

# Valuing Data Assets of Internet Finance Firms from a Corporate Life-Cycle Perspective: The Case of RoyalFlush

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**Abstract:** As accounting and financial services become more automated and data-intensive, data assets are becoming an important source of value for internet finance firms. Existing valuation methods, however, give insufficient attention to differences across stages of corporate development. This study combines corporate life-cycle theory, the Pearl curve, and the multi-period excess earnings method to value the data assets of RoyalFlush. Using December 31, 2024, as the valuation date, the Pearl curve indicates that RoyalFlush entered the growth stage in 2019, the maturity stage in 2021, and the decline stage in 2024. The study then forecasts free cash flow to the firm and contributory asset charges for 2025–2029. The weighted average cost of capital and rate-of-return decomposition methods produce a data-asset discount rate of 18.42%, and the estimated data-asset value is RMB 2,369.23 million. The analysis offers a life-cycle-based valuation approach that can inform data-asset management and transaction pricing.

**Keywords:** Corporate life cycle; Multi-period excess earnings method; Data asset valuation; Internet finance firms

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## 1. Introduction

Internet finance firms increasingly rely on financial-market data, user-behavior data, and transaction and financial-information data to create value. This reliance has deepened as artificial intelligence, big data, robotic process automation (RPA), and related technologies have spread through accounting and financial services. Yet data asset valuation lacks a unified framework, and traditional valuation methods have difficulty capturing changes in data-asset value over time.

Existing research focuses mainly on the characteristics of data assets and the methods used to value them. IBM, Babaiouff et al., and Nissim discuss data scale, synergy, and the forms in which data are stored or embodied, respectively <sup>[1–3]</sup>. Chinese studies generally emphasize the intangibility, dependence, capacity for further processing, and value volatility of data assets <sup>[4–6]</sup>. Various valuation approaches and models have

been developed for data assets, including income-based valuation, model-based valuation, and enterprise-specific valuation frameworks <sup>[7–9]</sup>.

The multi-period excess earnings method has also been applied to corporate data-asset valuation, as illustrated by Xiang and Song in their case study of Midea Group <sup>[6]</sup>. For internet finance firms, Guo combines the Black–Scholes (B-S) option model with the analytic hierarchy process (AHP) <sup>[10]</sup>. Sun and Yang apply the multi-period excess earnings method and introduce a coefficient for changes in data-asset value, while Feng et al. incorporate corporate life-cycle theory into data asset valuation <sup>[10–12]</sup>. Prior work concentrates on valuation methods themselves, leaving room for further analysis that integrates corporate development stages with changes in data-asset value.

Operating scale, development strategy, and the intensity of data use differ across stages of the corporate life cycle, so the income-generating capacity of data assets also changes over time. This study combines corporate life-cycle theory with the multi-period excess earnings method and uses RoyalFlush as a case study. The Pearl curve identifies the firm’s life-cycle stages and determines the earnings period; the valuation then deducts contributory asset charges from free cash flow to the firm and discounts the resulting excess earnings. The method therefore incorporates changes in data-asset earnings across the firm’s life cycle.

## **2. Theoretical foundations and valuation model**

### **2.1. Theoretical foundations**

Corporate life-cycle theory suggests that firms exhibit distinct operating, strategic, and financial characteristics across different stages of development <sup>[13]</sup>. For the purpose of data-asset valuation, this study classifies firm development into start-up, growth, maturity, and decline stages. During start-up, data mainly support business-model validation. Data use intensifies as the business expands during the growth stage. Mature firms rely more on data for targeted operational management and to maintain competitive advantage, whereas firms in decline face business contraction and weaker innovative capacity. The income-generating capacity of data assets is thus not constant, making the corporate life cycle an important basis for determining the earnings period and valuation parameters <sup>[14]</sup>.

The capital asset pricing model (CAPM) links the expected return of an asset to its systematic risk relative to the market <sup>[15]</sup>. It provides a basis for investors to assess asset values and formulate investment strategies, and for firms to make capital-budgeting decisions. This study uses the capital asset pricing model to estimate the cost of equity and combines the weighted average cost of capital method with the rate-of-return decomposition method to determine the discount rate for data assets. Expected data-asset earnings in different periods are then discounted to the valuation date.

### **2.2. Corporate life-cycle forecasting model**

#### **2.2.1. Pearl curve model**

The Pearl–Reed logistic curve (hereafter, the Pearl curve) is an S-shaped logistic growth curve that describes a process that first accelerates, then decelerates, and gradually approaches saturation over time <sup>[16]</sup>. This study uses operating revenue as the measure of firm size, fits the firm’s development path with a Pearl curve, and divides the corporate life cycle accordingly.

The general functional form of the Pearl curve is as follows:

$$f(x) = \frac{K}{1 + e^{g(x)}} \quad (1)$$

where  $K$  is a constant and  $g(x) = a_0 + a_1x + a_2x^2 + a_3x^3 + \dots$ ;  $g(x)$  is a linear function of  $x$ . The Pearl curve can therefore be represented by a differential equation. Rearranging the differential equation yields the Pearl curve in equation (2):

$$y = \frac{K}{1 + Ae^{-Bx}} \quad (2)$$

In the Pearl curve,  $A > 0$ ,  $B > 0$ , and  $K > 0$ . Parameter  $A$  is a constant obtained through integration and has no practical meaning. Parameter  $B$  generally represents the growth rate when the population or other target system grows fastest. Parameter  $K$  represents the maximum size of that population or system. As the independent variable  $x \rightarrow +\infty$ , the function approaches its maximum value,  $K$ . Here,  $x$  is the independent variable and  $Y$  is the dependent variable.

#### (1) Estimating initial values with the three-point method

First, three observations from the historical data are used to estimate the initial value of  $K$ , as follows:

After simplification, the formula for calculating the initial parameter value of  $K$  is given in equation (3):

$$K = \frac{2y_1y_2y_3 - y_2^2(y_1 + y_3)}{y_1y_3 - y_2^2} \quad (3)$$

#### (2) Estimating the initial values of $A$ and $B$ by substitution

Given the initial value of  $K$ , the corresponding observations are substituted into the Pearl curve to obtain the initial values of  $A$  and  $B$ . When  $x$  equals 0, the Pearl curve becomes equation (4):

$$y_0 = \frac{K}{1 + A} \quad (4)$$

Because the initial parameter value of  $K$  is known, the initial value of  $A$  can be calculated. Only the initial value of  $B$  remains to be estimated. According to the Pearl curve in equation (2), when  $x$  equals 1, the expression becomes:

$$y_1 = \frac{K}{1 + Ae^{-B}} \quad (5)$$

#### (3) Obtaining the Final Values of $K$ , $A$ , and $B$ through Software-Based Regression Analysis

Starting from the initial values of  $K$ ,  $A$ , and  $B$ , the model is fitted by nonlinear regression in SPSS to obtain the final parameter estimates.

### 2.2.2. Classification of corporate life-cycle stages

Firm size has an upper bound, and operating characteristics differ across stages of the corporate life cycle. Using operating revenue, observed throughout the firm's development, as the dependent variable in the Pearl curve yields a life-cycle forecasting model for internet firms.

$$y = \frac{K}{1 + Ae^{-Bx}} \quad (6)$$

Here,  $x$  denotes the year of the firm's development;  $y$  denotes the firm's operating revenue in year  $x$ ;  $A$  is the estimate obtained from the regression analysis;  $B$  is the growth rate when operating revenue grows

fastest; and K is the peak level of operating revenue.

Based on the corporate life-cycle theory described above, this study assumes that  $x_1$  marks the boundary between the start-up and growth stages,  $x_2$  marks the boundary between the growth and maturity stages, and  $x_3$  marks the boundary between the maturity and decline stages. The maturity stage is assumed to last  $m$  times as long as the growth stage. In general,  $m$  equals 2 when the firm develops very rapidly and 1 otherwise.

$$\text{Growthperiod} = x_2 - x_1 \quad (7)$$

$$\text{Maturityperiod} = x_3 - x_2 = m(x_2 - x_1) \quad (8)$$

Here,  $x_1$ ,  $x_2$ , and  $x_3$  are the boundaries separating the start-up, growth, maturity, and decline stages. As the firm approaches the later stages of its life cycle, the growth rate of operating revenue gradually slows, reflecting a weakening in growth momentum.

$$y = \frac{K}{1 + Ae^{-Bx}}, x \ll x_z \quad (9)$$

$$y = \frac{K}{1 + Ae^{-B(2x_z - x)}}, x > x_z \quad (10)$$

Differentiating the Pearl curve constructed for internet firms gives the boundaries between the stages of the corporate life cycle, as follows:

$$x_1 = \frac{\text{Ln}A - \text{Ln}(2 + \sqrt{3})}{B} \quad (11)$$

$$x_2 = \frac{\text{Ln}A + \text{Ln}(2 + \sqrt{3})}{B} \quad (12)$$

$$x_3 = (1 + m) \frac{\text{Ln}A + \text{Ln}(2 + \sqrt{3})}{B} - m \frac{\text{Ln}A - \text{Ln}(2 + \sqrt{3})}{B} \quad (13)$$

### 2.3. Multi-period excess earnings method

The multi-period excess earnings method first estimates the firm's total earnings and then deducts the contributory asset charges (CACs) associated with all assets other than the data assets being valued. The resulting excess earnings attributable to the data assets are discounted to the valuation date at an appropriate rate. The basic formula is:

$$P = \sum_{t=1}^n \frac{V_t}{(1 + R)^t} \quad (14)$$

where  $P$  is the appraised value of the intangible asset;  $V_t$  is the expected excess earnings from the intangible asset in year  $t$ ;  $R$  is the discount or capitalization rate; and  $t$  is the earnings period.

This study measures total earnings using free cash flow to the firm. Excess earnings attributable to data assets equal free cash flow to the firm less the CACs for current assets, fixed assets, on-balance-sheet intangible assets, and human capital, as follows:

$$v_t = v - v_c - v_f - v_i - v_h \quad (15)$$

where  $v_t$  is the excess earnings generated for the firm by the appraised asset in period  $t$ ;  $v$  is free cash flow to the firm;  $v_c$  is the CAC for current assets;  $v_f$  is the CAC for fixed assets;  $v_i$  is the CAC for on-balance-sheet intangible assets; and  $v_h$  is the CAC for human capital.

Combining equations (14) and (15) yields the multi-period excess earnings formula for the data assets of internet firms:

$$P = \sum_{t=1}^n \frac{v - v_c - v_f - v_i - v_h}{(1 + R)^t} \quad (16)$$

## 2.4. Parameter settings

### 2.4.1. Earnings period

The earnings period is the period over which data assets can continue to generate excess earnings. This study determines the earnings period of data assets from the firm's corporate life-cycle stage.

### 2.4.2. Free cash flow to the firm

Free cash flow to the firm measures the cash flow available after operating expenditures, investment expenditures, and taxes. This study calculates it as follows:

Free cash flow = operating revenue - operating costs - period expenses - income tax - capital expenditures - increase in working capital + depreciation of fixed assets + amortization of intangible assets

### 2.4.3. Contributory asset charges

#### (1) Charge for current assets

The contributory asset charge for current assets is calculated from their annual average balance and rate of return. Given their relatively high liquidity, the rate of return is the 1-year loan prime rate (LPR) published by the People's Bank of China.

Charge for current assets = annual average current assets  $\times$  one-year bank lending rate

#### (2) Charge for fixed assets

The contributory asset charge for fixed assets is measured as the required return on fixed assets. It is calculated by multiplying the annual average balance of fixed assets by the applicable rate of return. Given the relatively long service life and lower liquidity of fixed assets, this study uses the Loan Prime Rate (LPR) for maturities of more than five years published by the People's Bank of China as the required rate of return.

Contributory asset charge for fixed assets = annual average fixed assets  $\times$  LPR for maturities of more than five years

#### (3) Charge for other intangible assets

Other intangible assets are divided into on- and off-balance-sheet assets. The contributory asset charge for on-balance-sheet intangible assets comprises an amortization allowance and a return on the assets. The charge for off-balance-sheet intangible assets is estimated from annual labor input and the human-capital contribution rate, with labor input based on employee benefits payable.

#### 2.4.4. Discount rate

Future earnings must be discounted to the valuation date. This study combines the weighted average cost of capital and rate-of-return decomposition methods to determine the data-asset discount rate, using returns on comparable assets as the basis for the calculation.

$$WACC = K_e \times \frac{E}{D+E} + K_d \times \frac{D}{D+E} (1-T) \quad (17)$$

where  $K_e$  is the cost of equity;  $E$  is the value of equity;  $D$  is the value of debt;  $K_d$  is the cost of debt, measured using the People's Bank of China's LPR for maturities of more than 5 years; and  $T$  is the corporate income tax rate.

In the equation above,  $K_e$  is generally determined using the capital asset pricing model, as follows:

$$K_e = R_f + \beta \times (R_m - R_f) \quad (18)$$

where  $R_f$  is the average yield on five-year Chinese government bonds reported by the Bank of China;  $\beta$  measures the sensitivity of the firm's share price to market fluctuations; and  $R_m$  is the average annual return on the Shanghai Composite Index and the Shenzhen Component Index over the past ten years.

The rate-of-return decomposition method is calculated as follows:

$$i_j = \frac{WACC - (W_c \times i_c) - (W_f \times i_f)}{W_j} \quad (19)$$

$W_c$  is the share of current assets in total assets;  $i_c$  is the rate of return on current assets, measured by the People's Bank of China's 1-year LPR;  $W_f$  is the share of fixed assets in total assets;  $i_f$  is the rate of return on fixed assets, measured by the People's Bank of China's LPR for maturities of more than 5 years; and  $W_j$  is the share of other intangible assets in total assets.

### 3. Case analysis: RoyalFlush

#### 3.1. Case company and valuation assumptions

RoyalFlush was established in 1994 and listed on the ChiNext Market of the Shenzhen Stock Exchange in 2009 (stock code: 300033). Its principal businesses are financial big data processing and financial information services. In 2024, the company reported operating revenue of RMB 4.187 billion, up 17.47% year on year, and net profit attributable to shareholders of RMB 1.823 billion, up 30% year on year. RoyalFlush provides institutional clients and individual investors with financial data, software and maintenance, targeted promotion, value-added telecommunications, fund distribution, and related services. Its data resources are closely tied to these core businesses. Advertising and internet promotion services and value-added telecommunications services accounted for 48.36% and 38.59% of operating revenue, respectively, in 2024 and were the main sources of revenue. RoyalFlush's data assets mainly comprise financial-market data, user data, and transaction and financial-information data. Financial-market data cover stocks, funds, bonds, futures, and foreign exchange across different frequencies and dimensions. User data capture basic user information and behavioral preferences. Transaction and financial-information data record trading activity, capital flows, financial news, policies, and announcements. Together, these data support financial information, investment analysis, intelligent services, and related businesses.

The valuation covers RoyalFlush's data assets as of December 31, 2024, and adopts market value as the value standard. It estimates the data assets as a reference for transaction pricing, using information from RoyalFlush's annual reports. The valuation assumes that the company's business remains stable and continues to generate cash flow throughout the forecast period, and that the relevant interest rates and corporate income tax rate remain constant during the earnings period.

### 3.2. Valuation process and results

#### 3.2.1. Life-cycle identification and earnings period

The Pearl curve is fitted to RoyalFlush's operating revenue from 2009 to 2024, where  $x = \text{year} - 2009$  and  $y$  is operating revenue in the corresponding year. The initial parameter values are  $K=14.08$ ,  $A=6.37$ , and  $B=0.1278$ . The Pearl curve is then estimated by nonlinear regression in SPSS. After iteration, the final estimates of  $K$ ,  $A$ , and  $B$  are 50.732, 38.692, and 0.342, respectively. The model fits the data well, with  $R^2=0.946$ .

Substituting the optimal estimates of  $K$ ,  $A$ , and  $B$  into the Pearl curve model for RoyalFlush's corporate life cycle gives:

$$y = \frac{50.732}{1 + 38.692e^{-0.342x}}$$

The boundary formulas are applied assuming that the maturity stage lasts twice as long as the growth stage.

$$X_1 = \frac{\ln A - \ln(2 + \sqrt{3})}{B} = \frac{\ln 38.692 - \ln(2 + \sqrt{3})}{0.342} = 9.89$$

$$X_2 = \frac{\ln A + \ln(2 + \sqrt{3})}{B} = \frac{\ln 38.692 + \ln(2 + \sqrt{3})}{0.342} = 11.50$$

$$X_3 = m(X_2 - X_1) + X_2 = 2 * (11.50 - 9.89) + 11.50 = 14.72$$

The results indicate that RoyalFlush entered the growth stage in 2019, the maturity stage in 2021, and the decline stage in 2024 (**Figure 1**). Its life-cycle peak occurred around 2022.

$$X_z = m \frac{(X_2 - X_1)}{2} + X_2 = 2 * \frac{(11.50 - 9.89)}{2} + 11.50 = 13.11$$

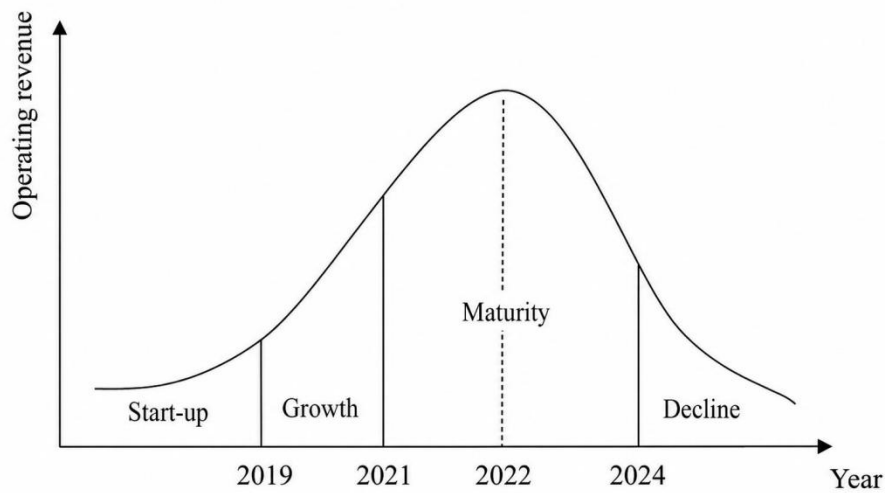


**Figure 1.** RoyalFlush corporate life-cycle curve

RoyalFlush's Pearl curve model for the corporate life cycle is therefore:

$$y = \frac{50.732}{1 + 38.692e^{-0.342x}}, x \leq 13.11$$

$$y = \frac{50.732}{1 + 38.692e^{-8.96724 + 0.342x}}, x > 13.11$$

Accordingly, this study uses 2025–2029 as the subsequent forecast period and estimates future excess earnings from the data assets based on the identified life-cycle stage.

### 3.2.2. Forecast of free cash flow to the firm

#### (1) Forecasts of operating revenue and operating costs

Given that RoyalFlush entered the early decline stage in 2024, the model does not assume an immediate contraction in revenue; instead, it imposes a gradual deceleration in revenue growth, with the forecast growth rate decreasing by one percentage point each year. The identified decline stage reflects a weakening in the firm's growth momentum rather than an immediate decrease in operating revenue. Historical revenue growth alone provides an unreliable basis for forecasting because growth at internet finance firms is volatile. This study uses the average operating-revenue growth rate of 10.61% over 2021–2024 as the baseline and assumes that the rate falls by 1 percentage point each year to forecast operating revenue for 2025–2029. Operating costs are projected using their average share of operating revenue over 2020–2024. **Table 1** reports the forecasts.

**Table 1.** Forecasts of operating revenue, 2025–2029 (Unit: RMB 10,000)

| Year              | 2025      | 2026      | 2027      | 2028      | 2029      |
|-------------------|-----------|-----------|-----------|-----------|-----------|
| Operating Revenue | 458914.56 | 498427.10 | 536357.40 | 571810.63 | 603889.20 |
| Operating Costs   | 44799.62  | 48656.87  | 52359.66  | 55820.63  | 58952.17  |

(2) Forecasts of period expenses

Period expenses comprise taxes and surcharges, selling expenses, administrative expenses, and finance costs. Each category is forecast for the next 5 years using its average share of operating revenue over 2020–2024, as reported in **Table 2**.

**Table 2.** Forecasts of period expenses, 2025–2029 (Unit: RMB 10,000)

| Year            | 2025      | 2026      | 2027      | 2028      | 2029   |
|-----------------|-----------|-----------|-----------|-----------|--------|
| Period Expenses | 182201.23 | 197888.76 | 212948.09 | 227023.97 | 239760 |

(3) Forecast of capital expenditures

Given the relatively high expenditure on fixed-asset acquisitions in 2020, this study uses the average ratio of capital expenditures to operating revenue over 2021–2024, 7.16%, to forecast capital expenditures for the next 5 years (**Table 3**).

**Table 3.** Forecast of capital expenditures, 2025–2029 (Unit: RMB 10,000)

| Year                 | 2025     | 2026     | 2027     | 2028     | 2029     |
|----------------------|----------|----------|----------|----------|----------|
| Capital expenditures | 32839.81 | 35667.32 | 38381.60 | 40918.62 | 43214.16 |

(4) Forecast of the increase in working capital

Over the past 5 years, the increase in working capital averaged 18.49% of operating revenue (**Table 4**). This ratio is used to forecast the increase in working capital for 2025–2029.

**Table 4.** Forecast of the increase in working capital, 2025–2029 (Unit: RMB 10,000)

| Year                        | 2025     | 2026     | 2027     | 2028      | 2029      |
|-----------------------------|----------|----------|----------|-----------|-----------|
| Increase in working capital | 84862.51 | 92169.17 | 99183.25 | 105739.26 | 111671.23 |

(5) Forecast of depreciation of fixed assets and amortization of intangible assets

Over the past 5 years, depreciation of fixed assets and amortization of intangible assets averaged 1.44% and 2.03% of operating revenue, respectively (**Table 5**). These ratios are used to forecast depreciation and amortization for the next 5 years.

**Table 5.** Forecasts of depreciation of fixed assets and amortization of intangible assets, 2025–2029 (Unit: RMB 10,000)

| Year                              | 2025    | 2026     | 2027     | 2028     | 2029     |
|-----------------------------------|---------|----------|----------|----------|----------|
| Depreciation of fixed assets      | 6625.30 | 7195.74  | 7743.34  | 8255.17  | 8718.29  |
| Amortization of intangible assets | 9328.19 | 10131.35 | 10902.34 | 11622.99 | 12275.03 |

(6) Income tax forecast

Income tax is estimated from the preceding forecasts and the corresponding tax rates. **Table 6** presents the results.

**Table 6.** Forecast of income tax, 2025–2029 (Unit: RMB 10,000)

| Year       | 2025    | 2026    | 2027    | 2028    | 2029    |
|------------|---------|---------|---------|---------|---------|
| Income tax | 5895.40 | 6403.00 | 6890.26 | 7345.71 | 7757.81 |

**(7) Forecast of free cash flow to the firm**

Operating revenue, operating costs, period expenses, income tax, capital expenditures, the increase in working capital, depreciation, and amortization are aggregated to derive free cash flow to the firm for 2025–2029 (**Table 7**).

**Table 7.** Forecast of free cash flow to the firm, 2025–2029 (Unit: RMB 10,000)

| Year                       | 2025      | 2026      | 2027      | 2028      | 2029      |
|----------------------------|-----------|-----------|-----------|-----------|-----------|
| Free cash flow to the firm | 124269.48 | 134969.08 | 145240.23 | 154840.61 | 163527.17 |

**3.2.3. Forecast of contributory asset charges****(1) Forecast of charges for fixed and current assets**

Over the past 5 years, capital expenditures on fixed assets averaged 0.29% (**Table 8**). A 3.6% loan prime rate (LPR) for maturities of more than 5 years is used to estimate the contributory asset charge for fixed assets. Current assets averaged 28.11% of operating revenue over the same 5-year period, and the 1-year LPR of 3.1% is used to estimate their charge over the next 5 years.

**Table 8.** Forecast of charges for fixed and current assets (Unit: RMB 10,000)

| Year                      | 2025     | 2026     | 2027     | 2028     | 2029     |
|---------------------------|----------|----------|----------|----------|----------|
| Charge for fixed assets   | 5824.35  | 4119.13  | 4472.64  | 6413.52  | 6874.03  |
| Charge for current assets | 30129.98 | 34411.10 | 39193.17 | 44476.16 | 50260.07 |

**(2) Forecast of charges for other intangible assets**

This study forecasts the charges for other intangible assets from both on- and off-balance-sheet perspectives. The charge for on-balance-sheet intangible assets is estimated from the 2020–2024 annual reports, using a 3.6% LPR for maturities of more than 5 years as the rate of return (**Table 9**). Following Feng et al. and Sun and Yang, employee benefits payable are used as a proxy for annual human-capital input, and the resulting human-capital contribution is treated as the contributory asset charge for off-balance-sheet intangible assets<sup>[11–12]</sup>. Employee benefits payable remained relatively stable as a share of operating revenue during 2020–2024. Accordingly, the five-year average ratio of 5.35% is used to forecast employee benefits payable for 2025–2029. A human-capital contribution rate of 34.5% is then applied to the forecast employee benefits payable to estimate the contribution attributable to human capital and, consequently, the contributory asset charge for off-balance-sheet intangible assets.

**Table 9.** Forecast of charges for other intangible assets (Unit: RMB 10,000)

| Year                                          | 2025    | 2026     | 2027     | 2028     | 2029     |
|-----------------------------------------------|---------|----------|----------|----------|----------|
| Amortization allowance                        | 269.91  | 799.77   | 799.77   | 799.77   | 799.77   |
| Rate of return                                |         |          | 3.6%     |          |          |
| Charge for on-balance-sheet intangible assets | 9714.88 | 10922.38 | 12129.73 | 13337.08 | 14544.45 |

|                                                |          |          |          |          |          |
|------------------------------------------------|----------|----------|----------|----------|----------|
| Human capital                                  | 24551.93 | 26665.85 | 28695.12 | 30591.87 | 32308.07 |
| Rate of return                                 |          |          | 34.5%    |          |          |
| Charge for off-balance-sheet intangible assets | 8470.41  | 9199.71  | 9899.81  | 10554.19 | 11146.28 |

### 3.2.4. Calculation of the discount rate

#### (1) Cost of debt (Kd)

The forecast period is 5 years. This study therefore uses the five-year loan rate of 3.6% observed on the valuation date, December 31, 2024, as the cost of debt, so  $K_d=3.6\%$ .

#### (2) Cost of equity (Ke)

The cost of equity is determined using the capital asset pricing model (CAPM).

1) Risk-free rate (Rf): Given the earnings period, this study uses 3.38%, the average yield on five-year Chinese government bonds over the past five years, as the risk-free rate.

2) Market risk return (Rm): Using the year-end closing levels of the Shanghai Composite Index and the Shenzhen Component Index over the past ten years, the average annual return for 2015-2024 is calculated as the market risk return, yielding 3.49%.

3) Beta coefficient:  $\beta$  is set to 3.2325, the average of RoyalFlush's beta coefficients over the past 5 years (Table 10).

**Table 10.** RoyalFlush beta estimates, 2020–2024

| Year | Beta   |
|------|--------|
| 2020 | 2.5249 |
| 2021 | 4.0689 |
| 2022 | 2.8227 |
| 2023 | 3.1936 |
| 2024 | 3.5526 |
| Mean | 3.2325 |

Substituting these parameters into the CAPM gives  $K_e=3.74\%$ .

$$K_e=3.38\%+3.2325*(3.49\%-3.38\%)=3.74\%$$

#### (3) Weighted average cost of capital

Over 2020–2024, liabilities and shareholders' equity represented average shares of 24.71% and 75.29% of total assets, respectively (Table 11). Given the availability and consistency of financial statement data, the book values of total liabilities and shareholders' equity are used as proxies for debt and equity in the WACC calculation. The resulting weighted average cost of capital is  $WACC=3.59\%$ .

**Table 11.** RoyalFlush's capital structure (Unit: RMB 10,000)

| Year                | 2020      | 2021      | 2022      | 2023      | 2024       |
|---------------------|-----------|-----------|-----------|-----------|------------|
| Total assets (D+E)  | 715569.73 | 850121.62 | 902753.77 | 984486.06 | 1097650.15 |
| Total liabilities D | 193148.62 | 202450.14 | 178235.82 | 252551.30 | 300217.64  |
| Total equity E      | 522421.10 | 647671.48 | 724517.94 | 731934.76 | 797432.51  |
| D/(D+E)             | 26.99%    | 23.81%    | 19.74%    | 25.65%    | 27.35%     |

|         |        |        |        |        |        |
|---------|--------|--------|--------|--------|--------|
| Mean    |        |        | 24.71% |        |        |
| E/(D+E) | 73.01% | 76.19% | 80.26% | 74.35% | 72.65% |
| Mean    |        |        | 75.29% |        |        |

#### (4) Discount rate for data assets

Using the shares of fixed assets, current assets, and intangible assets in total assets and their respective rates of return, the rate-of-return decomposition method yields an 18.42% rate of return on intangible assets (Table 12). The decomposition focuses on current assets, fixed assets, and intangible assets that are directly associated with the estimation of the required return on data assets. Because the earnings characteristics of data assets resemble those of intangible assets, this study uses 18.42% as the discount rate for data assets.

$$i_j = [3.59\% - (6.18\% \times 3.6\%) - (85.4\% \times 3.1\%)] / 3.91\% = 18.42\%$$

**Table 12.** Estimated rate of return on intangible assets

| WACC  | Wf    | if   | Wc    | ic   | Wj    | i <sub>j</sub> |
|-------|-------|------|-------|------|-------|----------------|
| 3.59% | 6.18% | 3.6% | 85.4% | 3.1% | 3.91% | 18.42%         |

### 3.2.5. Data asset valuation

Substituting the preceding free cash flow to the firm, contributory asset charges, and the 18.42% discount rate into the multi-period excess earnings method yields the value of RoyalFlush's data assets as of December 31, 2024. Table 13 reports the results.

**Table 13.** Valuation of RoyalFlush's data assets (Unit: RMB 10,000)

| Year                                           | 2025      | 2026      | 2027      | 2028      | 2029      |
|------------------------------------------------|-----------|-----------|-----------|-----------|-----------|
| Free cash flow to the firm                     | 124269.48 | 134969.08 | 145240.23 | 154840.61 | 163527.17 |
| Charge for fixed assets                        | 5824.35   | 4119.13   | 4472.64   | 6413.52   | 6874.03   |
| Charge for current assets                      | 30129.98  | 34411.10  | 39193.17  | 44476.16  | 50260.07  |
| Charge for on-balance-sheet intangible assets  | 9714.88   | 10922.38  | 12129.73  | 13337.08  | 14544.44  |
| Charge for off-balance-sheet intangible assets | 8470.41   | 9199.71   | 9899.81   | 10554.19  | 11146.28  |
| Excess earnings attributable to data assets    | 70129.85  | 76316.75  | 79544.87  | 80059.65  | 80702.33  |
| Discount rate                                  |           |           | 18.42%    |           |           |
| Present value of data assets                   | 59222.59  | 54423.80  | 47903.33  | 40714.75  | 34658.41  |
| Total                                          |           |           | 236922.88 |           |           |

The estimated value of RoyalFlush's data assets is RMB 2,369.23 million. Although the company had recognized data assets in its financial statements by 2025, publicly available information remains insufficient to validate this estimate externally. The calculation therefore illustrates the valuation procedure and provides an indicative benchmark for data-asset transactions and management.

## 4. Conclusions and outlook

### 4.1. Conclusions

This study combines corporate life-cycle theory with the multi-period excess earnings method and uses

RoyalFlush as a case study to estimate the value of its data assets. The main conclusions are as follows:

First, the life-cycle analysis indicates that RoyalFlush entered the growth stage in 2019, the maturity stage in 2021, and the decline stage in 2024, with the life-cycle peak occurring around 2022. Incorporating the corporate life cycle into the valuation captures differences across development stages and the corresponding variation in the earnings capacity assigned to data assets.

Second, this study derives excess earnings attributable to data assets by subtracting the CACs for current assets, fixed assets, on-balance-sheet intangible assets, and human capital from free cash flow to the firm. The weighted average cost of capital and rate-of-return decomposition methods then set the data-asset discount rate at 18.42%.

Third, using December 31, 2024 as the valuation date, the estimated value of RoyalFlush's data assets is RMB 2,369.23 million. The case results indicate that financial-market data, user data, and transaction and financial-information data play an important role in value creation by internet finance firms.

## 4.2. Limitations and future research

This study has several limitations. First, it examines a single firm, and the model's applicability to other internet subsectors requires further testing. Second, the valuation relies primarily on publicly available annual report data, while some parameters use historical averages or external benchmarks that may differ from the firm's actual conditions. Third, the model does not incorporate market-based applications such as data-asset transactions, pledging, or financial-statement recognition. Future research could broaden the sample and industry coverage, use firms' internal data and nonfinancial indicators to refine the valuation parameters, and examine how dynamic valuation results can be linked to data-asset transactions, financing, and accounting treatment.

## Disclosure statement

The author declares no conflict of interest.

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