2.06429	-0.13505	1497.77	1497.442	-0.32845	-0.02193
1526.87	1526.55	-0.32001	-0.02096	1497.8	1495.696	-2.10361	-0.14045
1527.02	1525.333	-1.68657	-0.11045	1497.75	1497.324	-0.42558	-0.02841
1527.18	1528.12	0.939658	0.061529	1497.47	1496.786	-0.684	-0.04568
1525.2	1526.373	1.172889	0.076901	1498.62	1496.98	-1.6401	-0.10944
1524.92	1525.356	0.436018	0.028593	1497.51	1496.874	-0.63559	-0.04244
1521.3	1522.303	1.002755	0.065914	1496.57	1495.45	-1.12018	-0.07485
1522.67	1525.352	2.681899	0.176131	1494.88	1494.087	-0.79344	-0.05308
1521.36	1521.847	0.486667	0.031989	1496.56	1495.871	-0.68878	-0.04602
1523.13	1523.383	0.252903	0.016604	1496.19	1494.9	-1.28999	-0.08622
1521.27	1521.569	0.298858	0.019645	1496.71	1495.179	-1.53129	-0.10231
1523.68	1524.537	0.856957	0.056243	1495.98	1495.239	-0.74071	-0.04951
1522.81	1523.674	0.864392	0.056763	1497.88	1496.773	-1.10709	-0.07391
1521.42	1521.651	0.231072	0.015188	1498.01	1496.986	-1.02395	-0.06835
1517.35	1518.354	1.003924	0.066163	1497.7	1496.556	-1.14432	-0.07641
1516.85	1517.006	0.156151	0.010294	1498.86	1498.142	-0.71849	-0.04794
1514.49	1515.04	0.550073	0.036321	1497.98	1497.338	-0.64196	-0.04286
1513.96	1514.59	0.630276	0.041631	1498.84	1497.741	-1.0991	-0.07333
1511.81	1512.403	0.592508	0.039192	1498.09	1497.301	-0.78888	-0.05266
1508.94	1509.814	0.874496	0.057954	1500.08	1498.532	-1.54841	-0.10322
1505.87	1506.486	0.615915	0.040901	1501.53	1497.624	-3.90572	-0.26012
1506.56	1508.061	1.500663	0.099609	1495.32	1497.714	2.394252	0.160116
1506.6	1507.919	1.319263	0.087566	1487.71	1488.749	1.039429	0.069868
1503.82	1503.02	-0.80017	-0.05321	1484.5	1484.017	-0.48322	-0.03255
1502.65	1502.323	-0.32743	-0.02179	1489.34	1488.936	-0.404	-0.02713
1500.38	1501.235	0.855483	0.057018	1492.95	1489.754	-3.19626	-0.21409

1502.56	1502.305	-0.25468	-0.01695	1494.1	1493.366	-0.73387	-0.04912
1501.76	1502.645	0.884769	0.058915	1493.93	1493.005	-0.92529	-0.06194
1501.7	1499.964	-1.73645	-0.11563	1492.11	1491.596	-0.51431	-0.03447
1500.04	1499.933	-0.10708	-0.00714	1494.47	1492.312	-2.15766	-0.14438
1499.34	1498.662	-0.6785	-0.04525	1494.13	1492.665	-1.46465	-0.09803
1501.83	1501.165	-0.66537	-0.0443	1491.58	1491.271	-0.30929	-0.02074
1506.07	1505.621	-0.44889	-0.02981	1489.26	1488.529	-0.73071	-0.04907
1507.86	1507.038	-0.8217	-0.05449	1487.77	1486.735	-1.03502	-0.06957
1506.58	1506.894	0.314351	0.020865	1485.03	1484.363	-0.6668	-0.0449
1506.68	1505.766	-0.91433	-0.06068	1483	1482.215	-0.785	-0.05293
1506.89	1505.839	-1.05073	-0.06973	1481.68	1481.958	0.278314	0.018784
1507.13	1505.923	-1.20693	-0.08008	1481.03	1480.383	-0.64676	-0.04367
1505.9	1505.604	-0.29642	-0.01968	1481.55	1479.004	-2.54635	-0.17187
1505.86	1505.981	0.121004	0.008036	1484.82	1483.192	-1.62815	-0.10965
1506.47	1506.466	-0.00379	-0.00025	1485.74	1485	-0.7397	-0.04979
1506.8	1506.969	0.169012	0.011217	1486.15	1484.225	-1.92524	-0.12955
1505.94	1505.934	-0.00556	-0.00037	1485.17	1483.864	-1.30559	-0.08791
1496.5	1500.164	3.664345	0.244861	1483.2	1482.47	-0.73036	-0.04924
1493.35	1496.228	2.877671	0.192699	1482	1480.804	-1.19646	-0.08073
1486.27	1487.729	1.45932	0.098187	1483.29	1481.581	-1.7091	-0.11522
1487.37	1484.321	-3.04929	-0.20501	1481.22	1480.318	-0.90157	-0.06087
1485.26	1485.01	-0.25022	-0.01685	1481.76	1481.023	-0.73718	-0.04975
1487.22	1486.024	-1.19606	-0.08042	1481.88	1480.85	-1.03016	-0.06952
1484.13	1484.077	-0.05317	-0.00358	1480.08	1478.809	-1.27074	-0.08586
1479.36	1479.759	0.398893	0.026964	1478.56	1477.838	-0.72248	-0.04886
1474.85	1474.967	0.117352	0.007957	1477.39	1475.566	-1.82361	-0.12343
1474.12	1472.017	-2.10315	-0.14267	1475.57	1474.938	-0.63151	-0.0428
1471.17	1470.89	-0.28011	-0.01904	1477.31	1475.922	-1.38807	-0.09396
1472.85	1469.767	-3.08257	-0.20929	1476.18	1474.236	-1.9435	-0.13166
1478.43	1477.428	-1.00226	-0.06779	1474.13	1472.87	-1.26031	-0.0855
1478.01	1475.545	-2.46469	-0.16676	1476.1	1474.715	-1.38519	-0.09384
1476.67	1475.984	-0.68621	-0.04647	1474.42	1473.147	-1.27291	-0.08633
1478.92	1477.697	-1.22276	-0.08268	1473.97	1471.967	-2.00324	-0.13591
1479.75	1478.432	-1.31845	-0.0891	1475.92	1473.46	-2.46011	-0.16668
1479.75	1479.107	-0.64256	-0.04342	1476.99	1475.636	-1.35421	-0.09169

1484.11	1482.887	-1.22287	-0.0824	1479.21	1478.327	-0.88313	-0.0597
1483.86	1483.826	-0.03358	-0.00226	1480.73	1478.879	-1.85093	-0.125
1484.68	1483.678	-1.00234	-0.06751	1482.04	1479.937	-2.10254	-0.14187
1485.37	1484.609	-0.76052	-0.0512	1483.42	1482.433	-0.98725	-0.06655
1488.55	1487.059	-1.49097	-0.10016	1482.73	1481.225	-1.5046	-0.10147
1488.28	1487.657	-0.62327	-0.04188	1481.81	1480.418	-1.39154	-0.09391
1485.06	1485.256	0.195929	0.013193	1482.27	1474.685	-7.58542	-0.51174
1487.28	1486.209	-1.07068	-0.07199	1486.19	1481.308	-4.88245	-0.32852
1486.83	1486.342	-0.48826	-0.03284	1488.38	1484.037	-4.34265	-0.29177
1489.05	1487.979	-1.07087	-0.07192	1490.77	1492.899	2.12891	0.142806
1492.13	1491.01	-1.12007	-0.07507	1485.07	1484.584	-0.48574	-0.03271
1491.38	1490.749	-0.63053	-0.04228	1482.06	1481.044	-1.01641	-0.06858
1490.48	1489.834	-0.64606	-0.04335	1485.42	1484.633	-0.78682	-0.05297
1488.77	1488.212	-0.55792	-0.03748	1488.19	1486.526	-1.66443	-0.11184
1487.92	1486.911	-1.00866	-0.06779	1486.15	1484.861	-1.28921	-0.08675
1489.18	1488.005	-1.17513	-0.07891	1486.3	1484.123	-2.17735	-0.14649
1487.84	1486.704	-1.13636	-0.07638	1484.08	1483.134	-0.94574	-0.06373
1488.39	1486.956	-1.43387	-0.09634	1480.58	1480.399	-0.18095	-0.01222
1485.98	1485.795	-0.1855	-0.01248	1481.12	1479.623	-1.49699	-0.10107
1485.03	1484.185	-0.84547	-0.05693	1478.38	1477.665	-0.71492	-0.04836
1483.35	1482.273	-1.07674	-0.07259	1474.84	1473.943	-0.89712	-0.06083
1483.25	1482.436	-0.81413	-0.05489	1475.56	1475.573	0.012561	0.000851
1482.31	1481.075	-1.23504	-0.08332	1477.29	1476.792	-0.49785	-0.0337
1480.87	1480.19	-0.68019	-0.04593	1476.17	1474.797	-1.3732	-0.09302
1480.82	1479.459	-1.36052	-0.09188	1476.1	1473.667	-2.43346	-0.16486
1481.44	1479.918	-1.52151	-0.1027	1476.42	1475.904	-0.51564	-0.03492
1481.2	1479.969	-1.23095	-0.08311	1477.8	1475.297	-2.50252	-0.16934
1481.19	1479.799	-1.39088	-0.0939	1482.43	1480.401	-2.02922	-0.13688
1481.21	1479.736	-1.47405	-0.09952	1484.28	1483.654	-0.62623	-0.04219
1480.6	1479.79	-0.81045	-0.05474	1483.47	1483.658	0.188386	0.012699
1489.49	1487.943	-1.54747	-0.10389	1484.13	1483.701	-0.42916	-0.02892
1494.17	1492.853	-1.31684	-0.08813	1481.12	1479.929	-1.19071	-0.08039
1488.62	1488.528	-0.0922	-0.00619	1480.82	1478.948	-1.87157	-0.12639
1489.08	1487.224	-1.8559	-0.12463	1480.09	1478.976	-1.11421	-0.07528
1489.2	1489.467	0.266837	0.017918	1480.12	1479.886	-0.23384	-0.0158

1487.9	1487.758	-0.1423	-0.00956	1479.38	1477.514	-1.86595	-0.12613
1485.29	1485.231	-0.05919	-0.00398	1479.11	1477.551	-1.55904	-0.1054
1480.47	1480.219	-0.25134	-0.01698	1478.86	1477.648	-1.21156	-0.08193
1477.25	1476.681	-0.56934	-0.03854	1478.33	1477.751	-0.57922	-0.03918
1475.56	1474.288	-1.27226	-0.08622	1475.99	1475.076	-0.91439	-0.06195
1478.14	1477.204	-0.93615	-0.06333	1477.42	1475.581	-1.83883	-0.12446
1477.06	1477.745	0.684862	0.046367	1476.27	1475.181	-1.08901	-0.07377
1478.84	1477.207	-1.63294	-0.11042	1476.95	1475.244	-1.70611	-0.11552
1476.85	1476.485	-0.36479	-0.0247	1476.75	1474.285	-2.46546	-0.16695
1475.06	1474.086	-0.97378	-0.06602	1476.86	1475.088	-1.77178	-0.11997
1473.47	1472.886	-0.58423	-0.03965	1479.3	1478.11	-1.19028	-0.08046
1474.09	1472.305	-1.78513	-0.1211	1478.16	1476.844	-1.31578	-0.08901
1474.48	1474.736	0.256138	0.017371	1477.8	1475.896	-1.90425	-0.12886
1473.47	1471.858	-1.61187	-0.10939	1476.53	1474.54	-1.98993	-0.13477
1472.76	1472.142	-0.61814	-0.04197	1476.84	1475.431	-1.40913	-0.09542
1472.86	1470.44	-2.41961	-0.16428	1477.97	1476.32	-1.65026	-0.11166
1475.22	1474.01	-1.20973	-0.082	1476.74	1475.431	-1.30921	-0.08866
1473.39	1472.282	-1.10795	-0.0752	1477.33	1475.761	-1.56916	-0.10622
1473.31	1472.158	-1.15238	-0.07822	1477.31	1475.55	-1.76031	-0.11916
1472.85	1471.365	-1.48501	-0.10083	1467.12	1468.957	1.837194	0.125225
1476.54	1475.472	-1.06837	-0.07236	1475.42	1472.811	-2.60936	-0.17686
1481.96	1480.153	-1.80696	-0.12193	1472.18	1472.674	0.493965	0.033553
1485.12	1483.919	-1.20088	-0.08086	1472.63	1470.132	-2.49794	-0.16962
1483.48	1482.685	-0.79459	-0.05356	1475.25	1474.351	-0.89891	-0.06093
1480.61	1479.815	-0.79514	-0.0537	1467.8	1468.366	0.565798	0.038547
1479.7	1479.759	0.059134	0.003996	1466.95	1468.681	1.73068	0.117978
1478.62	1477.591	-1.02939	-0.06962	1465.12	1463.935	-1.18527	-0.0809
1476.62	1475.604	-1.01632	-0.06883	1463.89	1462.312	-1.57837	-0.10782
1476.17	1474.85	-1.31984	-0.08941	1461.91	1461.405	-0.50529	-0.03456
1475.37	1474.393	-0.97667	-0.0662	1465.99	1464.353	-1.63686	-0.11166
1475.43	1475.084	-0.34641	-0.02348	1461.49	1461.302	-0.18794	-0.01286
1472.52	1471.927	-0.59291	-0.04027	1459.37	1457.427	-1.94342	-0.13317
1472.24	1469.958	-2.28199	-0.155	1458.15	1458.015	-0.13501	-0.00926
1472.62	1471.219	-1.40086	-0.09513	1459.44	1458.48	-0.96035	-0.0658
1470.96	1469.573	-1.38726	-0.09431	1458.29	1456.629	-1.66053	-0.11387

1471.39	1469.905	-1.48543	-0.10095	1457.02	1455.597	-1.42309	-0.09767
1468.33	1467.486	-0.84389	-0.05747	1457.52	1456.295	-1.22452	-0.08401
1468.3	1466.302	-1.99792	-0.13607	1456.51	1456.419	-0.09076	-0.00623
1466.69	1465.569	-1.12114	-0.07644	1453.88	1452.77	-1.11038	-0.07637
1465.63	1463.368	-2.26187	-0.15433	1457.13	1455.048	-2.08184	-0.14287
1464.29	1462.535	-1.75549	-0.11989	1455.47	1453.994	-1.4756	-0.10138
1465.34	1463.743	-1.59672	-0.10897	1458.23	1456.089	-2.14097	-0.14682
1465.34	1463.671	-1.66898	-0.1139	1456.66	1455.345	-1.31526	-0.09029
1452.64	1452.17	-0.47009	-0.03236	1453.72	1452.146	-1.57359	-0.10825
1442.78	1443.66	0.880155	0.061004	1455.12	1454.064	-1.05579	-0.07256
1437.17	1435.279	-1.89075	-0.13156	1452.82	1451.529	-1.29133	-0.08888
1447.58	1445.358	-2.22178	-0.15348	1451.82	1450.417	-1.40257	-0.09661
1448.59	1445.285	-3.30462	-0.22813	1451.46	1450.773	-0.68745	-0.04736
1455.6	1453.395	-2.2046	-0.15146	1451.41	1450.075	-1.3345	-0.09195
1458.67	1457.717	-0.95338	-0.06536	1456.79	1454.629	-2.16071	-0.14832
1463.18	1462.446	-0.73356	-0.05013	1456.96	1455.541	-1.41927	-0.09741
1460.48	1460.005	-0.4746	-0.0325	1459.42	1457.659	-1.7613	-0.12069
1460.11	1459.948	-0.16163	-0.01107	1459	1458.186	-0.81404	-0.05579
1460.77	1457.946	-2.82444	-0.19335	1457.37	1455.957	-1.41284	-0.09694
1462.26	1461.947	-0.31288	-0.0214	1456.35	1454.702	-1.64762	-0.11313
1459.75	1458.726	-1.02352	-0.07012	1455.36	1453.58	-1.78036	-0.12233
1459.09	1457.312	-1.77829	-0.12188	1456.97	1455.122	-1.84798	-0.12684
1463	1461.377	-1.62344	-0.11097	1455.37	1453.896	-1.47394	-0.10128
1464.32	1463.892	-0.42831	-0.02925	1453.06	1452.202	-0.85776	-0.05903
1464.87	1463.47	-1.39967	-0.09555	1455.49	1453.891	-1.59937	-0.10989
1465.35	1463.528	-1.8222	-0.12435	1456.03	1453.691	-2.33921	-0.16066
1466.47	1464.89	-1.57997	-0.10774	1455.15	1454.497	-0.65317	-0.04489
1464.4	1463.336	-1.06411	-0.07267	1452.92	1451.734	-1.18568	-0.08161
1462.78	1461.423	-1.35744	-0.0928	1453.24	1451.527	-1.71302	-0.11788
1465.42	1463.637	-1.78303	-0.12167	1453.34	1452.173	-1.16652	-0.08026
1464.69	1463.427	-1.26269	-0.08621	1454.78	1453.028	-1.75174	-0.12041
1465.28	1464.464	-0.81646	-0.05572	1456.19	1453.742	-2.44825	-0.16813
1464.76	1465.2	0.439791	0.030025	1466.3	1463.983	-2.31708	-0.15802
1465.77	1464.076	-1.6942	-0.11558	1466.74	1462.481	-4.259	-0.29037
1464.49	1463.414	-1.07589	-0.07346	1461.47	1460.725	-0.74499	-0.05098

1463.9	1462.695	-1.20495	-0.08231	1456.56	1455.932	-0.62773	-0.0431
1464.65	1462.675	-1.97467	-0.13482	1459.33	1459.333	0.00273	0.000187
1464.52	1462.179	-2.34075	-0.15983	1455.32	1455.989	0.668909	0.045963
1464.19	1462.376	-1.81407	-0.1239	1454.55	1455.953	1.40274	0.096438
1463.37	1462.133	-1.23717	-0.08454	1452.31	1450.298	-2.01233	-0.13856
1462.02	1461.035	-0.98493	-0.06737	1451.42	1449.314	-2.10596	-0.1451
1463.45	1461.885	-1.56491	-0.10693	1449.69	1448.427	-1.26278	-0.08711
1461.05	1459.914	-1.13629	-0.07777	1453.85	1451.931	-1.91859	-0.13197
1460.45	1458.418	-2.03234	-0.13916	1455.64	1453.085	-2.55475	-0.17551
1459.36	1458.394	-0.96594	-0.06619	1453.36	1451.903	-1.4571	-0.10026
1460.13	1458.255	-1.87502	-0.12841	1454.97	1452.444	-2.52637	-0.17364
1458.72	1457.249	-1.47145	-0.10087	1456.67	1455.159	-1.51113	-0.10374
1459.22	1457.638	-1.58227	-0.10843	1456.05	1453.987	-2.06255	-0.14165
1459.72	1457.827	-1.89329	-0.1297	1455.61	1453.556	-2.05411	-0.14112
1461.13	1459.307	-1.82285	-0.12476	1458.03	1455.804	-2.22636	-0.1527
1459.69	1458.71	-0.98019	-0.06715	1458.99	1457.193	-1.79727	-0.12319
1459.1	1457.52	-1.57997	-0.10828	1458.33	1457.441	-0.88882	-0.06095
1459.38	1458.001	-1.37908	-0.0945	1457.83	1456.97	-0.86015	-0.059
1460.19	1458.282	-1.90795	-0.13066	1457.6	1455.873	-1.72719	-0.1185
1461.28	1459.446	-1.83357	-0.12548	1460.27	1457.973	-2.29746	-0.15733
1462.05	1459.93	-2.12013	-0.14501	1460.75	1459.368	-1.38169	-0.09459
1460.92	1455.325	-5.59518	-0.38299	1463.43	1460.707	-2.72319	-0.18608
1460.74	1458.64	-2.10006	-0.14377	1463.2	1462.023	-1.17658	-0.08041
1455.97	1455.172	-0.79808	-0.05481	1463.67	1460.352	-3.31796	-0.22669
1451.73	1450.869	-0.86144	-0.05934	1463.99	1462.707	-1.28339	-0.08766
1455	1452.432	-2.56801	-0.1765	1466.05	1463.532	-2.51753	-0.17172
1451.83	1451.768	-0.06208	-0.00428	1467.55	1465.224	-2.32641	-0.15852
1448.31	1447.733	-0.57666	-0.03982	1467.96	1464.893	-3.06665	-0.20891
1446.56	1445.098	-1.46238	-0.10109	1469.83	1467.394	-2.4364	-0.16576
1450.65	1449.401	-1.24888	-0.08609	1469.13	1467.651	-1.47949	-0.10071
1452.54	1449.739	-2.80052	-0.1928	1464.74	1463.5	-1.24014	-0.08467
1452.06	1450.567	-1.49263	-0.10279	1464.31	1462.95	-1.36005	-0.09288
1450.13	1450.375	0.245401	0.016923	1461.53	1459.985	-1.54545	-0.10574
1448.66	1446.72	-1.93958	-0.13389	1463.16	1460.851	-2.30875	-0.15779
1446.41	1444.506	-1.90412	-0.13164	1463.21	1461.821	-1.38891	-0.09492

1445.5	1443.879	-1.62085	-0.11213	1461.68	1459.837	-1.84296	-0.12608
1442.44	1441.446	-0.9943	-0.06893	1461.78	1459.758	-2.0215	-0.13829
1444.2	1442.715	-1.48544	-0.10286	1461.75	1459.125	-2.62501	-0.17958
1443.32	1442.18	-1.14003	-0.07899	1462.57	1459.807	-2.7633	-0.18893
1443.1	1441.11	-1.9902	-0.13791	1461.6	1459.586	-2.01409	-0.1378
1442.88	1441.807	-1.07268	-0.07434	1462.7	1460.243	-2.45661	-0.16795
1445.89	1444.226	-1.66395	-0.11508	1461.63	1459.452	-2.17805	-0.14902
1448.47	1446.307	-2.16271	-0.14931	1462.93	1460.452	-2.47809	-0.16939
1447	1445.286	-1.71372	-0.11843	1464.22	1461.824	-2.39616	-0.16365
1447.15	1446.225	-0.9253	-0.06394	1463.92	1461.704	-2.21641	-0.1514
1445.23	1443.682	-1.54793	-0.10711	1463.3	1461.963	-1.33664	-0.09134
1446.1	1444.031	-2.06903	-0.14308	1462.53	1458.78	-3.74959	-0.25638
1445.03	1443.657	-1.37309	-0.09502	1461.62	1459.167	-2.45328	-0.16785
1444.51	1442.727	-1.78314	-0.12344	1465.99	1462.247	-3.74318	-0.25533
1443.04	1441.691	-1.3493	-0.0935	1458.95	1458.433	-0.51716	-0.03545
1442.77	1440.425	-2.34531	-0.16256	1464.13	1461.495	-2.63547	-0.18
1443.37	1441.483	-1.88742	-0.13077	1457.92	1457.178	-0.74168	-0.05087
1442.1	1440.53	-1.57024	-0.10889	1457.81	1456.156	-1.65421	-0.11347
1441.16	1439.421	-1.73894	-0.12066	1457.74	1457.88	0.140316	0.009626
1440.94	1439.889	-1.05105	-0.07294	1454.03	1452.383	-1.6466	-0.11324
1438.9	1437.513	-1.38739	-0.09642	1453.31	1451.35	-1.96039	-0.13489
1438.58	1436.284	-2.2963	-0.15962	1446.3	1446.519	0.219244	0.015159
1439.24	1438.481	-0.75931	-0.05276	1447.26	1446.546	-0.7136	-0.04931
1438.1	1436.582	-1.51812	-0.10556	1452.63	1450.598	-2.03217	-0.1399
1438.47	1436.083	-2.38706	-0.16594	1450.68	1451.069	0.388766	0.026799
1436.59	1435.664	-0.92576	-0.06444	1451.66	1449.919	-1.74085	-0.11992
1436.68	1435.387	-1.29267	-0.08998	1453.76	1452.145	-1.61479	-0.11108
1436.14	1434.278	-1.86189	-0.12965	1457.51	1455.99	-1.51988	-0.10428
1435.44	1434.601	-0.83934	-0.05847	1455.02	1453.229	-1.79111	-0.1231
1433.7	1432.418	-1.28241	-0.08945	1454.34	1453.596	-0.74392	-0.05115
1432.72	1431.205	-1.51477	-0.10573	1454.14	1451.859	-2.28128	-0.15688
1432.97	1431.122	-1.84784	-0.12895	1454.22	1453.204	-1.01617	-0.06988
1434.42	1432.529	-1.89122	-0.13185	1453.54	1451.172	-2.36805	-0.16292
1435.28	1433.669	-1.61096	-0.11224	1451.58	1450.231	-1.34885	-0.09292
1442.54	1444.736	2.196291	0.152252	1447.44	1446.763	-0.67686	-0.04676

1440.86	1438.946	-1.91369	-0.13282	1444.97	1444.914	-0.05647	-0.00391
1438.8	1437.936	-0.86375	-0.06003	1443.45	1442.463	-0.9875	-0.06841
1441.51	1438.288	-3.22198	-0.22351	1444.44	1441.934	-2.50629	-0.17351
1442.57	1441.857	-0.71284	-0.04941	1445.74	1443.322	-2.41799	-0.16725
1439.35	1438.504	-0.84566	-0.05875	1443.63	1442.802	-0.82823	-0.05737
1443.75	1441.448	-2.30181	-0.15943	1442.46	1442.268	-0.19168	-0.01329
1443.18	1443.093	-0.08685	-0.00602	1443.24	1442.133	-1.10681	-0.07669
1444.1	1442.529	-1.57144	-0.10882	1441.35	1440.486	-0.86404	-0.05995
1440.92	1439.679	-1.24124	-0.08614	1438.52	1437.995	-0.52527	-0.03651
1440.97	1438.374	-2.59593	-0.18015	1441.94	1439.475	-2.46515	-0.17096
1438.44	1437.683	-0.75733	-0.05265	1445.63	1443.642	-1.98823	-0.13753
1438.87	1437.794	-1.07594	-0.07478	1443.98	1442.332	-1.64787	-0.11412
1435.81	1435.102	-0.70776	-0.04929	1442.5	1441.332	-1.16756	-0.08094
1436.67	1434.96	-1.71008	-0.11903	1441.06	1440.02	-1.03998	-0.07217
1436.34	1435.662	-0.67826	-0.04722	1439.53	1438.574	-0.95577	-0.06639
1437.4	1435.46	-1.93964	-0.13494	1439.01	1437.545	-1.46468	-0.10178
1437.68	1436.592	-1.08765	-0.07565	1437.64	1438.244	0.604284	0.042033
1436.28	1435.641	-0.63854	-0.04446	1437.74	1435.096	-2.64359	-0.18387
1437.76	1436.069	-1.69076	-0.1176	1435.63	1434.927	-0.70342	-0.049
1437.93	1436.604	-1.32567	-0.09219	1434.6	1433.218	-1.38237	-0.09636
1436.94	1435.824	-1.11554	-0.07763	1431.68	1431.384	-0.29629	-0.0207
1435.94	1434.429	-1.51107	-0.10523	1428.17	1428.273	0.102581	0.007183
1434.78	1433.913	-0.86698	-0.06043	1428.32	1427.367	-0.95337	-0.06675
1437.12	1435.906	-1.21448	-0.08451	1438.35	1438.305	-0.04498	-0.00313
1437.71	1436.042	-1.66804	-0.11602	1438.05	1437.915	-0.13512	-0.0094
1438	1436.408	-1.59236	-0.11073	1432.4	1432.645	0.245184	0.017117
1439.51	1438.142	-1.36823	-0.09505	1433.38	1430.732	-2.64831	-0.18476
1440.47	1438.667	-1.80308	-0.12517	1431.56	1431.212	-0.34781	-0.0243
1441.1	1439.606	-1.49365	-0.10365	1425.72	1426.189	0.468501	0.032861
1442.65	1440.922	-1.72797	-0.11978	1430.63	1430.233	-0.39711	-0.02776
1445.33	1443.478	-1.852	-0.12814	1437.51	1437.043	-0.46714	-0.0325
1445.72	1443.309	-2.41092	-0.16676	1442.97	1441.392	-1.5782	-0.10937
1446.54	1444.303	-2.23652	-0.15461	1437.8	1437.672	-0.12827	-0.00892
1448.28	1446.535	-1.74527	-0.12051	1435.88	1435.548	-0.33215	-0.02313
1452.81	1450.902	-1.9084	-0.13136	1432.6	1432.196	-0.40391	-0.02819

1456.15	1454.132	-2.01758	-0.13856	1430.68	1430.883	0.202537	0.014157
1453.49	1452.154	-1.33569	-0.0919	1431.69	1431.473	-0.21665	-0.01513
1453.8	1452.829	-0.97093	-0.06679	1433.19	1432.015	-1.17532	-0.08201
1453.11	1451.414	-1.69583	-0.1167	1434.25	1433.049	-1.20066	-0.08371
1452.39	1451.025	-1.36493	-0.09398	1433.93	1432.609	-1.32101	-0.09213
1451.47	1449.924	-1.5464	-0.10654	1433.27	1432.457	-0.81306	-0.05673
1451.87	1449.36	-2.51048	-0.17291	1432.31	1431.754	-0.55619	-0.03883
1451.58	1449.577	-2.00335	-0.13801	1431.81	1431.692	-0.11803	-0.00824
1451.16	1449.536	-1.62433	-0.11193	1431.56	1431.761	0.200704	0.01402
1451.79	1450.035	-1.7551	-0.12089	1430.18	1429.661	-0.51935	-0.03631
1453.21	1451.247	-1.96266	-0.13506	1429.01	1428.304	-0.70644	-0.04944
1452.98	1451.534	-1.44582	-0.09951	1426.52	1427.396	0.876098	0.061415
1446.91	1445.231	-1.6794	-0.11607	1426.29	1425.038	-1.25246	-0.08781
1439.04	1440.386	1.345737	0.093516	1425.63	1427.146	1.516163	0.10635
1438.68	1439.078	0.398277	0.027683	1424.51	1423.218	-1.29155	-0.09067
1436.45	1436.037	-0.41285	-0.02874	1424.27	1423.61	-0.65999	-0.04634
1435.58	1435.94	0.359556	0.025046	1419.53	1420.495	0.964789	0.067965
1441.98	1440.339	-1.64135	-0.11383	1426.26	1425.675	-0.58465	-0.04099
1445.82	1445.285	-0.53484	-0.03699	1431.1	1430.019	-1.08087	-0.07553
1443.04	1442.209	-0.83138	-0.05761	1432.92	1433.295	0.37458	0.026141
1443.48	1441.179	-2.30121	-0.15942	1434.14	1434.643	0.503027	0.035075
1439.31	1439.003	-0.30704	-0.02133	1433.96	1432.056	-1.90365	-0.13275
1441.46	1440.351	-1.10873	-0.07692	1433.65	1433.201	-0.44937	-0.03134
1444.35	1443.349	-1.00099	-0.0693	1435.66	1434.195	-1.46452	-0.10201
1445.4	1443.424	-1.97644	-0.13674	1438	1436.683	-1.31734	-0.09161
1449.22	1448.022	-1.19765	-0.08264	1438.55	1438.945	0.395281	0.027478
1448.56	1446.946	-1.61444	-0.11145	1439.19	1437.622	-1.5677	-0.10893
1448.79	1448.165	-0.62548	-0.04317	1439.19	1439.139	-0.05115	-0.00355
1448.24	1446.294	-1.94575	-0.13435	1438.64	1437.508	-1.13191	-0.07868
1446.1	1444.986	-1.11406	-0.07704	1440.14	1438.682	-1.45847	-0.10127
1446.25	1444.329	-1.9215	-0.13286	1438.76	1437.292	-1.46822	-0.10205
1445.01	1443.805	-1.20539	-0.08342	1439.88	1438.357	-1.52342	-0.1058
1444.14	1443.25	-0.88988	-0.06162	1439.68	1438.592	-1.08808	-0.07558
1445.09	1443.792	-1.29823	-0.08984	1440.12	1438.811	-1.30915	-0.09091
1445.5	1443.874	-1.62597	-0.11248	1439.78	1438.032	-1.74823	-0.12142

1444.74	1443.605	-1.13498	-0.07856	1440.49	1438.918	-1.57177	-0.10911
1442.29	1442.181	-0.10946	-0.00759	1435.97	1432.441	-3.52928	-0.24578
1439.83	1439.249	-0.58093	-0.04035	1433.69	1429.988	-3.70166	-0.25819
1438.31	1437.34	-0.97041	-0.06747	1429.27	1430.544	1.274227	0.089152
1437.29	1436.308	-0.9824	-0.06835	1429.58	1428.452	-1.12833	-0.07893
1437.12	1436.574	-0.54591	-0.03799	1425.44	1427.766	2.326301	0.163199
1434.38	1434.052	-0.32843	-0.0229	1423.45	1423.506	0.056229	0.00395
1435.36	1434.591	-0.76879	-0.05356	1423.08	1423.332	0.251659	0.017684
1434.27	1433.049	-1.22076	-0.08511	1415.79	1418.607	2.817189	0.198984
1431.99	1431.81	-0.17971	-0.01255	1416.94	1419.84	2.900442	0.204698
1433.07	1431.635	-1.43488	-0.10013	1417.81	1422.71	4.900299	0.345624
1433.91	1433.549	-0.36113	-0.02519	1413.02	1416.058	3.037752	0.214983
1433.8	1432.949	-0.85084	-0.05934	1406.27	1411.386	5.115882	0.363791
1432.71	1431.836	-0.87445	-0.06103	1404.66	1409.791	5.130893	0.365277
1433.84	1432.899	-0.94108	-0.06563	1403.46	1407.512	4.05177	0.288699
1434.67	1433.999	-0.67136	-0.0468	1405.84	1411.621	5.780709	0.411193
1433.46	1432.486	-0.97422	-0.06796	1405.76	1410.337	4.576793	0.325574
1432.99	1432.875	-0.11543	-0.00805	1409.39	1411.963	2.573141	0.182571
1431.58	1430.704	-0.87585	-0.06118	1408.84	1411.191	2.350682	0.166852
1432.6	1432.345	-0.25545	-0.01783	1406.88	1410.9	4.020463	0.285772
1433.67	1433.314	-0.35551	-0.0248	1405.92	1409.117	3.196733	0.227377
1430.3	1430.747	0.446965	0.03125	1407.94	1410.973	3.032646	0.215396
1430.62	1429.951	-0.66927	-0.04678	1404.95	1409.233	4.282963	0.304848
1430.46	1430.08	-0.37977	-0.02655	1401.79	1406.697	4.907431	0.350083
1429.89	1429.749	-0.14102	-0.00986	1401.47	1406.453	4.982585	0.355526
1433.35	1431.595	-1.75475	-0.12242	1396.87	1403.23	6.360074	0.455309
1435.68	1435.018	-0.66191	-0.0461	1397.01	1401.895	4.884983	0.349674
1431.55	1430.631	-0.91851	-0.06416	1395.84	1402.284	6.444489	0.461693
1434.16	1434.863	0.703294	0.049039	1395.77	1402.393	6.623391	0.474533
1433.63	1432.619	-1.01089	-0.07051	1394.22	1401.529	7.309369	0.524262
1439.93	1438.403	-1.52691	-0.10604	1393.04	1399.655	6.614724	0.474841
1447.33	1445.488	-1.84179	-0.12725	1392.73	1400.197	7.466738	0.536122
1445.36	1446.063	0.703028	0.04864	1392.12	1399.055	6.935485	0.498196
1445.08	1443.863	-1.21675	-0.0842	1396.35	1401.911	5.561253	0.398271
1442.24	1441.716	-0.524	-0.03633	1398.77	1403.841	5.070931	0.362528

1445.42	1444.355	-1.06529	-0.0737	1397.04	1402.8	5.760363	0.412326
1446.61	1444.154	-2.45551	-0.16974	1395.01	1401.322	6.312127	0.452479
1446.7	1444.793	-1.90735	-0.13184	1395.21	1400.618	5.407532	0.387578
1449.2	1447.269	-1.93127	-0.13326	1394.45	1400.531	6.081377	0.436113
1450.5	1448.581	-1.91941	-0.13233	1392.3	1399.638	7.338389	0.52707
1448.17	1448.081	-0.08877	-0.00613	1390.97	1398.142	7.171959	0.515608
1446.55	1445.695	-0.85546	-0.05914	1390.46	1398.641	8.181097	0.588373
1444.43	1443.093	-1.33675	-0.09255	1393.88	1400.72	6.839823	0.490704
1443.3	1441.498	-1.80201	-0.12485	1390.03	1397.963	7.933062	0.570712
1444.24	1442.98	-1.26044	-0.08727	1388.89	1396.829	7.938567	0.571576
1443.8	1443.301	-0.49876	-0.03454	1391.27	1398.464	7.193554	0.517049
1444.38	1443.701	-0.67881	-0.047	1390.22	1397.438	7.217934	0.519194
1442.96	1441.143	-1.81738	-0.12595	1388.69	1396.169	7.479353	0.538591
1443.19	1441.84	-1.35021	-0.09356	1389.37	1396.299	6.928915	0.498709
1445.63	1443.721	-1.90914	-0.13206	1398.48	1401.36	2.879914	0.205932
1445.07	1443.46	-1.61039	-0.11144	1396.86	1402.947	6.087331	0.435787
1444.35	1442.556	-1.79354	-0.12418	1392.2	1399.928	7.728033	0.555095
1448.08	1446.008	-2.07164	-0.14306	1385.98	1395.831	9.850703	0.710739
1447.69	1446.44	-1.2498	-0.08633	1384.72	1396.202	11.48175	0.829175
1448.51	1446.597	-1.91298	-0.13207	1384.34	1392.493	8.153238	0.588962
1447.22	1445.913	-1.30659	-0.09028	1378.21	1389.085	10.87453	0.789033
1446.52	1445.534	-0.98598	-0.06816	1378.44	1389.246	10.80579	0.783914
1445.4	1443.706	-1.6944	-0.11723	1372.36	1384.966	12.6057	0.918542
1443.86	1442.232	-1.62791	-0.11275	1369.12	1381.995	12.87462	0.940357
1444.24	1442.325	-1.91532	-0.13262	1374.15	1386.261	12.11148	0.88138
1444.35	1442.116	-2.23439	-0.1547	1381.16	1391.311	10.15137	0.734989
1441.61	1440.472	-1.13766	-0.07892	1375.97	1386.131	10.16054	0.738427
1440.07	1439.476	-0.59395	-0.04124	1372.66	1383.376	10.71628	0.780694
1440.76	1438.974	-1.78571	-0.12394	1377.23	1386.424	9.193542	0.667539
1440.92	1439.393	-1.52704	-0.10598	1381.04	1389.766	8.726082	0.631849
1441.81	1439.552	-2.25835	-0.15663	1384.33	1391.463	7.133114	0.515276
1440.96	1439.397	-1.56265	-0.10844	1387.62	1394.053	6.4334	0.463628
1442.97	1440.877	-2.09296	-0.14505	1384.72	1392.604	7.883914	0.569351
1440.91	1439.223	-1.6868	-0.11706	1386.75	1393.012	6.26198	0.451558
1441.04	1439.948	-1.09205	-0.07578	1391.17	1396.297	5.127397	0.368567

1440.13	1438.214	-1.9163	-0.13306	1392.25	1395.389	3.138562	0.225431
1439.42	1438.018	-1.40167	-0.09738	1390.9	1394.79	3.889724	0.279655
1440.31	1438.518	-1.79172	-0.1244	1388.74	1393.853	5.112981	0.368174
1458.75	1454.765	-3.9846	-0.27315	1390.55	1394.673	4.122544	0.296469
1461.84	1459.287	-2.55261	-0.17462	1388.36	1393.456	5.0959	0.367045
1462.88	1464.375	1.495133	0.102205	1387.13	1392.575	5.444815	0.392524
1457.93	1457.367	-0.56286	-0.03861	1388.15	1393.079	4.929114	0.355085
1461.52	1460.028	-1.49167	-0.10206	1390.22	1394.528	4.308229	0.309895
1462.76	1463.465	0.704705	0.048176	1392.63	1395.816	3.186384	0.228803
1461.97	1460.115	-1.85543	-0.12691	1392.92	1395.998	3.078214	0.22099
1460.2	1460.861	0.661472	0.0453	1391.91	1395.028	3.118291	0.22403
1462.74	1461.039	-1.70073	-0.11627	1387.98	1392.564	4.584129	0.330273
1465.56	1464.578	-0.98171	-0.06699	1385.32	1390.219	4.898684	0.353614
1470.17	1468.466	-1.70418	-0.11592	1385.19	1388.746	3.555919	0.25671
1469.11	1467.605	-1.50547	-0.10248	1384.87	1389.067	4.19652	0.303026
1468.93	1468.051	-0.87909	-0.05985	1382.92	1387.16	4.240203	0.306612
1470.14	1469.813	-0.32696	-0.02224	1379.69	1384.473	4.782682	0.346649
1471.06	1469.618	-1.44205	-0.09803	1377.27	1382.612	5.342115	0.387877
1470.15	1468.975	-1.17483	-0.07991	1377.28	1382.045	4.764974	0.34597
1471.93	1470.145	-1.78509	-0.12128	1379.72	1383.318	3.597551	0.260745
1473.27	1472.399	-0.8711	-0.05913	1378.81	1382.167	3.357186	0.243484
1473.16	1471.735	-1.42524	-0.09675	1374.66	1379.654	4.993705	0.363268
1474.94	1473.484	-1.45597	-0.09871	1372.66	1377.503	4.842647	0.352793
1476.66	1475.843	-0.81712	-0.05534	1367.41	1373.496	6.086482	0.44511
1475.59	1475.067	-0.523	-0.03544	1368.84	1373.365	4.525016	0.330573
1477.26	1475.655	-1.60495	-0.10864	1366.14	1371.614	5.474189	0.400705
1476.94	1476.618	-0.32197	-0.0218	1365.19	1370.135	4.945448	0.362253

表 17 收盘价岭回归预测与误差分析

实际值	预测值	绝对误差	相对误差	实际值	预测值	绝对误差	相对误差
1575.839	1585.401	9.56175	0.606772	1575.839	1585.401	9.56175	0.606772
1572.615	1576.885	4.2695	0.27149	1572.615	1576.885	4.2695	0.27149
1570.878	1573.591	2.71256	0.172678	1570.878	1573.591	2.71256	0.172678
1566.618	1570.134	3.51572	0.224415	1566.618	1570.134	3.51572	0.224415

1565.711	1565.754	0.04243	0.00271	1565.711	1565.754	0.04243	0.00271
1562.212	1564.332	2.12032	0.135726	1562.212	1564.332	2.12032	0.135726
1557.361	1561.438	4.07659	0.261763	1557.361	1561.438	4.07659	0.261763
1553.419	1555.874	2.45523	0.158053	1553.419	1555.874	2.45523	0.158053
1548.907	1552.151	3.2438	0.209425	1548.907	1552.151	3.2438	0.209425
1549.357	1550.935	1.57817	0.10186	1549.357	1550.935	1.57817	0.10186
1552.606	1551.914	-0.69165	-0.04455	1552.606	1551.914	-0.69165	-0.04455
1550.43	1553.832	3.40253	0.219457	1550.43	1553.832	3.40253	0.219457
1548.786	1549.844	1.05867	0.068355	1548.786	1549.844	1.05867	0.068355
1549.125	1550.096	0.97163	0.062721	1549.125	1550.096	0.97163	0.062721
1549.726	1549.8	0.07403	0.004777	1549.726	1549.8	0.07403	0.004777
1550.747	1549.683	-1.06436	-0.06864	1550.747	1549.683	-1.06436	-0.06864
1549.603	1550.008	0.4054	0.026162	1549.603	1550.008	0.4054	0.026162
1551.089	1550.619	-0.47038	-0.03033	1551.089	1550.619	-0.47038	-0.03033
1548.975	1550.066	1.09123	0.070449	1548.975	1550.066	1.09123	0.070449
1546.617	1547.433	0.81595	0.052757	1546.617	1547.433	0.81595	0.052757
1547.944	1547.411	-0.53292	-0.03443	1547.944	1547.411	-0.53292	-0.03443
1549.568	1548.451	-1.11739	-0.07211	1549.568	1548.451	-1.11739	-0.07211
1552.605	1552.281	-0.32335	-0.02083	1552.605	1552.281	-0.32335	-0.02083
1555.06	1554.102	-0.95858	-0.06164	1555.06	1554.102	-0.95858	-0.06164
1551.922	1553.363	1.44033	0.092809	1551.922	1553.363	1.44033	0.092809
1554.73	1554.188	-0.54213	-0.03487	1554.73	1554.188	-0.54213	-0.03487
1555.459	1554.9	-0.55928	-0.03596	1555.459	1554.9	-0.55928	-0.03596
1557.306	1556.087	-1.21899	-0.07828	1557.306	1556.087	-1.21899	-0.07828
1557.426	1557.808	0.38218	0.024539	1557.426	1557.808	0.38218	0.024539
1557.934	1557.303	-0.63087	-0.04049	1557.934	1557.303	-0.63087	-0.04049
1559.371	1558.917	-0.45404	-0.02912	1559.371	1558.917	-0.45404	-0.02912
1558.461	1557.823	-0.638	-0.04094	1558.461	1557.823	-0.638	-0.04094
1560.576	1560.009	-0.56694	-0.03633	1560.576	1560.009	-0.56694	-0.03633
1559.884	1559.421	-0.46293	-0.02968	1559.884	1559.421	-0.46293	-0.02968
1558.969	1558.452	-0.51684	-0.03315	1558.969	1558.452	-0.51684	-0.03315
1560.091	1558.595	-1.49597	-0.09589	1560.091	1558.595	-1.49597	-0.09589
1558.229	1558.406	0.17717	0.01137	1558.229	1558.406	0.17717	0.01137
1557.276	1556.479	-0.79769	-0.05122	1557.276	1556.479	-0.79769	-0.05122
1556.132	1555.767	-0.36491	-0.02345	1556.132	1555.767	-0.36491	-0.02345

1555.636	1554.935	-0.70122	-0.04508	1555.636	1554.935	-0.70122	-0.04508
1554.656	1554.148	-0.5078	-0.03266	1554.656	1554.148	-0.5078	-0.03266
1555.779	1554.511	-1.26796	-0.0815	1555.779	1554.511	-1.26796	-0.0815
1555.717	1555.305	-0.41185	-0.02647	1555.717	1555.305	-0.41185	-0.02647
1556.045	1555.248	-0.79693	-0.05122	1556.045	1555.248	-0.79693	-0.05122
1554.881	1554.437	-0.4441	-0.02856	1554.881	1554.437	-0.4441	-0.02856
1556.246	1554.866	-1.37999	-0.08867	1556.246	1554.866	-1.37999	-0.08867
1556.816	1555.137	-1.67819	-0.1078	1556.816	1555.137	-1.67819	-0.1078
1556.852	1555.22	-1.63202	-0.10483	1556.852	1555.22	-1.63202	-0.10483
1544.057	1554.574	10.51754	0.681163	1544.057	1554.574	10.51754	0.681163
1543.426	1543.702	0.27593	0.017878	1543.426	1543.702	0.27593	0.017878
1543.731	1544.06	0.32975	0.021361	1543.731	1544.06	0.32975	0.021361
1540.427	1541.786	1.35931	0.088242	1540.427	1541.786	1.35931	0.088242
1529.883	1538.496	8.6133	0.563004	1529.883	1538.496	8.6133	0.563004
1528.49	1528.352	-0.1378	-0.00902	1528.49	1528.352	-0.1378	-0.00902
1526.868	1526.938	0.07074	0.004633	1526.868	1526.938	0.07074	0.004633
1527.024	1525.484	-1.53989	-0.10084	1527.024	1525.484	-1.53989	-0.10084
1527.183	1527.332	0.1491	0.009763	1527.183	1527.332	0.1491	0.009763
1525.196	1526.802	1.60603	0.1053	1525.196	1526.802	1.60603	0.1053
1524.923	1524.807	-0.11609	-0.00761	1524.923	1524.807	-0.11609	-0.00761
1521.302	1523.412	2.11015	0.138707	1521.302	1523.412	2.11015	0.138707
1522.674	1524.463	1.78981	0.117544	1522.674	1524.463	1.78981	0.117544
1521.364	1522.043	0.67899	0.04463	1521.364	1522.043	0.67899	0.04463
1523.133	1522.284	-0.84878	-0.05573	1523.133	1522.284	-0.84878	-0.05573
1521.272	1521.562	0.28991	0.019057	1521.272	1521.562	0.28991	0.019057
1523.683	1523.35	-0.33291	-0.02185	1523.683	1523.35	-0.33291	-0.02185
1522.815	1523.312	0.4978	0.032689	1522.815	1523.312	0.4978	0.032689
1521.418	1521.207	-0.21044	-0.01383	1521.418	1521.207	-0.21044	-0.01383
1517.352	1519.995	2.64265	0.174162	1517.352	1519.995	2.64265	0.174162
1516.847	1516.216	-0.63034	-0.04156	1516.847	1516.216	-0.63034	-0.04156
1514.492	1515.178	0.68615	0.045306	1514.492	1515.178	0.68615	0.045306
1513.956	1513.925	-0.03176	-0.0021	1513.956	1513.925	-0.03176	-0.0021
1511.813	1512.762	0.94944	0.062801	1511.813	1512.762	0.94944	0.062801
1508.944	1511.139	2.19525	0.145483	1508.944	1511.139	2.19525	0.145483
1505.875	1507.223	1.34785	0.089506	1505.875	1507.223	1.34785	0.089506

1506.555	1507.146	0.59075	0.039212	1506.555	1507.146	0.59075	0.039212
1506.603	1507.201	0.59842	0.03972	1506.603	1507.201	0.59842	0.03972
1503.815	1505.081	1.26577	0.084171	1503.815	1505.081	1.26577	0.084171
1502.647	1502.896	0.24942	0.016599	1502.647	1502.896	0.24942	0.016599
1500.379	1501.805	1.42593	0.095038	1500.379	1501.805	1.42593	0.095038
1502.56	1501.589	-0.97085	-0.06461	1502.56	1501.589	-0.97085	-0.06461
1501.759	1502.179	0.41959	0.02794	1501.759	1502.179	0.41959	0.02794
1501.703	1500.403	-1.29975	-0.08655	1501.703	1500.403	-1.29975	-0.08655
1500.041	1500.382	0.34152	0.022767	1500.041	1500.382	0.34152	0.022767
1499.339	1498.662	-0.67711	-0.04516	1499.339	1498.662	-0.67711	-0.04516
1501.834	1501.094	-0.73984	-0.04926	1501.834	1501.094	-0.73984	-0.04926
1506.066	1505.225	-0.84037	-0.0558	1506.066	1505.225	-0.84037	-0.0558
1507.856	1506.55	-1.30628	-0.08663	1507.856	1506.55	-1.30628	-0.08663
1506.577	1506.477	-0.10005	-0.00664	1506.577	1506.477	-0.10005	-0.00664
1506.683	1505.441	-1.2415	-0.0824	1506.683	1505.441	-1.2415	-0.0824
1506.886	1505.561	-1.32513	-0.08794	1506.886	1505.561	-1.32513	-0.08794
1507.129	1505.781	-1.34849	-0.08947	1507.129	1505.781	-1.34849	-0.08947
1505.905	1505.747	-0.15778	-0.01048	1505.905	1505.747	-0.15778	-0.01048
1505.856	1505.26	-0.59574	-0.03956	1505.856	1505.26	-0.59574	-0.03956
1506.471	1505.59	-0.88042	-0.05844	1506.471	1505.59	-0.88042	-0.05844
1506.802	1505.824	-0.97797	-0.0649	1506.802	1505.824	-0.97797	-0.0649
1505.941	1505.308	-0.63317	-0.04204	1505.941	1505.308	-0.63317	-0.04204
1496.5	1501.834	5.33441	0.356459	1496.5	1501.834	5.33441	0.356459
1493.351	1498.137	4.78617	0.320499	1493.351	1498.137	4.78617	0.320499
1486.266	1492.665	6.39942	0.43057	1486.266	1492.665	6.39942	0.43057
1487.37	1486.196	-1.17354	-0.0789	1487.37	1486.196	-1.17354	-0.0789
1485.258	1486.552	1.29414	0.087132	1485.258	1486.552	1.29414	0.087132
1487.22	1486.546	-0.67464	-0.04536	1487.22	1486.546	-0.67464	-0.04536
1484.134	1485.961	1.82706	0.123106	1484.134	1485.961	1.82706	0.123106
1479.364	1482.91	3.54595	0.239694	1479.364	1482.91	3.54595	0.239694
1474.854	1478.259	3.40452	0.230838	1474.854	1478.259	3.40452	0.230838
1474.116	1473.463	-0.65304	-0.0443	1474.116	1473.463	-0.65304	-0.0443
1471.172	1473.094	1.92247	0.130676	1471.172	1473.094	1.92247	0.130676
1472.848	1471.782	-1.06664	-0.07242	1472.848	1471.782	-1.06664	-0.07242
1478.427	1478.069	-0.35855	-0.02425	1478.427	1478.069	-0.35855	-0.02425

1478.011	1477.191	-0.81966	-0.05546	1478.011	1477.191	-0.81966	-0.05546
1476.669	1476.871	0.20191	0.013673	1476.669	1476.871	0.20191	0.013673
1478.922	1478.326	-0.59609	-0.04031	1478.922	1478.326	-0.59609	-0.04031
1479.748	1478.915	-0.83254	-0.05626	1479.748	1478.915	-0.83254	-0.05626
1479.75	1479.229	-0.52126	-0.03523	1479.75	1479.229	-0.52126	-0.03523
1484.11	1483.194	-0.91541	-0.06168	1484.11	1483.194	-0.91541	-0.06168
1483.864	1484.115	0.25157	0.016954	1483.864	1484.115	0.25157	0.016954
1484.677	1483.729	-0.94745	-0.06382	1484.677	1483.729	-0.94745	-0.06382
1485.365	1484.441	-0.92436	-0.06223	1485.365	1484.441	-0.92436	-0.06223
1488.549	1487.451	-1.09782	-0.07375	1488.549	1487.451	-1.09782	-0.07375
1488.277	1487.672	-0.60512	-0.04066	1488.277	1487.672	-0.60512	-0.04066
1485.059	1487.83	2.77151	0.186626	1485.059	1487.83	2.77151	0.186626
1487.275	1486.489	-0.78689	-0.05291	1487.275	1486.489	-0.78689	-0.05291
1486.828	1486.563	-0.26546	-0.01785	1486.828	1486.563	-0.26546	-0.01785
1489.047	1487.903	-1.14361	-0.0768	1489.047	1487.903	-1.14361	-0.0768
1492.127	1490.923	-1.20332	-0.08064	1492.127	1490.923	-1.20332	-0.08064
1491.384	1491.102	-0.28118	-0.01885	1491.384	1491.102	-0.28118	-0.01885
1490.483	1490.342	-0.14061	-0.00943	1490.483	1490.342	-0.14061	-0.00943
1488.775	1489.118	0.34342	0.023067	1488.775	1489.118	0.34342	0.023067
1487.921	1487.61	-0.31101	-0.0209	1487.921	1487.61	-0.31101	-0.0209
1489.18	1487.865	-1.31477	-0.08829	1489.18	1487.865	-1.31477	-0.08829
1487.838	1487.656	-0.18274	-0.01228	1487.838	1487.656	-0.18274	-0.01228
1488.395	1487.039	-1.35621	-0.09112	1488.395	1487.039	-1.35621	-0.09112
1485.985	1487.445	1.46049	0.098284	1485.985	1487.445	1.46049	0.098284
1485.032	1484.736	-0.29581	-0.01992	1485.032	1484.736	-0.29581	-0.01992
1483.348	1483.623	0.2741	0.018478	1483.348	1483.623	0.2741	0.018478
1483.248	1482.605	-0.64245	-0.04331	1483.248	1482.605	-0.64245	-0.04331
1482.306	1481.672	-0.63364	-0.04275	1482.306	1481.672	-0.63364	-0.04275
1480.875	1481.147	0.27167	0.018345	1480.875	1481.147	0.27167	0.018345
1480.819	1479.869	-0.95053	-0.06419	1480.819	1479.869	-0.95053	-0.06419
1481.444	1480.116	-1.32839	-0.08967	1481.444	1480.116	-1.32839	-0.08967
1481.204	1480.302	-0.90164	-0.06087	1481.204	1480.302	-0.90164	-0.06087
1481.186	1480.248	-0.93811	-0.06334	1481.186	1480.248	-0.93811	-0.06334
1481.214	1480.032	-1.18245	-0.07983	1481.214	1480.032	-1.18245	-0.07983
1480.598	1480.19	-0.40826	-0.02757	1480.598	1480.19	-0.40826	-0.02757

1489.49	1490.031	0.5406	0.036294	1489.49	1490.031	0.5406	0.036294
1494.167	1493.366	-0.80081	-0.0536	1494.167	1493.366	-0.80081	-0.0536
1488.616	1492.444	3.82752	0.257119	1488.616	1492.444	3.82752	0.257119
1489.078	1488.001	-1.07688	-0.07232	1489.078	1488.001	-1.07688	-0.07232
1489.197	1489.636	0.43931	0.0295	1489.197	1489.636	0.43931	0.0295
1487.902	1488.547	0.64511	0.043357	1487.902	1488.547	0.64511	0.043357
1485.286	1487.051	1.76508	0.118838	1485.286	1487.051	1.76508	0.118838
1480.469	1483.432	2.96286	0.20013	1480.469	1483.432	2.96286	0.20013
1477.245	1479.171	1.92602	0.130379	1477.245	1479.171	1.92602	0.130379
1475.562	1475.894	0.33276	0.022551	1475.562	1475.894	0.33276	0.022551
1478.144	1477.633	-0.51091	-0.03456	1478.144	1477.633	-0.51091	-0.03456
1477.058	1478.9	1.84177	0.124692	1477.058	1478.9	1.84177	0.124692
1478.844	1477.692	-1.15283	-0.07795	1478.844	1477.692	-1.15283	-0.07795
1476.852	1478.143	1.29086	0.087406	1476.852	1478.143	1.29086	0.087406
1475.064	1475.571	0.50731	0.034392	1475.064	1475.571	0.50731	0.034392
1473.465	1474.422	0.95697	0.064947	1473.465	1474.422	0.95697	0.064947
1474.091	1472.797	-1.2931	-0.08772	1474.091	1472.797	-1.2931	-0.08772
1474.477	1475.082	0.60481	0.041019	1474.477	1475.082	0.60481	0.041019
1473.473	1473.065	-0.40876	-0.02774	1473.473	1473.065	-0.40876	-0.02774
1472.757	1472.97	0.21265	0.014439	1472.757	1472.97	0.21265	0.014439
1472.864	1471.886	-0.97792	-0.0664	1472.864	1471.886	-0.97792	-0.0664
1475.216	1474.473	-0.74235	-0.05032	1475.216	1474.473	-0.74235	-0.05032
1473.39	1473.839	0.44979	0.030528	1473.39	1473.839	0.44979	0.030528
1473.307	1472.405	-0.90191	-0.06122	1473.307	1472.405	-0.90191	-0.06122
1472.854	1472.566	-0.28808	-0.01956	1472.854	1472.566	-0.28808	-0.01956
1476.541	1476.111	-0.42986	-0.02911	1476.541	1476.111	-0.42986	-0.02911
1481.964	1481.063	-0.9011	-0.0608	1481.964	1481.063	-0.9011	-0.0608
1485.12	1484.15	-0.9699	-0.06531	1485.12	1484.15	-0.9699	-0.06531
1483.483	1483.737	0.25449	0.017155	1483.483	1483.737	0.25449	0.017155
1480.61	1481.684	1.0736	0.072511	1480.61	1481.684	1.0736	0.072511
1479.701	1480.608	0.90627	0.061247	1479.701	1480.608	0.90627	0.061247
1478.616	1478.311	-0.3048	-0.02061	1478.616	1478.311	-0.3048	-0.02061
1476.621	1477.259	0.63798	0.043205	1476.621	1477.259	0.63798	0.043205
1476.167	1475.362	-0.8049	-0.05453	1476.167	1475.362	-0.8049	-0.05453
1475.371	1474.951	-0.42002	-0.02847	1475.371	1474.951	-0.42002	-0.02847

1475.43	1475.304	-0.12504	-0.00847	1475.43	1475.304	-0.12504	-0.00847
1472.516	1474.331	1.8146	0.123231	1472.516	1474.331	1.8146	0.123231
1472.238	1471.244	-0.99404	-0.06752	1472.238	1471.244	-0.99404	-0.06752
1472.616	1471.766	-0.84952	-0.05769	1472.616	1471.766	-0.84952	-0.05769
1470.957	1471.074	0.1177	0.008002	1470.957	1471.074	0.1177	0.008002
1471.395	1470.578	-0.81621	-0.05547	1471.395	1470.578	-0.81621	-0.05547
1468.331	1470.112	1.78074	0.121276	1468.331	1470.112	1.78074	0.121276
1468.296	1467.395	-0.90129	-0.06138	1468.296	1467.395	-0.90129	-0.06138
1466.695	1467.172	0.47744	0.032552	1466.695	1467.172	0.47744	0.032552
1465.625	1465.18	-0.44517	-0.03037	1465.625	1465.18	-0.44517	-0.03037
1464.294	1464.514	0.22044	0.015054	1464.294	1464.514	0.22044	0.015054
1465.343	1464.331	-1.0114	-0.06902	1465.343	1464.331	-1.0114	-0.06902
1465.342	1464.244	-1.09809	-0.07494	1465.342	1464.244	-1.09809	-0.07494
1452.641	1457.255	4.61412	0.317637	1452.641	1457.255	4.61412	0.317637
1442.777	1451.613	8.836	0.61243	1442.777	1451.613	8.836	0.61243
1437.171	1441.024	3.85284	0.268085	1437.171	1441.024	3.85284	0.268085
1447.58	1447.512	-0.06768	-0.00468	1447.58	1447.512	-0.06768	-0.00468
1448.592	1447.578	-1.01383	-0.06999	1448.592	1447.578	-1.01383	-0.06999
1455.603	1455.046	-0.55655	-0.03824	1455.603	1455.046	-0.55655	-0.03824
1458.673	1458.698	0.02537	0.001739	1458.673	1458.698	0.02537	0.001739
1463.18	1464.54	1.36	0.092948	1463.18	1464.54	1.36	0.092948
1460.48	1462.563	2.08257	0.142595	1460.48	1462.563	2.08257	0.142595
1460.112	1461.652	1.54075	0.105523	1460.112	1461.652	1.54075	0.105523
1460.774	1459.536	-1.23814	-0.08476	1460.774	1459.536	-1.23814	-0.08476
1462.256	1462.811	0.55535	0.037979	1462.256	1462.811	0.55535	0.037979
1459.747	1461.059	1.31198	0.089877	1459.747	1461.059	1.31198	0.089877
1459.093	1459.005	-0.08792	-0.00603	1459.093	1459.005	-0.08792	-0.00603
1463.001	1462.332	-0.66886	-0.04572	1463.001	1462.332	-0.66886	-0.04572
1464.323	1464.574	0.2509	0.017134	1464.323	1464.574	0.2509	0.017134
1464.866	1464.193	-0.6735	-0.04598	1464.866	1464.193	-0.6735	-0.04598
1465.353	1464.478	-0.87431	-0.05967	1465.353	1464.478	-0.87431	-0.05967
1466.474	1465.525	-0.94903	-0.06472	1466.474	1465.525	-0.94903	-0.06472
1464.404	1465.247	0.84288	0.057558	1464.404	1465.247	0.84288	0.057558
1462.775	1462.916	0.14024	0.009587	1462.775	1462.916	0.14024	0.009587
1465.42	1464.357	-1.06263	-0.07251	1465.42	1464.357	-1.06263	-0.07251

1464.691	1464.371	-0.3197	-0.02183	1464.691	1464.371	-0.3197	-0.02183
1465.277	1465.08	-0.19726	-0.01346	1465.277	1465.08	-0.19726	-0.01346
1464.759	1466.369	1.61014	0.109925	1464.759	1466.369	1.61014	0.109925
1465.771	1464.809	-0.96157	-0.0656	1465.771	1464.809	-0.96157	-0.0656
1464.486	1464.988	0.50245	0.034309	1464.486	1464.988	0.50245	0.034309
1463.897	1463.357	-0.54044	-0.03692	1463.897	1463.357	-0.54044	-0.03692
1464.646	1463.286	-1.35991	-0.09285	1464.646	1463.286	-1.35991	-0.09285
1464.52	1463.081	-1.43908	-0.09826	1464.52	1463.081	-1.43908	-0.09826
1464.192	1463.211	-0.9802	-0.06694	1464.192	1463.211	-0.9802	-0.06694
1463.37	1463.283	-0.08687	-0.00594	1463.37	1463.283	-0.08687	-0.00594
1462.016	1462.389	0.37301	0.025513	1462.016	1462.389	0.37301	0.025513
1463.451	1462.381	-1.06999	-0.07311	1463.451	1462.381	-1.06999	-0.07311
1461.049	1462.057	1.00742	0.068952	1461.049	1462.057	1.00742	0.068952
1460.447	1459.665	-0.78213	-0.05355	1460.447	1459.665	-0.78213	-0.05355
1459.365	1459.602	0.23742	0.016269	1459.365	1459.602	0.23742	0.016269
1460.132	1458.753	-1.37853	-0.09441	1460.132	1458.753	-1.37853	-0.09441
1458.724	1458.461	-0.26322	-0.01804	1458.724	1458.461	-0.26322	-0.01804
1459.22	1458.32	-0.90065	-0.06172	1459.22	1458.32	-0.90065	-0.06172
1459.719	1458.514	-1.20551	-0.08259	1459.719	1458.514	-1.20551	-0.08259
1461.129	1459.919	-1.21003	-0.08281	1461.129	1459.919	-1.21003	-0.08281
1459.687	1460.11	0.42291	0.028973	1459.687	1460.11	0.42291	0.028973
1459.105	1458.375	-0.72951	-0.05	1459.105	1458.375	-0.72951	-0.05
1459.383	1458.554	-0.82859	-0.05678	1459.383	1458.554	-0.82859	-0.05678
1460.187	1458.781	-1.40602	-0.09629	1460.187	1458.781	-1.40602	-0.09629
1461.279	1459.888	-1.39071	-0.09517	1461.279	1459.888	-1.39071	-0.09517
1462.054	1460.62	-1.43439	-0.09811	1462.054	1460.62	-1.43439	-0.09811
1460.919	1460.612	-0.30707	-0.02102	1460.919	1460.612	-0.30707	-0.02102
1460.743	1460.331	-0.41194	-0.0282	1460.743	1460.331	-0.41194	-0.0282
1455.967	1459.168	3.20052	0.219821	1455.967	1459.168	3.20052	0.219821
1451.733	1454.611	2.87821	0.19826	1451.733	1454.611	2.87821	0.19826
1454.999	1453.856	-1.14353	-0.07859	1454.999	1453.856	-1.14353	-0.07859
1451.83	1455.181	3.35113	0.230821	1451.83	1455.181	3.35113	0.230821
1448.313	1450.977	2.66346	0.183901	1448.313	1450.977	2.66346	0.183901
1446.556	1446.773	0.21684	0.01499	1446.556	1446.773	0.21684	0.01499
1450.653	1450.851	0.19799	0.013648	1450.653	1450.851	0.19799	0.013648

1452.541	1451.286	-1.25538	-0.08643	1452.541	1451.286	-1.25538	-0.08643
1452.064	1451.731	-0.33321	-0.02295	1452.064	1451.731	-0.33321	-0.02295
1450.131	1452.645	2.51378	0.173349	1450.131	1452.645	2.51378	0.173349
1448.656	1448.523	-0.13315	-0.00919	1448.656	1448.523	-0.13315	-0.00919
1446.408	1447.171	0.76266	0.052728	1446.408	1447.171	0.76266	0.052728
1445.499	1445.159	-0.33977	-0.02351	1445.499	1445.159	-0.33977	-0.02351
1442.443	1443.994	1.5507	0.107505	1442.443	1443.994	1.5507	0.107505
1444.199	1443.439	-0.75945	-0.05259	1444.199	1443.439	-0.75945	-0.05259
1443.317	1443.493	0.17615	0.012205	1443.317	1443.493	0.17615	0.012205
1443.103	1442.032	-1.07171	-0.07426	1443.103	1442.032	-1.07171	-0.07426
1442.876	1442.776	-0.09952	-0.0069	1442.876	1442.776	-0.09952	-0.0069
1445.894	1445.193	-0.70075	-0.04846	1445.894	1445.193	-0.70075	-0.04846
1448.47	1447.316	-1.15383	-0.07966	1448.47	1447.316	-1.15383	-0.07966
1446.997	1447.029	0.03208	0.002217	1446.997	1447.029	0.03208	0.002217
1447.152	1446.882	-0.26981	-0.01864	1447.152	1446.882	-0.26981	-0.01864
1445.226	1446.064	0.83772	0.057965	1445.226	1446.064	0.83772	0.057965
1446.1	1444.793	-1.3069	-0.09037	1446.1	1444.793	-1.3069	-0.09037
1445.025	1445.082	0.05661	0.003918	1445.025	1445.082	0.05661	0.003918
1444.509	1444.056	-0.4534	-0.03139	1444.509	1444.056	-0.4534	-0.03139
1443.038	1443.395	0.35774	0.024791	1443.038	1443.395	0.35774	0.024791
1442.768	1441.865	-0.90231	-0.06254	1442.768	1441.865	-0.90231	-0.06254
1443.371	1442.463	-0.9078	-0.06289	1443.371	1442.463	-0.9078	-0.06289
1442.103	1441.952	-0.15096	-0.01047	1442.103	1441.952	-0.15096	-0.01047
1441.157	1440.758	-0.39838	-0.02764	1441.157	1440.758	-0.39838	-0.02764
1440.941	1440.803	-0.1372	-0.00952	1440.941	1440.803	-0.1372	-0.00952
1438.903	1439.505	0.60203	0.04184	1438.903	1439.505	0.60203	0.04184
1438.58	1437.584	-0.9958	-0.06922	1438.58	1437.584	-0.9958	-0.06922
1439.237	1439.198	-0.03889	-0.0027	1439.237	1439.198	-0.03889	-0.0027
1438.095	1437.947	-0.14815	-0.0103	1438.095	1437.947	-0.14815	-0.0103
1438.467	1437.167	-1.29968	-0.09035	1438.467	1437.167	-1.29968	-0.09035
1436.588	1437.5	0.91243	0.063514	1436.588	1437.5	0.91243	0.063514
1436.683	1436.077	-0.60583	-0.04217	1436.683	1436.077	-0.60583	-0.04217
1436.14	1435.387	-0.75237	-0.05239	1436.14	1435.387	-0.75237	-0.05239
1435.437	1435.593	0.15598	0.010866	1435.437	1435.593	0.15598	0.010866
1433.7	1434.141	0.44158	0.0308	1433.7	1434.141	0.44158	0.0308

1432.718	1432.439	-0.27859	-0.01944	1432.718	1432.439	-0.27859	-0.01944
1432.974	1431.948	-1.02602	-0.0716	1432.974	1431.948	-1.02602	-0.0716
1434.417	1433.32	-1.09661	-0.07645	1434.417	1433.32	-1.09661	-0.07645
1435.276	1434.106	-1.1696	-0.08149	1435.276	1434.106	-1.1696	-0.08149
1442.535	1447.979	5.44436	0.377416	1442.535	1447.979	5.44436	0.377416
1440.863	1442.096	1.23342	0.085603	1440.863	1442.096	1.23342	0.085603
1438.802	1441.193	2.39122	0.166195	1438.802	1441.193	2.39122	0.166195
1441.512	1440.408	-1.10325	-0.07653	1441.512	1440.408	-1.10325	-0.07653
1442.57	1442.63	0.06076	0.004212	1442.57	1442.63	0.06076	0.004212
1439.352	1441.426	2.07429	0.144113	1439.352	1441.426	2.07429	0.144113
1443.751	1443.079	-0.67198	-0.04654	1443.751	1443.079	-0.67198	-0.04654
1443.177	1444.377	1.20024	0.083167	1443.177	1444.377	1.20024	0.083167
1444.101	1444.11	0.00836	0.000579	1444.101	1444.11	0.00836	0.000579
1440.921	1442.621	1.69958	0.117951	1440.921	1442.621	1.69958	0.117951
1440.966	1439.77	-1.1959	-0.08299	1440.966	1439.77	-1.1959	-0.08299
1438.438	1440.047	1.60868	0.111835	1438.438	1440.047	1.60868	0.111835
1438.869	1438.609	-0.25948	-0.01803	1438.869	1438.609	-0.25948	-0.01803
1435.807	1437.79	1.98364	0.138155	1435.807	1437.79	1.98364	0.138155
1436.671	1435.592	-1.07843	-0.07506	1436.671	1435.592	-1.07843	-0.07506
1436.339	1436.249	-0.08967	-0.00624	1436.339	1436.249	-0.08967	-0.00624
1437.396	1436.202	-1.19414	-0.08308	1437.396	1436.202	-1.19414	-0.08308
1437.675	1437.065	-0.61	-0.04243	1437.675	1437.065	-0.61	-0.04243
1436.282	1437.025	0.74245	0.051692	1436.282	1437.025	0.74245	0.051692
1437.764	1436.962	-0.80182	-0.05577	1437.764	1436.962	-0.80182	-0.05577
1437.932	1437.085	-0.84684	-0.05889	1437.932	1437.085	-0.84684	-0.05889
1436.936	1436.952	0.01612	0.001122	1436.936	1436.952	0.01612	0.001122
1435.945	1435.506	-0.4393	-0.03059	1435.945	1435.506	-0.4393	-0.03059
1434.782	1434.991	0.20946	0.014599	1434.782	1434.991	0.20946	0.014599
1437.12	1436.433	-0.687	-0.0478	1437.12	1436.433	-0.687	-0.0478
1437.707	1436.616	-1.09124	-0.0759	1437.707	1436.616	-1.09124	-0.0759
1437.995	1436.908	-1.08675	-0.07557	1437.995	1436.908	-1.08675	-0.07557
1439.509	1438.605	-0.90336	-0.06275	1439.509	1438.605	-0.90336	-0.06275
1440.466	1439.381	-1.08528	-0.07534	1440.466	1439.381	-1.08528	-0.07534
1441.105	1440.126	-0.97857	-0.0679	1441.105	1440.126	-0.97857	-0.0679
1442.65	1441.325	-1.32423	-0.09179	1442.65	1441.325	-1.32423	-0.09179

1445.326	1444.11	-1.21575	-0.08412	1445.326	1444.11	-1.21575	-0.08412
1445.72	1444.26	-1.46036	-0.10101	1445.72	1444.26	-1.46036	-0.10101
1446.538	1445.136	-1.40199	-0.09692	1446.538	1445.136	-1.40199	-0.09692
1448.281	1447.055	-1.22552	-0.08462	1448.281	1447.055	-1.22552	-0.08462
1452.809	1451.839	-0.97014	-0.06678	1452.809	1451.839	-0.97014	-0.06678
1456.153	1455.099	-1.05422	-0.0724	1456.153	1455.099	-1.05422	-0.0724
1453.486	1454.27	0.78361	0.053912	1453.486	1454.27	0.78361	0.053912
1453.804	1453.307	-0.49686	-0.03418	1453.804	1453.307	-0.49686	-0.03418
1453.115	1452.417	-0.69797	-0.04803	1453.115	1452.417	-0.69797	-0.04803
1452.39	1451.793	-0.59707	-0.04111	1452.39	1451.793	-0.59707	-0.04111
1451.474	1450.825	-0.6494	-0.04474	1451.474	1450.825	-0.6494	-0.04474
1451.867	1450.331	-1.53559	-0.10577	1451.867	1450.331	-1.53559	-0.10577
1451.577	1450.397	-1.17997	-0.08129	1451.577	1450.397	-1.17997	-0.08129
1451.162	1450.349	-0.81379	-0.05608	1451.162	1450.349	-0.81379	-0.05608
1451.793	1450.387	-1.40551	-0.09681	1451.793	1450.387	-1.40551	-0.09681
1453.211	1451.756	-1.45528	-0.10014	1453.211	1451.756	-1.45528	-0.10014
1452.98	1451.973	-1.00694	-0.0693	1452.98	1451.973	-1.00694	-0.0693
1446.907	1455.008	8.10154	0.559921	1446.907	1455.008	8.10154	0.559921
1439.038	1445.963	6.92498	0.481223	1439.038	1445.963	6.92498	0.481223
1438.677	1439.405	0.72728	0.050552	1438.677	1439.405	0.72728	0.050552
1436.445	1437.961	1.51543	0.105499	1436.445	1437.961	1.51543	0.105499
1435.581	1436.744	1.16301	0.081013	1435.581	1436.744	1.16301	0.081013
1441.975	1441.103	-0.8729	-0.06054	1441.975	1441.103	-0.8729	-0.06054
1445.815	1446.034	0.21832	0.0151	1445.815	1446.034	0.21832	0.0151
1443.045	1444.259	1.21469	0.084175	1443.045	1444.259	1.21469	0.084175
1443.482	1442.084	-1.39748	-0.09681	1443.482	1442.084	-1.39748	-0.09681
1439.307	1441.785	2.47823	0.172182	1439.307	1441.785	2.47823	0.172182
1441.459	1440.709	-0.7498	-0.05202	1441.459	1440.709	-0.7498	-0.05202
1444.346	1443.825	-0.52127	-0.03609	1444.346	1443.825	-0.52127	-0.03609
1445.403	1444.132	-1.27124	-0.08795	1445.403	1444.132	-1.27124	-0.08795
1449.223	1448.719	-0.50431	-0.0348	1449.223	1448.719	-0.50431	-0.0348
1448.558	1447.843	-0.71416	-0.0493	1448.558	1447.843	-0.71416	-0.0493
1448.793	1448.478	-0.31491	-0.02174	1448.793	1448.478	-0.31491	-0.02174
1448.244	1447.319	-0.92565	-0.06392	1448.244	1447.319	-0.92565	-0.06392
1446.097	1446.749	0.65191	0.045081	1446.097	1446.749	0.65191	0.045081

1446.248	1445.084	-1.16382	-0.08047	1446.248	1445.084	-1.16382	-0.08047
1445.007	1444.767	-0.23936	-0.01656	1445.007	1444.767	-0.23936	-0.01656
1444.14	1444.111	-0.02951	-0.00204	1444.14	1444.111	-0.02951	-0.00204
1445.092	1443.96	-1.13195	-0.07833	1445.092	1443.96	-1.13195	-0.07833
1445.498	1444.175	-1.32336	-0.09155	1445.498	1444.175	-1.32336	-0.09155
1444.738	1444.113	-0.62546	-0.04329	1444.738	1444.113	-0.62546	-0.04329
1442.294	1444.083	1.78956	0.124077	1442.294	1444.083	1.78956	0.124077
1439.828	1440.962	1.13352	0.078726	1439.828	1440.962	1.13352	0.078726
1438.315	1438.15	-0.16534	-0.0115	1438.315	1438.15	-0.16534	-0.0115
1437.291	1437.065	-0.22645	-0.01576	1437.291	1437.065	-0.22645	-0.01576
1437.116	1436.884	-0.23265	-0.01619	1437.116	1436.884	-0.23265	-0.01619
1434.375	1435.494	1.11904	0.078016	1434.375	1435.494	1.11904	0.078016
1435.36	1434.32	-1.04007	-0.07246	1435.36	1434.32	-1.04007	-0.07246
1434.273	1433.931	-0.34164	-0.02382	1434.273	1433.931	-0.34164	-0.02382
1431.992	1432.683	0.6904	0.048213	1431.992	1432.683	0.6904	0.048213
1433.072	1431.824	-1.24828	-0.08711	1433.072	1431.824	-1.24828	-0.08711
1433.914	1433.19	-0.72389	-0.05048	1433.914	1433.19	-0.72389	-0.05048
1433.797	1432.929	-0.86785	-0.06053	1433.797	1432.929	-0.86785	-0.06053
1432.714	1432.413	-0.30064	-0.02098	1432.714	1432.413	-0.30064	-0.02098
1433.842	1432.819	-1.02296	-0.07134	1433.842	1432.819	-1.02296	-0.07134
1434.667	1433.732	-0.93514	-0.06518	1434.667	1433.732	-0.93514	-0.06518
1433.459	1433.196	-0.26288	-0.01834	1433.459	1433.196	-0.26288	-0.01834
1432.985	1432.79	-0.1958	-0.01366	1432.985	1432.79	-0.1958	-0.01366
1431.584	1431.7	0.11569	0.008081	1431.584	1431.7	0.11569	0.008081
1432.6	1431.914	-0.68514	-0.04782	1432.6	1431.914	-0.68514	-0.04782
1433.67	1433.442	-0.22765	-0.01588	1433.67	1433.442	-0.22765	-0.01588
1430.301	1432.401	2.10055	0.146861	1430.301	1432.401	2.10055	0.146861
1430.624	1429.557	-1.06692	-0.07458	1430.624	1429.557	-1.06692	-0.07458
1430.461	1429.698	-0.76277	-0.05332	1430.461	1429.698	-0.76277	-0.05332
1429.888	1429.576	-0.3121	-0.02183	1429.888	1429.576	-0.3121	-0.02183
1433.345	1433.22	-0.12554	-0.00876	1433.345	1433.22	-0.12554	-0.00876
1435.676	1435.011	-0.66504	-0.04632	1435.676	1435.011	-0.66504	-0.04632
1431.549	1434.178	2.62915	0.183658	1431.549	1434.178	2.62915	0.183658
1434.161	1435.101	0.94054	0.065581	1434.161	1435.101	0.94054	0.065581
1433.632	1433.058	-0.5735	-0.04	1433.632	1433.058	-0.5735	-0.04

1439.934	1439.127	-0.80684	-0.05603	1439.934	1439.127	-0.80684	-0.05603
1447.328	1446.678	-0.64981	-0.0449	1447.328	1446.678	-0.64981	-0.0449
1445.363	1448.04	2.6768	0.185199	1445.363	1448.04	2.6768	0.185199
1445.077	1444.526	-0.55086	-0.03812	1445.077	1444.526	-0.55086	-0.03812
1442.24	1443.953	1.71347	0.118806	1442.24	1443.953	1.71347	0.118806
1445.423	1445.096	-0.32779	-0.02268	1445.423	1445.096	-0.32779	-0.02268
1446.606	1445.209	-1.39635	-0.09653	1446.606	1445.209	-1.39635	-0.09653
1446.698	1445.733	-0.96443	-0.06666	1446.698	1445.733	-0.96443	-0.06666
1449.202	1447.941	-1.2615	-0.08705	1449.202	1447.941	-1.2615	-0.08705
1450.499	1449.179	-1.31939	-0.09096	1450.499	1449.179	-1.31939	-0.09096
1448.175	1450.543	2.36837	0.163542	1448.175	1450.543	2.36837	0.163542
1446.55	1447.573	1.02345	0.070751	1446.55	1447.573	1.02345	0.070751
1444.431	1445.22	0.78906	0.054628	1444.431	1445.22	0.78906	0.054628
1443.296	1442.99	-0.30621	-0.02122	1443.296	1442.99	-0.30621	-0.02122
1444.236	1443.478	-0.7577	-0.05246	1444.236	1443.478	-0.7577	-0.05246
1443.803	1444.178	0.37443	0.025934	1443.803	1444.178	0.37443	0.025934
1444.382	1444.381	-0.00127	-8.8E-05	1444.382	1444.381	-0.00127	-8.8E-05
1442.956	1442.862	-0.09419	-0.00653	1442.956	1442.862	-0.09419	-0.00653
1443.19	1442.414	-0.77581	-0.05376	1443.19	1442.414	-0.77581	-0.05376
1445.634	1444.518	-1.11539	-0.07716	1445.634	1444.518	-1.11539	-0.07716
1445.071	1444.692	-0.37879	-0.02621	1445.071	1444.692	-0.37879	-0.02621
1444.349	1443.63	-0.71921	-0.04979	1444.349	1443.63	-0.71921	-0.04979
1448.083	1446.947	-1.13507	-0.07838	1448.083	1446.947	-1.13507	-0.07838
1447.686	1447.171	-0.51486	-0.03556	1447.686	1447.171	-0.51486	-0.03556
1448.506	1447.167	-1.33829	-0.09239	1448.506	1447.167	-1.33829	-0.09239
1447.222	1447.43	0.20779	0.014358	1447.222	1447.43	0.20779	0.014358
1446.518	1446.681	0.16321	0.011283	1446.518	1446.681	0.16321	0.011283
1445.405	1445.132	-0.27278	-0.01887	1445.405	1445.132	-0.27278	-0.01887
1443.863	1443.768	-0.09503	-0.00658	1443.863	1443.768	-0.09503	-0.00658
1444.242	1443.059	-1.18299	-0.08191	1444.242	1443.059	-1.18299	-0.08191
1444.355	1443.192	-1.16274	-0.0805	1444.355	1443.192	-1.16274	-0.0805
1441.608	1442.809	1.20132	0.083332	1441.608	1442.809	1.20132	0.083332
1440.069	1441.169	1.10038	0.076412	1440.069	1441.169	1.10038	0.076412
1440.764	1439.662	-1.10263	-0.07653	1440.764	1439.662	-1.10263	-0.07653
1440.923	1440.261	-0.66205	-0.04595	1440.923	1440.261	-0.66205	-0.04595

1441.814	1440.486	-1.32765	-0.09208	1441.814	1440.486	-1.32765	-0.09208
1440.958	1440.669	-0.28923	-0.02007	1440.958	1440.669	-0.28923	-0.02007
1442.971	1441.756	-1.21497	-0.0842	1442.971	1441.756	-1.21497	-0.0842
1440.913	1441.474	0.56114	0.038943	1440.913	1441.474	0.56114	0.038943
1441.044	1440.552	-0.49195	-0.03414	1441.044	1440.552	-0.49195	-0.03414
1440.128	1439.541	-0.58674	-0.04074	1440.128	1439.541	-0.58674	-0.04074
1439.424	1438.922	-0.50168	-0.03485	1439.424	1438.922	-0.50168	-0.03485
1440.307	1439.039	-1.26829	-0.08806	1440.307	1439.039	-1.26829	-0.08806
1458.747	1458.634	-0.11275	-0.00773	1458.747	1458.634	-0.11275	-0.00773
1461.84	1461.375	-0.46474	-0.03179	1461.84	1461.375	-0.46474	-0.03179
1462.884	1465.26	2.37657	0.162458	1462.884	1465.26	2.37657	0.162458
1457.926	1461.564	3.63752	0.2495	1457.926	1461.564	3.63752	0.2495
1461.519	1461.444	-0.0748	-0.00512	1461.519	1461.444	-0.0748	-0.00512
1462.761	1464.254	1.49323	0.102083	1462.761	1464.254	1.49323	0.102083
1461.972	1461.609	-0.36248	-0.02479	1461.972	1461.609	-0.36248	-0.02479
1460.203	1462.848	2.64479	0.181125	1460.203	1462.848	2.64479	0.181125
1462.74	1461.839	-0.9018	-0.06165	1462.74	1461.839	-0.9018	-0.06165
1465.559	1465.331	-0.22864	-0.0156	1465.559	1465.331	-0.22864	-0.0156
1470.169	1469.287	-0.88229	-0.06001	1470.169	1469.287	-0.88229	-0.06001
1469.113	1468.64	-0.47232	-0.03215	1469.113	1468.64	-0.47232	-0.03215
1468.932	1468.382	-0.54961	-0.03742	1468.932	1468.382	-0.54961	-0.03742
1470.139	1470.246	0.10717	0.00729	1470.139	1470.246	0.10717	0.00729
1471.057	1470.377	-0.68074	-0.04628	1471.057	1470.377	-0.68074	-0.04628
1470.145	1469.97	-0.1755	-0.01194	1470.145	1469.97	-0.1755	-0.01194
1471.93	1470.688	-1.24106	-0.08432	1471.93	1470.688	-1.24106	-0.08432
1473.274	1472.682	-0.59156	-0.04015	1473.274	1472.682	-0.59156	-0.04015
1473.165	1472.269	-0.89586	-0.06081	1473.165	1472.269	-0.89586	-0.06081
1474.94	1473.867	-1.07333	-0.07277	1474.94	1473.867	-1.07333	-0.07277
1476.664	1476.125	-0.53844	-0.03646	1476.664	1476.125	-0.53844	-0.03646
1475.592	1475.821	0.22922	0.015534	1475.592	1475.821	0.22922	0.015534
1477.26	1475.872	-1.38764	-0.09393	1477.26	1475.872	-1.38764	-0.09393
1476.945	1476.855	-0.09027	-0.00611	1476.945	1476.855	-0.09027	-0.00611
1477.652	1476.873	-0.77842	-0.05268	1477.652	1476.873	-0.77842	-0.05268

附录 E 问题四的数据和代码

```
for j=1:10000
for i=1:912
t(i)=0;
price(i)=0;
out(i)=0;
p(i)=0;
n(j,i)=int8(0);

end
pMAX=0;
t(1)=1000000;
for i=1:911
p(i)=rand(1);
if profit(i)<0&t(i)>0 %股价下跌且有钱
n_max=int8(t(i)/nowp(i)); %最大可买股数
if p(i)>=0.75 &n_max>=1 %买入
n_temp=int8(rand(1)*double(n_max));%生成买几股
n(j,i+1)=n(j,i)+n_temp;
out(i)=n_temp*nowp(i);
t(i+1)=t(i)-out(i)-0.003*abs(out(i));
end
if p(i)<0.75 %啥也不干
out(i)=0;
t(i+1)=t(i);%还是原来的交易额
n(j,i+1)=n(j,i);
end

elseif profit(i)>=0&n(j,i)>0 %股价增长且有股
if p(i)>=0.75 %卖出
n_max=n(j,i);
n_temp=int8(rand(1)*double(n_max));
n(j,i+1)=n(j,i)-n_temp;
out(i)=n_temp*nowp(i);
t(i+1)=t(i)+out(i)-0.003*abs(out(i));
end
```

```

if p(i)<0.75 %啥也不干
out(i)=0;
t(i+1)=t(i);%还是原来的交易额
n(j,i+1)=n(j,i);
end
else
out(i)=0;
t(i+1)=t(i);%还是原来的交易额
n(j,i+1)=n(j,i);
end
num=double(n(j,i+1));

handing(j,i)=num*nowp(i)+t(i+1);

if num*nowp(i)+t(i+1) > pMAX
pMAX=num*nowp(i)+t(i+1);
MaxI=i;
end
end
total_max(j)= pMAX;
total_maxi(j)=MaxI;
end

total_max=total_max';
total_maxi=total_maxi';

max1=max(total_max);
max_t=numel(find(total_max==max1));

```

表 18 一月预测收益率

时间	收益率	时间	收益量
2022-1-4 9:35		2022-1-17 13:05	-0.03%
2022-1-4 9:40	-0.24%	2022-1-17 13:10	-0.01%
2022-1-4 9:45	-0.10%	2022-1-17 13:15	-0.06%
2022-1-4 9:50	-0.32%	2022-1-17 13:20	-0.01%
2022-1-4 9:55	-0.17%	2022-1-17 13:25	0.04%

2022-1-4 10:00	-0.19%	2022-1-17 13:30	0.10%
2022-1-4 10:05	-0.25%	2022-1-17 13:35	0.01%
2022-1-4 10:10	-0.32%	2022-1-17 13:40	0.00%
2022-1-4 10:15	-0.29%	2022-1-17 13:45	0.09%
2022-1-4 10:20	0.16%	2022-1-17 13:50	-0.03%
2022-1-4 10:25	-0.01%	2022-1-17 13:55	0.05%
2022-1-4 10:30	0.07%	2022-1-17 14:00	0.01%
2022-1-4 10:35	-0.19%	2022-1-17 14:05	-0.06%
2022-1-4 10:40	0.06%	2022-1-17 14:10	0.00%
2022-1-4 10:45	0.00%	2022-1-17 14:15	-0.11%
2022-1-4 10:50	0.01%	2022-1-17 14:20	-0.11%
2022-1-4 10:55	-0.04%	2022-1-17 14:25	-0.05%
2022-1-4 11:00	0.08%	2022-1-17 14:30	0.15%
2022-1-4 11:05	-0.13%	2022-1-17 14:35	0.04%
2022-1-4 11:10	-0.16%	2022-1-17 14:40	0.05%
2022-1-4 11:15	0.10%	2022-1-17 14:45	0.03%
2022-1-4 11:20	0.08%	2022-1-17 14:50	-0.01%
2022-1-4 11:25	0.23%	2022-1-17 14:55	-0.06%
2022-1-4 11:30	0.13%	2022-1-17 15:00	0.01%
2022-1-4 13:05	-0.18%	2022-1-18 9:35	-0.10%
2022-1-4 13:10	0.17%	2022-1-18 9:40	1.09%
2022-1-4 13:15	0.08%	2022-1-18 9:45	0.43%
2022-1-4 13:20	0.06%	2022-1-18 9:50	-0.04%
2022-1-4 13:25	0.13%	2022-1-18 9:55	0.03%
2022-1-4 13:30	-0.06%	2022-1-18 10:00	0.40%
2022-1-4 13:35	0.11%	2022-1-18 10:05	0.08%
2022-1-4 13:40	-0.10%	2022-1-18 10:10	0.08%
2022-1-4 13:45	0.16%	2022-1-18 10:15	0.09%
2022-1-4 13:50	-0.06%	2022-1-18 10:20	0.15%
2022-1-4 13:55	-0.06%	2022-1-18 10:25	0.38%
2022-1-4 14:00	0.06%	2022-1-18 10:30	-0.10%
2022-1-4 14:05	-0.09%	2022-1-18 10:35	-0.04%
2022-1-4 14:10	-0.08%	2022-1-18 10:40	-0.16%
2022-1-4 14:15	-0.05%	2022-1-18 10:45	-0.18%
2022-1-4 14:20	-0.04%	2022-1-18 10:50	-0.29%

2022-1-4 14:25	-0.05%	2022-1-18 10:55	-0.12%
2022-1-4 14:30	0.05%	2022-1-18 11:00	0.15%
2022-1-4 14:35	0.06%	2022-1-18 11:05	-0.10%
2022-1-4 14:40	0.00%	2022-1-18 11:10	-0.01%
2022-1-4 14:45	-0.10%	2022-1-18 11:15	-0.03%
2022-1-4 14:50	0.06%	2022-1-18 11:20	-0.07%
2022-1-4 14:55	0.02%	2022-1-18 11:25	-0.07%
2022-1-4 15:00	0.03%	2022-1-18 11:30	0.09%
2022-1-5 9:35	-0.52%	2022-1-18 13:05	-0.19%
2022-1-5 9:40	-0.40%	2022-1-18 13:10	-0.01%
2022-1-5 9:45	0.17%	2022-1-18 13:15	0.00%
2022-1-5 9:50	-0.31%	2022-1-18 13:20	-0.05%
2022-1-5 9:55	-0.55%	2022-1-18 13:25	0.12%
2022-1-5 10:00	-0.38%	2022-1-18 13:30	-0.17%
2022-1-5 10:05	0.01%	2022-1-18 13:35	-0.12%
2022-1-5 10:10	-0.08%	2022-1-18 13:40	0.11%
2022-1-5 10:15	0.18%	2022-1-18 13:45	-0.04%
2022-1-5 10:20	-0.11%	2022-1-18 13:50	0.01%
2022-1-5 10:25	-0.07%	2022-1-18 13:55	-0.01%
2022-1-5 10:30	-0.20%	2022-1-18 14:00	-0.10%
2022-1-5 10:35	0.20%	2022-1-18 14:05	-0.09%
2022-1-5 10:40	-0.23%	2022-1-18 14:10	0.12%
2022-1-5 10:45	0.10%	2022-1-18 14:15	-0.06%
2022-1-5 10:50	-0.12%	2022-1-18 14:20	0.02%
2022-1-5 10:55	0.20%	2022-1-18 14:25	0.00%
2022-1-5 11:00	-0.06%	2022-1-18 14:30	0.10%
2022-1-5 11:05	-0.13%	2022-1-18 14:35	0.01%
2022-1-5 11:10	-0.22%	2022-1-18 14:40	-0.03%
2022-1-5 11:15	-0.09%	2022-1-18 14:45	0.11%
2022-1-5 11:20	-0.13%	2022-1-18 14:50	-0.05%
2022-1-5 11:25	-0.03%	2022-1-18 14:55	0.03%
2022-1-5 11:30	-0.14%	2022-1-18 15:00	-0.03%
2022-1-5 13:05	-0.17%	2022-1-19 9:35	0.08%
2022-1-5 13:10	-0.22%	2022-1-19 9:40	-0.06%
2022-1-5 13:15	0.10%	2022-1-19 9:45	0.01%

2022-1-5 13:20	-0.01%	2022-1-19 9:50	-0.60%
2022-1-5 13:25	-0.32%	2022-1-19 9:55	-0.32%
2022-1-5 13:30	-0.05%	2022-1-19 10:00	0.33%
2022-1-5 13:35	-0.07%	2022-1-19 10:05	0.05%
2022-1-5 13:40	0.07%	2022-1-19 10:10	0.24%
2022-1-5 13:45	0.02%	2022-1-19 10:15	-0.02%
2022-1-5 13:50	-0.18%	2022-1-19 10:20	-0.09%
2022-1-5 13:55	0.00%	2022-1-19 10:25	0.05%
2022-1-5 14:00	-0.08%	2022-1-19 10:30	0.02%
2022-1-5 14:05	0.17%	2022-1-19 10:35	-0.09%
2022-1-5 14:10	0.30%	2022-1-19 10:40	-0.18%
2022-1-5 14:15	0.09%	2022-1-19 10:45	-0.12%
2022-1-5 14:20	-0.01%	2022-1-19 10:50	-0.16%
2022-1-5 14:25	-0.07%	2022-1-19 10:55	-0.14%
2022-1-5 14:30	0.00%	2022-1-19 11:00	-0.02%
2022-1-5 14:35	0.01%	2022-1-19 11:05	-0.11%
2022-1-5 14:40	-0.02%	2022-1-19 11:10	-0.09%
2022-1-5 14:45	0.03%	2022-1-19 11:15	0.28%
2022-1-5 14:50	0.03%	2022-1-19 11:20	0.12%
2022-1-5 14:55	0.03%	2022-1-19 11:25	-0.05%
2022-1-5 15:00	-0.07%	2022-1-19 11:30	-0.02%
2022-1-6 9:35	-0.38%	2022-1-19 13:05	-0.09%
2022-1-6 9:40	-0.26%	2022-1-19 13:10	-0.11%
2022-1-6 9:45	-0.57%	2022-1-19 13:15	0.05%
2022-1-6 9:50	-0.23%	2022-1-19 13:20	-0.09%
2022-1-6 9:55	0.05%	2022-1-19 13:25	0.05%
2022-1-6 10:00	0.07%	2022-1-19 13:30	-0.01%
2022-1-6 10:05	-0.13%	2022-1-19 13:35	-0.14%
2022-1-6 10:10	-0.29%	2022-1-19 13:40	-0.07%
2022-1-6 10:15	-0.32%	2022-1-19 13:45	-0.15%
2022-1-6 10:20	-0.20%	2022-1-19 13:50	-0.04%
2022-1-6 10:25	-0.08%	2022-1-19 13:55	0.07%
2022-1-6 10:30	-0.08%	2022-1-19 14:00	-0.11%
2022-1-6 10:35	0.52%	2022-1-19 14:05	-0.09%
2022-1-6 10:40	-0.13%	2022-1-19 14:10	0.13%

2022-1-6 10:45	0.03%	2022-1-19 14:15	-0.11%
2022-1-6 10:50	0.12%	2022-1-19 14:20	-0.08%
2022-1-6 10:55	0.05%	2022-1-19 14:25	0.10%
2022-1-6 11:00	0.05%	2022-1-19 14:30	0.15%
2022-1-6 11:05	0.26%	2022-1-19 14:35	0.18%
2022-1-6 11:10	0.06%	2022-1-19 14:40	0.04%
2022-1-6 11:15	-0.01%	2022-1-19 14:45	0.07%
2022-1-6 11:20	0.06%	2022-1-19 14:50	0.17%
2022-1-6 11:25	0.16%	2022-1-19 14:55	-0.08%
2022-1-6 11:30	0.04%	2022-1-19 15:00	-0.05%
2022-1-6 13:05	-0.16%	2022-1-20 9:35	-0.39%
2022-1-6 13:10	0.06%	2022-1-20 9:40	0.45%
2022-1-6 13:15	0.01%	2022-1-20 9:45	0.18%
2022-1-6 13:20	0.11%	2022-1-20 9:50	0.60%
2022-1-6 13:25	0.20%	2022-1-20 9:55	-0.56%
2022-1-6 13:30	-0.02%	2022-1-20 10:00	-0.24%
2022-1-6 13:35	-0.06%	2022-1-20 10:05	0.24%
2022-1-6 13:40	-0.11%	2022-1-20 10:10	0.13%
2022-1-6 13:45	-0.09%	2022-1-20 10:15	-0.11%
2022-1-6 13:50	0.07%	2022-1-20 10:20	-0.05%
2022-1-6 13:55	-0.09%	2022-1-20 10:25	-0.07%
2022-1-6 14:00	0.02%	2022-1-20 10:30	-0.18%
2022-1-6 14:05	-0.08%	2022-1-20 10:35	-0.05%
2022-1-6 14:10	-0.11%	2022-1-20 10:40	-0.13%
2022-1-6 14:15	-0.13%	2022-1-20 10:45	-0.25%
2022-1-6 14:20	0.01%	2022-1-20 10:50	0.11%
2022-1-6 14:25	-0.09%	2022-1-20 10:55	0.08%
2022-1-6 14:30	-0.06%	2022-1-20 11:00	-0.14%
2022-1-6 14:35	-0.05%	2022-1-20 11:05	-0.08%
2022-1-6 14:40	0.03%	2022-1-20 11:10	0.15%
2022-1-6 14:45	0.00%	2022-1-20 11:15	-0.04%
2022-1-6 14:50	-0.01%	2022-1-20 11:20	0.35%
2022-1-6 14:55	0.00%	2022-1-20 11:25	0.22%
2022-1-6 15:00	0.00%	2022-1-20 11:30	0.00%
2022-1-7 9:35	0.55%	2022-1-20 13:05	0.00%

2022-1-7 9:40	0.33%	2022-1-20 13:10	-0.25%
2022-1-7 9:45	-0.29%	2022-1-20 13:15	-0.07%
2022-1-7 9:50	-0.09%	2022-1-20 13:20	0.00%
2022-1-7 9:55	0.15%	2022-1-20 13:25	0.06%
2022-1-7 10:00	-0.11%	2022-1-20 13:30	-0.16%
2022-1-7 10:05	-0.17%	2022-1-20 13:35	0.00%
2022-1-7 10:10	-0.34%	2022-1-20 13:40	0.01%
2022-1-7 10:15	-0.24%	2022-1-20 13:45	0.01%
2022-1-7 10:20	-0.16%	2022-1-20 13:50	-0.18%
2022-1-7 10:25	0.20%	2022-1-20 13:55	0.03%
2022-1-7 10:30	0.04%	2022-1-20 14:00	-0.03%
2022-1-7 10:35	-0.04%	2022-1-20 14:05	0.00%
2022-1-7 10:40	-0.05%	2022-1-20 14:10	-0.07%
2022-1-7 10:45	-0.16%	2022-1-20 14:15	0.05%
2022-1-7 10:50	-0.08%	2022-1-20 14:20	0.20%
2022-1-7 10:55	-0.04%	2022-1-20 14:25	-0.09%
2022-1-7 11:00	0.17%	2022-1-20 14:30	-0.06%
2022-1-7 11:05	-0.20%	2022-1-20 14:35	-0.09%
2022-1-7 11:10	0.02%	2022-1-20 14:40	0.06%
2022-1-7 11:15	-0.12%	2022-1-20 14:45	0.06%
2022-1-7 11:20	0.24%	2022-1-20 14:50	-0.06%
2022-1-7 11:25	-0.12%	2022-1-20 14:55	0.02%
2022-1-7 11:30	-0.01%	2022-1-20 15:00	-0.01%
2022-1-7 13:05	-0.05%	2022-1-21 9:35	-0.45%
2022-1-7 13:10	0.28%	2022-1-21 9:40	0.26%
2022-1-7 13:15	0.32%	2022-1-21 9:45	-0.01%
2022-1-7 13:20	0.25%	2022-1-21 9:50	-0.17%
2022-1-7 13:25	-0.08%	2022-1-21 9:55	0.29%
2022-1-7 13:30	-0.19%	2022-1-21 10:00	-0.41%
2022-1-7 13:35	0.00%	2022-1-21 10:05	0.02%
2022-1-7 13:40	-0.15%	2022-1-21 10:10	-0.32%
2022-1-7 13:45	-0.13%	2022-1-21 10:15	-0.11%
2022-1-7 13:50	-0.05%	2022-1-21 10:20	-0.06%
2022-1-7 13:55	-0.03%	2022-1-21 10:25	0.20%
2022-1-7 14:00	0.05%	2022-1-21 10:30	-0.21%

2022-1-7 14:05	-0.21%	2022-1-21 10:35	-0.27%
2022-1-7 14:10	-0.13%	2022-1-21 10:40	0.04%
2022-1-7 14:15	0.09%	2022-1-21 10:45	0.03%
2022-1-7 14:20	-0.11%	2022-1-21 10:50	-0.13%
2022-1-7 14:25	0.02%	2022-1-21 10:55	-0.07%
2022-1-7 14:30	-0.16%	2022-1-21 11:00	0.05%
2022-1-7 14:35	-0.08%	2022-1-21 11:05	0.01%
2022-1-7 14:40	-0.05%	2022-1-21 11:10	-0.25%
2022-1-7 14:45	-0.15%	2022-1-21 11:15	0.16%
2022-1-7 14:50	-0.06%	2022-1-21 11:20	-0.07%
2022-1-7 14:55	0.08%	2022-1-21 11:25	0.14%
2022-1-7 15:00	0.00%	2022-1-21 11:30	-0.05%
2022-1-10 9:35	-0.79%	2022-1-21 13:05	-0.22%
2022-1-10 9:40	-0.59%	2022-1-21 13:10	0.13%
2022-1-10 9:45	-0.58%	2022-1-21 13:15	-0.17%
2022-1-10 9:50	0.70%	2022-1-21 13:20	-0.08%
2022-1-10 9:55	-0.01%	2022-1-21 13:25	0.02%
2022-1-10 10:00	0.56%	2022-1-21 13:30	-0.05%
2022-1-10 10:05	0.30%	2022-1-21 13:35	0.31%
2022-1-10 10:10	0.32%	2022-1-21 13:40	0.06%
2022-1-10 10:15	-0.17%	2022-1-21 13:45	0.15%
2022-1-10 10:20	0.00%	2022-1-21 13:50	0.04%
2022-1-10 10:25	-0.14%	2022-1-21 13:55	-0.15%
2022-1-10 10:30	0.27%	2022-1-21 14:00	-0.09%
2022-1-10 10:35	-0.22%	2022-1-21 14:05	-0.08%
2022-1-10 10:40	-0.10%	2022-1-21 14:10	0.11%
2022-1-10 10:45	0.28%	2022-1-21 14:15	-0.08%
2022-1-10 10:50	0.17%	2022-1-21 14:20	-0.12%
2022-1-10 10:55	-0.03%	2022-1-21 14:25	0.12%
2022-1-10 11:00	0.00%	2022-1-21 14:30	-0.01%
2022-1-10 11:05	0.09%	2022-1-21 14:35	0.06%
2022-1-10 11:10	-0.11%	2022-1-21 14:40	-0.19%
2022-1-10 11:15	-0.13%	2022-1-21 14:45	-0.01%
2022-1-10 11:20	0.15%	2022-1-21 14:50	0.04%
2022-1-10 11:25	-0.01%	2022-1-21 14:55	0.06%

2022-1-10 11:30	0.07%	2022-1-21 15:00	0.05%
2022-1-10 13:05	0.05%	2022-1-24 9:35	0.70%
2022-1-10 13:10	-0.08%	2022-1-24 9:40	-0.10%
2022-1-10 13:15	-0.05%	2022-1-24 9:45	-0.12%
2022-1-10 13:20	-0.05%	2022-1-24 9:50	-0.33%
2022-1-10 13:25	0.00%	2022-1-24 9:55	0.23%
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2022-1-10 13:35	0.01%	2022-1-24 10:05	0.00%
2022-1-10 13:40	-0.02%	2022-1-24 10:10	-0.39%
2022-1-10 13:45	-0.08%	2022-1-24 10:15	-0.07%
2022-1-10 13:50	0.06%	2022-1-24 10:20	-0.06%
2022-1-10 13:55	-0.13%	2022-1-24 10:25	0.24%
2022-1-10 14:00	-0.10%	2022-1-24 10:30	0.08%
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2022-1-10 14:10	-0.01%	2022-1-24 10:40	0.04%
2022-1-10 14:15	-0.07%	2022-1-24 10:45	0.19%
2022-1-10 14:20	0.03%	2022-1-24 10:50	-0.08%
2022-1-10 14:25	0.01%	2022-1-24 10:55	-0.03%
2022-1-10 14:30	0.10%	2022-1-24 11:00	0.15%
2022-1-10 14:35	-0.04%	2022-1-24 11:05	0.10%
2022-1-10 14:40	-0.08%	2022-1-24 11:10	0.02%
2022-1-10 14:45	0.03%	2022-1-24 11:15	-0.03%
2022-1-10 14:50	0.02%	2022-1-24 11:20	-0.08%
2022-1-10 14:55	0.08%	2022-1-24 11:25	0.14%
2022-1-10 15:00	0.03%	2022-1-24 11:30	0.10%
2022-1-11 9:35	-0.32%	2022-1-24 13:05	0.09%
2022-1-11 9:40	0.23%	2022-1-24 13:10	0.09%
2022-1-11 9:45	-0.24%	2022-1-24 13:15	-0.11%
2022-1-11 9:50	-0.30%	2022-1-24 13:20	0.16%
2022-1-11 9:55	0.11%	2022-1-24 13:25	0.06%
2022-1-11 10:00	-0.05%	2022-1-24 13:30	0.12%
2022-1-11 10:05	-0.28%	2022-1-24 13:35	-0.02%
2022-1-11 10:10	-0.18%	2022-1-24 13:40	0.17%
2022-1-11 10:15	0.30%	2022-1-24 13:45	0.02%
2022-1-11 10:20	0.02%	2022-1-24 13:50	-0.28%

2022-1-11 10:25	0.06%	2022-1-24 13:55	-0.04%
2022-1-11 10:30	-0.01%	2022-1-24 14:00	-0.20%
2022-1-11 10:35	-0.25%	2022-1-24 14:05	0.06%
2022-1-11 10:40	-0.15%	2022-1-24 14:10	0.07%
2022-1-11 10:45	-0.04%	2022-1-24 14:15	-0.14%
2022-1-11 10:50	-0.17%	2022-1-24 14:20	-0.01%
2022-1-11 10:55	0.09%	2022-1-24 14:25	-0.04%
2022-1-11 11:00	-0.04%	2022-1-24 14:30	0.05%
2022-1-11 11:05	-0.07%	2022-1-24 14:35	-0.02%
2022-1-11 11:10	0.05%	2022-1-24 14:40	0.05%
2022-1-11 11:15	0.17%	2022-1-24 14:45	-0.05%
2022-1-11 11:20	0.14%	2022-1-24 14:50	0.07%
2022-1-11 11:25	-0.07%	2022-1-24 14:55	0.09%
2022-1-11 11:30	0.06%	2022-1-24 15:00	-0.01%
2022-1-11 13:05	-0.18%	2022-1-25 9:35	0.02%
2022-1-11 13:10	0.02%	2022-1-25 9:40	-0.22%
2022-1-11 13:15	-0.03%	2022-1-25 9:45	0.03%
2022-1-11 13:20	-0.06%	2022-1-25 9:50	0.21%
2022-1-11 13:25	-0.07%	2022-1-25 9:55	-0.26%
2022-1-11 13:30	-0.09%	2022-1-25 10:00	0.21%
2022-1-11 13:35	0.07%	2022-1-25 10:05	-0.30%
2022-1-11 13:40	-0.07%	2022-1-25 10:10	-0.07%
2022-1-11 13:45	-0.08%	2022-1-25 10:15	0.12%
2022-1-11 13:50	0.03%	2022-1-25 10:20	-0.38%
2022-1-11 13:55	-0.17%	2022-1-25 10:25	-0.07%
2022-1-11 14:00	-0.09%	2022-1-25 10:30	-0.33%
2022-1-11 14:05	0.15%	2022-1-25 10:35	0.00%
2022-1-11 14:10	-0.13%	2022-1-25 10:40	0.28%
2022-1-11 14:15	-0.03%	2022-1-25 10:45	0.03%
2022-1-11 14:20	-0.03%	2022-1-25 10:50	-0.08%
2022-1-11 14:25	-0.02%	2022-1-25 10:55	0.15%
2022-1-11 14:30	-0.08%	2022-1-25 11:00	0.26%
2022-1-11 14:35	0.02%	2022-1-25 11:05	-0.19%
2022-1-11 14:40	-0.15%	2022-1-25 11:10	0.03%
2022-1-11 14:45	-0.08%	2022-1-25 11:15	-0.12%

2022-1-11 14:50	-0.01%	2022-1-25 11:20	0.09%
2022-1-11 14:55	0.10%	2022-1-25 11:25	-0.14%
2022-1-11 15:00	0.08%	2022-1-25 11:30	-0.06%
2022-1-12 9:35	0.77%	2022-1-25 13:05	-0.24%
2022-1-12 9:40	-0.40%	2022-1-25 13:10	-0.13%
2022-1-12 9:45	-0.07%	2022-1-25 13:15	-0.17%
2022-1-12 9:50	0.02%	2022-1-25 13:20	-0.04%
2022-1-12 9:55	0.25%	2022-1-25 13:25	0.10%
2022-1-12 10:00	-0.23%	2022-1-25 13:30	-0.04%
2022-1-12 10:05	0.20%	2022-1-25 13:35	-0.04%
2022-1-12 10:10	0.11%	2022-1-25 13:40	-0.01%
2022-1-12 10:15	-0.04%	2022-1-25 13:45	-0.11%
2022-1-12 10:20	-0.20%	2022-1-25 13:50	-0.17%
2022-1-12 10:25	-0.09%	2022-1-25 13:55	0.10%
2022-1-12 10:30	-0.05%	2022-1-25 14:00	0.29%
2022-1-12 10:35	0.01%	2022-1-25 14:05	-0.09%
2022-1-12 10:40	-0.19%	2022-1-25 14:10	-0.07%
2022-1-12 10:45	-0.01%	2022-1-25 14:15	-0.09%
2022-1-12 10:50	0.05%	2022-1-25 14:20	-0.10%
2022-1-12 10:55	-0.01%	2022-1-25 14:25	-0.07%
2022-1-12 11:00	0.08%	2022-1-25 14:30	0.05%
2022-1-12 11:05	-0.07%	2022-1-25 14:35	-0.22%
2022-1-12 11:10	0.03%	2022-1-25 14:40	-0.01%
2022-1-12 11:15	0.04%	2022-1-25 14:45	-0.12%
2022-1-12 11:20	-0.05%	2022-1-25 14:50	-0.13%
2022-1-12 11:25	-0.10%	2022-1-25 14:55	-0.22%
2022-1-12 11:30	-0.04%	2022-1-25 15:00	-0.06%
2022-1-12 13:05	0.14%	2022-1-26 9:35	0.77%
2022-1-12 13:10	0.01%	2022-1-26 9:40	-0.03%
2022-1-12 13:15	0.03%	2022-1-26 9:45	-0.37%
2022-1-12 13:20	0.12%	2022-1-26 9:50	-0.13%
2022-1-12 13:25	0.04%	2022-1-26 9:55	0.03%
2022-1-12 13:30	0.07%	2022-1-26 10:00	-0.35%
2022-1-12 13:35	0.09%	2022-1-26 10:05	0.28%
2022-1-12 13:40	0.18%	2022-1-26 10:10	0.48%

2022-1-12 13:45	-0.01%	2022-1-26 10:15	0.30%
2022-1-12 13:50	0.07%	2022-1-26 10:20	-0.26%
2022-1-12 13:55	0.15%	2022-1-26 10:25	-0.15%
2022-1-12 14:00	0.30%	2022-1-26 10:30	-0.23%
2022-1-12 14:05	0.22%	2022-1-26 10:35	-0.09%
2022-1-12 14:10	-0.14%	2022-1-26 10:40	0.04%
2022-1-12 14:15	0.05%	2022-1-26 10:45	0.04%
2022-1-12 14:20	-0.10%	2022-1-26 10:50	0.07%
2022-1-12 14:25	-0.03%	2022-1-26 10:55	-0.03%
2022-1-12 14:30	-0.08%	2022-1-26 11:00	-0.01%
2022-1-12 14:35	-0.04%	2022-1-26 11:05	-0.05%
2022-1-12 14:40	0.01%	2022-1-26 11:10	0.00%
2022-1-12 14:45	0.00%	2022-1-26 11:15	0.00%
2022-1-12 14:50	0.03%	2022-1-26 11:20	-0.15%
2022-1-12 14:55	0.08%	2022-1-26 11:25	-0.09%
2022-1-12 15:00	0.02%	2022-1-26 11:30	-0.06%
2022-1-13 9:35	-0.43%	2022-1-26 13:05	-0.17%
2022-1-13 9:40	-0.34%	2022-1-26 13:10	0.15%
2022-1-13 9:45	-0.09%	2022-1-26 13:15	-0.28%
2022-1-13 9:50	-0.21%	2022-1-26 13:20	0.03%
2022-1-13 9:55	-0.01%	2022-1-26 13:25	-0.22%
2022-1-13 10:00	0.31%	2022-1-26 13:30	0.36%
2022-1-13 10:05	0.34%	2022-1-26 13:35	0.30%
2022-1-13 10:10	-0.21%	2022-1-26 13:40	0.23%
2022-1-13 10:15	-0.07%	2022-1-26 13:45	0.09%
2022-1-13 10:20	-0.15%	2022-1-26 13:50	-0.18%
2022-1-13 10:25	0.09%	2022-1-26 13:55	0.08%
2022-1-13 10:30	0.21%	2022-1-26 14:00	0.07%
2022-1-13 10:35	0.01%	2022-1-26 14:05	0.17%
2022-1-13 10:40	0.32%	2022-1-26 14:10	0.16%
2022-1-13 10:45	-0.07%	2022-1-26 14:15	-0.09%
2022-1-13 10:50	0.08%	2022-1-26 14:20	0.11%
2022-1-13 10:55	-0.13%	2022-1-26 14:25	-0.11%
2022-1-13 11:00	-0.09%	2022-1-26 14:30	0.08%
2022-1-13 11:05	-0.05%	2022-1-26 14:35	-0.10%

2022-1-13 11:10	-0.04%	2022-1-26 14:40	0.07%
2022-1-13 11:15	-0.04%	2022-1-26 14:45	0.02%
2022-1-13 11:20	0.04%	2022-1-26 14:50	0.02%
2022-1-13 11:25	0.01%	2022-1-26 14:55	-0.05%
2022-1-13 11:30	-0.02%	2022-1-26 15:00	0.06%
2022-1-13 13:05	-0.10%	2022-1-27 9:35	-0.45%
2022-1-13 13:10	-0.20%	2022-1-27 9:40	-0.17%
2022-1-13 13:15	-0.13%	2022-1-27 9:45	0.04%
2022-1-13 13:20	-0.07%	2022-1-27 9:50	-0.15%
2022-1-13 13:25	0.02%	2022-1-27 9:55	-0.05%
2022-1-13 13:30	-0.18%	2022-1-27 10:00	-0.30%
2022-1-13 13:35	0.04%	2022-1-27 10:05	-0.01%
2022-1-13 13:40	-0.11%	2022-1-27 10:10	-0.33%
2022-1-13 13:45	-0.09%	2022-1-27 10:15	0.09%
2022-1-13 13:50	-0.01%	2022-1-27 10:20	0.20%
2022-1-13 13:55	0.13%	2022-1-27 10:25	-0.47%
2022-1-13 14:00	-0.04%	2022-1-27 10:30	-0.33%
2022-1-13 14:05	-0.08%	2022-1-27 10:35	-0.11%
2022-1-13 14:10	0.07%	2022-1-27 10:40	-0.16%
2022-1-13 14:15	0.08%	2022-1-27 10:45	0.29%
2022-1-13 14:20	-0.11%	2022-1-27 10:50	-0.09%
2022-1-13 14:25	0.03%	2022-1-27 10:55	0.12%
2022-1-13 14:30	-0.15%	2022-1-27 11:00	-0.05%
2022-1-13 14:35	0.11%	2022-1-27 11:05	-0.02%
2022-1-13 14:40	0.07%	2022-1-27 11:10	-0.13%
2022-1-13 14:45	-0.18%	2022-1-27 11:15	0.13%
2022-1-13 14:50	-0.06%	2022-1-27 11:20	-0.12%
2022-1-13 14:55	0.01%	2022-1-27 11:25	-0.18%
2022-1-13 15:00	-0.02%	2022-1-27 11:30	-0.02%
2022-1-14 9:35	0.13%	2022-1-27 13:05	-0.23%
2022-1-14 9:40	0.24%	2022-1-27 13:10	-0.10%
2022-1-14 9:45	-0.31%	2022-1-27 13:15	0.03%
2022-1-14 9:50	0.30%	2022-1-27 13:20	0.01%
2022-1-14 9:55	-0.16%	2022-1-27 13:25	-0.06%
2022-1-14 10:00	0.40%	2022-1-27 13:30	-0.13%

2022-1-14 10:05	0.49%	2022-1-27 13:35	0.04%
2022-1-14 10:10	0.04%	2022-1-27 13:40	-0.08%
2022-1-14 10:15	-0.15%	2022-1-27 13:45	0.20%
2022-1-14 10:20	-0.15%	2022-1-27 13:50	0.14%
2022-1-14 10:25	0.18%	2022-1-27 13:55	-0.07%
2022-1-14 10:30	-0.01%	2022-1-27 14:00	-0.11%
2022-1-14 10:35	0.04%	2022-1-27 14:05	-0.05%
2022-1-14 10:40	0.17%	2022-1-27 14:10	-0.01%
2022-1-14 10:45	0.09%	2022-1-27 14:15	-0.06%
2022-1-14 10:50	-0.03%	2022-1-27 14:20	-0.11%
2022-1-14 10:55	-0.16%	2022-1-27 14:25	0.04%
2022-1-14 11:00	-0.18%	2022-1-27 14:30	0.15%
2022-1-14 11:05	-0.11%	2022-1-27 14:35	-0.20%
2022-1-14 11:10	0.10%	2022-1-27 14:40	-0.08%
2022-1-14 11:15	0.02%	2022-1-27 14:45	0.12%
2022-1-14 11:20	0.03%	2022-1-27 14:50	-0.07%
2022-1-14 11:25	-0.18%	2022-1-27 14:55	-0.09%
2022-1-14 11:30	0.05%	2022-1-27 15:00	0.01%
2022-1-14 13:05	0.13%	2022-1-28 9:35	0.36%
2022-1-14 13:10	-0.02%	2022-1-28 9:40	0.11%
2022-1-14 13:15	-0.06%	2022-1-28 9:45	-0.22%
2022-1-14 13:20	0.24%	2022-1-28 9:50	-0.29%
2022-1-14 13:25	0.03%	2022-1-28 9:55	0.03%
2022-1-14 13:30	0.01%	2022-1-28 10:00	-0.27%
2022-1-14 13:35	-0.05%	2022-1-28 10:05	-0.24%
2022-1-14 13:40	-0.03%	2022-1-28 10:10	0.01%
2022-1-14 13:45	-0.13%	2022-1-28 10:15	-0.31%
2022-1-14 13:50	-0.10%	2022-1-28 10:20	-0.21%
2022-1-14 13:55	0.01%	2022-1-28 10:25	0.31%
2022-1-14 14:00	-0.01%	2022-1-28 10:30	0.36%
2022-1-14 14:05	-0.11%	2022-1-28 10:35	-0.37%
2022-1-14 14:10	-0.07%	2022-1-28 10:40	-0.20%
2022-1-14 14:15	-0.03%	2022-1-28 10:45	0.22%
2022-1-14 14:20	0.03%	2022-1-28 10:50	0.24%
2022-1-14 14:25	0.01%	2022-1-28 10:55	0.12%

2022-1-14 14:30	-0.01%	2022-1-28 11:00	0.19%
2022-1-14 14:35	0.10%	2022-1-28 11:05	-0.10%
2022-1-14 14:40	-0.11%	2022-1-28 11:10	0.03%
2022-1-14 14:45	0.05%	2022-1-28 11:15	0.24%
2022-1-14 14:50	-0.12%	2022-1-28 11:20	-0.07%
2022-1-14 14:55	-0.01%	2022-1-28 11:25	-0.04%
2022-1-14 15:00	0.03%	2022-1-28 11:30	-0.07%
2022-1-17 9:35	1.13%	2022-1-28 13:05	0.06%
2022-1-17 9:40	0.31%	2022-1-28 13:10	-0.09%
2022-1-17 9:45	0.35%	2022-1-28 13:15	-0.06%
2022-1-17 9:50	-0.48%	2022-1-28 13:20	0.04%
2022-1-17 9:55	0.18%	2022-1-28 13:25	0.10%
2022-1-17 10:00	0.24%	2022-1-28 13:30	0.09%
2022-1-17 10:05	-0.23%	2022-1-28 13:35	0.01%
2022-1-17 10:10	0.05%	2022-1-28 13:40	-0.07%
2022-1-17 10:15	0.01%	2022-1-28 13:45	-0.18%
2022-1-17 10:20	0.24%	2022-1-28 13:50	-0.17%
2022-1-17 10:25	0.27%	2022-1-28 13:55	-0.11%
2022-1-17 10:30	-0.06%	2022-1-28 14:00	0.02%
2022-1-17 10:35	0.03%	2022-1-28 14:05	-0.14%
2022-1-17 10:40	0.12%	2022-1-28 14:10	-0.19%
2022-1-17 10:45	-0.01%	2022-1-28 14:15	-0.13%
2022-1-17 10:50	-0.04%	2022-1-28 14:20	-0.04%
2022-1-17 10:55	0.08%	2022-1-28 14:25	0.09%
2022-1-17 11:00	0.15%	2022-1-28 14:30	-0.08%
2022-1-17 11:05	-0.05%	2022-1-28 14:35	-0.18%
2022-1-17 11:10	0.12%	2022-1-28 14:40	-0.16%
2022-1-17 11:15	0.16%	2022-1-28 14:45	-0.29%
2022-1-17 11:20	-0.05%	2022-1-28 14:50	-0.01%
2022-1-17 11:25	0.04%	2022-1-28 14:55	-0.13%
2022-1-17 11:30	0.07%	2022-1-28 15:00	-0.11%

表 19 1 月动态股票购买

时间	现有资产	股票股数	时间	现有资产	股票股数
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2022-1-4 9:35	1003022.127	2	2022-1-17 13:05	1007276.493	4
2022-1-4 9:40	1003018.885	2	2022-1-17 13:10	1007273.129	4
2022-1-4 9:45	1003008.866	2	2022-1-17 13:15	1188570.357	127
2022-1-4 9:50	1010703.389	7	2022-1-17 13:20	1172533.88	116
2022-1-4 9:55	1010682.576	7	2022-1-17 13:25	1172711.441	116
2022-1-4 10:00	1010655.713	7	2022-1-17 13:30	1116725.334	78
2022-1-4 10:05	1010621.228	7	2022-1-17 13:35	1116720.532	78
2022-1-4 10:10	1010589.507	7	2022-1-17 13:40	1062244.919	41
2022-1-4 10:15	1010607.267	7	2022-1-17 13:45	1062226.083	41
2022-1-4 10:20	1010606.677	7	2022-1-17 13:50	1062253.594	41
2022-1-4 10:25	1004530.24	3	2022-1-17 13:55	1062258.072	41
2022-1-4 10:30	1004521.284	3	2022-1-17 14:00	1131562.137	88
2022-1-4 10:35	1004524.212	3	2022-1-17 14:05	1087352.082	58
2022-1-4 10:40	1001549.792	1	2022-1-17 14:10	1188999.842	127
2022-1-4 10:45	1001549.9	1	2022-1-17 14:15	1188799.987	127
2022-1-4 10:50	1001549.35	1	2022-1-17 14:20	1188706.793	127
2022-1-4 10:55	1001550.607	1	2022-1-17 14:25	1188989.714	127
2022-1-4 11:00	1001548.564	1	2022-1-17 14:30	1082856.881	55
2022-1-4 11:05	1001546.032	1	2022-1-17 14:35	1080065.983	53
2022-1-4 11:10	1001547.51	1	2022-1-17 14:40	1080086.24	53
2022-1-4 11:15	1001548.736	1	2022-1-17 14:45	1080080.089	53
2022-1-4 11:20	1001552.258	1	2022-1-17 14:50	1080030.842	53
2022-1-4 11:25	1001554.325	1	2022-1-17 14:55	1080037.92	53
2022-1-4 11:30	1001551.56	1	2022-1-17 15:00	1079958.393	53
2022-1-4 13:05	1001554.23	1	2022-1-18 9:35	1080811.226	53
2022-1-4 13:10	1001555.45	1	2022-1-18 9:40	1081154.153	53
2022-1-4 13:15	1001556.367	1	2022-1-18 9:45	1081120.798	53
2022-1-4 13:20	1001558.315	1	2022-1-18 9:50	1081145.256	53
2022-1-4 13:25	1001557.438	1	2022-1-18 9:55	1037972.635	24
2022-1-4 13:30	1001559.224	1	2022-1-18 10:00	1038000.718	24
2022-1-4 13:35	1001557.711	1	2022-1-18 10:05	1038030.019	24
2022-1-4 13:40	1001560.233	1	2022-1-18 10:10	1038064.257	24
2022-1-4 13:45	1001559.346	1	2022-1-18 10:15	1027675.225	17
2022-1-4 13:50	1166716.257	107	2022-1-18 10:20	1027773.225	17
2022-1-4 13:55	1154453.571	99	2022-1-18 10:25	1027747.641	17

2022-1-4 14:00	1154315.841	99	2022-1-18 10:30	1194114.877	*127
2022-1-4 14:05	1154188.426	99	2022-1-18 10:35	1193684.355	127
2022-1-4 14:10	1154106.867	99	2022-1-18 10:40	1193344.436	127
2022-1-4 14:15	1154047.376	99	2022-1-18 10:45	1192780.076	127
2022-1-4 14:20	1153964.552	99	2022-1-18 10:50	1192432.46	127
2022-1-4 14:25	1133939.962	86	2022-1-18 10:55	1192719.25	127
2022-1-4 14:30	1134019.783	86	2022-1-18 11:00	1192536.549	127
2022-1-4 14:35	1036060.997	23	2022-1-18 11:05	1192393.798	127
2022-1-4 14:40	1036026.705	23	2022-1-18 11:10	1192329.328	127
2022-1-4 14:45	1022166.563	14	2022-1-18 11:15	1192064.65	127
2022-1-4 14:50	1022170.502	14	2022-1-18 11:20	1191931.427	127
2022-1-4 14:55	1022176.136	14	2022-1-18 11:25	1192099.111	127
2022-1-4 15:00	1022063.848	14	2022-1-18 11:30	1191744.46	127
2022-1-5 9:35	1021978.003	14	2022-1-18 13:05	1191732.672	127
2022-1-5 9:40	1022015.309	14	2022-1-18 13:10	1191731.54	127
2022-1-5 9:45	1069585.78	45	2022-1-18 13:15	1191644.812	127
2022-1-5 9:50	1145689.694	95	2022-1-18 13:20	1191872.639	127
2022-1-5 9:55	1145134.966	95	2022-1-18 13:25	1191543.997	127
2022-1-5 10:00	1145146.772	95	2022-1-18 13:30	1191195.323	127
2022-1-5 10:05	1145031.2	95	2022-1-18 13:35	1191402.084	127
2022-1-5 10:10	1091938.322	60	2022-1-18 13:40	1191333.704	127
2022-1-5 10:15	1193973.461	127	2022-1-18 13:45	1191358.33	127
2022-1-5 10:20	1193844.319	127	2022-1-18 13:50	1191344.932	127
2022-1-5 10:25	1193329.516	127	2022-1-18 13:55	1191164.01	127
2022-1-5 10:30	1193716.757	127	2022-1-18 14:00	1190990.875	127
2022-1-5 10:35	1193144.555	127	2022-1-18 14:05	1191217.527	127
2022-1-5 10:40	1193339.657	127	2022-1-18 14:10	1191094.183	127
2022-1-5 10:45	1193109.273	127	2022-1-18 14:15	1112011.726	74
2022-1-5 10:50	1193486.222	127	2022-1-18 14:20	1112016.209	74
2022-1-5 10:55	1193376.676	127	2022-1-18 14:25	1112129.697	74
2022-1-5 11:00	1193119.714	127	2022-1-18 14:30	1112145.469	74
2022-1-5 11:05	1192573.938	127	2022-1-18 14:35	1112113.621	74
2022-1-5 11:10	1192402.771	127	2022-1-18 14:40	1112230.973	74
2022-1-5 11:15	1192153.079	127	2022-1-18 14:45	1112171.516	74
2022-1-5 11:20	1192095.955	127	2022-1-18 14:50	1112201.328	74

2022-1-5 11:25	1191818.109	127	2022-1-18 14:55	1112168.784	74
2022-1-5 11:30	1191489.431	127	2022-1-18 15:00	1112259.839	74
2022-1-5 13:05	1191066.701	127	2022-1-19 9:35	1112192.698	74
2022-1-5 13:10	1191266.694	127	2022-1-19 9:40	1112199.356	74
2022-1-5 13:15	1191248.737	127	2022-1-19 9:45	1111535.959	74
2022-1-5 13:20	1190626.508	127	2022-1-19 9:50	1111185.743	74
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