TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

Financial Valuation of Human Capital According to the Human Capital Asset Pricing Model

Haider Neama Ghali Al-Furaiji[1], Zainab Sabah Faraj[2]

[1]College of Administration and Economics – Al-Mustansiriyah University, [2]Ministry of Higher Education and Scientific Research – Department of Research and Development

Abstract. Financial valuation is one of the most important analytical tools in the fields of economics and financial management. It is used to determine the financial value of assets, projects, and various investments. Financial valuation plays a key role in improving the efficiency of resource allocation, reducing risk, and promoting sustainable growth across different sectors. In this research, the valuation of human capital is considered one of the modern applications of financial valuation, where the financial value of individuals is analyzed. This has sparked increasing academic debate regarding the feasibility, importance, and methodology of evaluating human resources as a fundamental organizational asset. This intellectual debate has encouraged many researchers to explore this topic further, aiming to assess existing models and propose new ones for valuing intangible assets—specifically, the financial valuation of human capital. Accordingly, the research problem centers around the ongoing debate about the possibility of evaluating human capital through quantitative models and expressing it in financial terms, which directly influences organizational decision-making, returns, and risk levels. The main objective of this study is to provide a financial value that reflects human capital as an intangible asset. To achieve this, the Human Capital Asset Pricing Model was employed and applied to a sample representing human capital—specifically, surgical physicians. The research reached several conclusions and recommendations, most notably that the model offers a financial valuation method for estimating the value of human capital. A key recommendation of the study is that relying on a single model may not be sufficient for the financial valuation of physicians, and that integrating multiple models could lead to a more accurate estimation.

Keywords. Human capital , human capital valuation , capital asset pricing model (CAPM) , human capital pricing model (HCAPM)

Chapter 1 Research Methodology

1.1 Research Problem

The process of human capital valuation is one of the most important topics that has gained significant attention in modern financial literature. This interest has led to a broad philosophical debate on how to assign a monetary value to human capital, in addition to the diversity of models used in its assessment, whether through quantitative or qualitative approaches.

The core research problem lies in the intellectual debate surrounding the feasibility of evaluating human capital using quantitative models and expressing it in monetary terms—an issue that directly affects organizational decision-making, returns, and risk exposure.

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

1.2 Research Importance

The importance of this study stems from its analysis of a fundamental aspect of financial theory, focusing specifically on the quantitative assessment of human capital. The research is based on calculating financial value using the Human Capital Asset Pricing Model (HCAPM).

By providing quantitative data and a monetary value for each individual within the organization, such models support both internal and external disclosure requirements. This enables more accurate managerial decisions, ultimately increasing returns and reducing risks. The research also contributes to the ongoing intellectual discourse regarding the measurement of human capital's financial value.

1.3 Research Objectives

The study aims to present a monetary value that reflects human capital as an intangible asset, which can be relied upon in investment decisions, in addition to enabling financial evaluation of human resources.

1.4 Research Hypothesis

The study adopts the main hypothesis that:

If a physician's beta is high, it indicates greater exposure to risk, which necessitates a higher required return on investment.

1.5 Research Sample and Duration

To achieve the research objectives concerning the financial valuation of human capital, a sample of 20 surgical physicians from the Baghdad Health Department was selected, covering a period of 30 months from January 1, 2022, to June 30, 2024.

The evaluation of the surgical physicians is based on monthly cash flows. In this study, the focus is on cash flows generated from performing surgical operations.

1.6 Model Used: Human Capital Asset Pricing Model (HCAPM)

The financial valuation is conducted using the HCAPM, based on the physicians' cash flows, under the assumption that these flows represent the physicians' revenues. A human capital portfolio consisting of 20 physicians is constructed each month to calculate the market return and each physician's beta. Then, the HCAPM formula is applied to determine the required return on human capital, which is used as the discount rate.

The process involves the following steps:

1. Calculate the physician's monthly return based on monthly cash flows and investment cost (i.e., monthly salary), using the following equation:

Return = (Cash Flow – Salary) / Salary

2. Calculate the monthly portfolio return = sum of physicians' returns ÷ 20, across 30 months. This forms 30 portfolios. Then, compute the market return R_m:

Average Market Return $R_m{\prime} = R_m / 30$

3. Calculate covariance between each physician's return and the market return using Equation (3):

$$Cov = \Sigma[(R_{physician} - \bar{R}_{physician})(R_{market} - \bar{R}_{market})] / n$$

4. Calculate the market return variance using Equation (4):

$$Var(Rm) = \Sigma(R_{market} - \bar{R}_{market})^2 / n$$

5. Calculate Beta β for each physician using Equation (5):

$$\beta = Cov(R_{physician}, R_{market}) / Var(R_{market})$$

6. Risk-free rate (Rf): The discount rate used in the model is the latest Treasury Bill rate during the study period, Rf = 0.04755, as announced by the Central Bank of Iraq on June 30, 2024.
7. Calculate Risk Premium:
Risk Premium = R_m – R_f (same for all physicians)
8. Calculate Human Capital Return using the HCAPM formula:
Return = R_f + β(R_m – R_f)
9. Calculate Present Value for each physician using:

$$PV_{Personnel\,measure} = \sum_{i=0}^{n} \frac{MP_i^{Gross}}{(1+r_{HC})^i}$$

Where:
- PV = Individual present value
- MP_t = Cash flow in period t
- r = Human capital return rate

Chapter 2: Theoretical Background

2.1 The Concept of Human Capital

Human capital is considered the most fundamental and vital component of intangible assets (Obara & Gabriel, 2013, p. 30). It has been discussed as a broad concept and its measurement models have been approached from various economic, accounting, and managerial perspectives. The first to recognize the quantitative concept of human capital was the American economist and Nobel Laureate Theodore Schultz, who defined human capital as:
"The skills, knowledge, and similar attributes that influence human capabilities to perform productive work" (Welpe et al., 2007, p. 277).
Schultz introduced the concept of human capital to refer to investments in education, training, healthcare, and other activities that improve individuals' productivity, thereby increasing their earning potential.
Subsequently, American economist Gary Becker developed the concept further in his 1962 book Human Capital, where he provided a detailed analysis of how to measure and assess it. Over the past forty years (Dadd & Hinton, 2022, p. 6), other economists have expanded Schultz's definition in various ways, including by introducing diverse measurement criteria.
Economically, human capital is defined as a future service that can be monetized and is legally guaranteed, making it a critical contributor to value creation, economic growth, and development—both at the organizational and national levels. However, valuing these assets remains an economic challenge due to the absence of a direct market for measurement, and discounted cash flow models are often used (Kucharíková, 2015, p. 52).
Ultimately, human capital is an essential intangible asset associated with a company's future potential and significantly contributes to its value (Dinçer & Yüksel, 2021, p. 267). It is defined as the skills and capabilities an individual possesses that allow them to earn income (Aliu & Aigbavboa, 2019, p. 3). More comprehensively, it refers to the complete set of embodied attributes within employees that have defined value and serve as sources of future income for both the individual and the organization. Some scholars even use the term human capital as a synonym for investment in employees, assuming that an employee with human capital contributes added value to the organization (Obara & Gabriel, 2013, p. 34).

2.2 Financial Valuation of Human Capital

Financial valuation is the process of determining the monetary value of a company or asset using a set of financial tools and methodologies. Its primary aim is to assess the true value of the organization or asset by considering factors such as financial returns, risks, and future expectations, thereby providing reliable data to support decision-making.

Valuation tools for intangible assets differ significantly from those used for tangible assets (Mate-Kole, 2014, p. 9). Given organizations' heavy reliance on human capital to generate income—either through intellectual efforts or physical labor (Arkan, 2016, p. 181)—it becomes essential to assess and estimate the financial value of human resources within the organization. However, measuring, evaluating, and managing human resources presents significant challenges due to the diversity of perspectives on this topic (Piao & Managi, 2022, p. 11).

The primary purpose of human capital valuation is to reveal its true worth, report it accurately, and ensure proper management. Estimating individuals' expected future value and the associated risks is challenging due to the inherent difficulty in quantifying human asset value (Das & Topno, 2012, p. 96). This is especially true in complex and rapidly changing environments (Al-Furaiji, 2001, p. 1).

2.3 Human Capital Asset Pricing Model (HCAPM)

The Human Capital Asset Pricing Model (HCAPM) is based on the calculation of present value, considering multiple factors such as risk and market return.

This model extends the principles of the Capital Asset Pricing Model (CAPM) and evaluates the present value of individuals based on the return on human capital, which is used as the discount rate to assess expected future cash flows derived from human resources.

These cash flows represent anticipated income streams, which are then discounted using the human capital return rate to determine their present value. The model also incorporates the risks associated with human capital, market volatility, and economic conditions (Welpe, Lutz, & Barthel, 2007, p. 282).

Equation (1):

$PV_i = CF_i / (1 + r)^i$

Where:

- PV_i = Individual present value
- r = Human capital return rate
- CF_i = Total cash flow in period i

This theory emerged in the mid-1960s and is credited to Sharpe, Lintner, and Mossin. It illustrates the relationship between expected return and investment risk, assuming that financial markets are in equilibrium and are exposed to systematic (non-diversifiable) risks, which are typically measured by the beta coefficient. The model disregards unsystematic risks, as they can be mitigated through diversification.

The HCAPM is not only used to evaluate and predict stock returns but also to manage investment portfolios and mitigate risks associated with financial assets like securities and equities.

Equation (2):

$R_i = Rf + \beta\ (Rm - Rf)$

Where:

- R_i = Expected return on the asset
- Rf = Risk-free rate
- β = Beta coefficient
- Rm = Market return (Chen, 2022, p. 53)

The model requires a linear relationship between beta and expected return (AlAmaren, Alathamneh, & Alrjoub, 2021, p. 2), as illustrated in Figure 1. The Security Market Line

TechHub Journal
ISSN 2810-2800
TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

graphically represents the risk-return tradeoff, starting from the risk-free rate and factoring in systematic risk and the risk premium. The upward slope reflects the expectation of higher returns for higher risk.
According to Rossi (2016, p. 605), the expected return in this model consists of two main components:
1. Risk-Free Return: The minimum return achievable without taking on risk.
2. Risk Premium: The additional return expected for bearing investment risk, assuming that riskier investments should yield higher returns (Hull, 2018, p. 9).
Despite its widespread application, the model has faced criticism for assuming investors have uniform expectations regarding standard deviation (as a measure of volatility), (Abu Raghif, 2018, p. 91) expected return, and covariance of securities in a balanced market. It also assumes that investors are risk-averse and require higher returns to compensate for higher risks (Chen, 2022, p. 55).

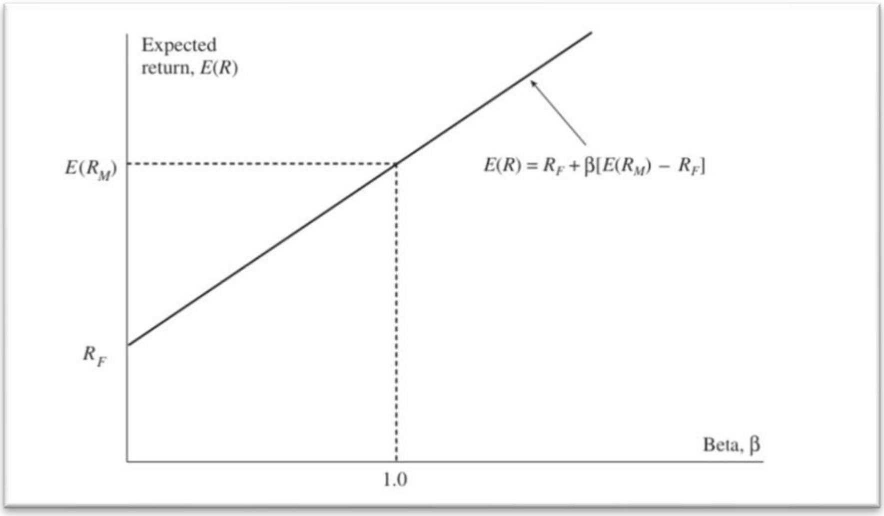

Figure (1): Capital Asset Pricing Model (CAPM)
Source: Hull, 2018, p. 9
Since the CAPM model serves as an important analytical tool in management, researchers have been motivated to derive the Human Capital Asset Pricing Model (HCAPM) and explore its applicability in valuing human capital—one of the key intangible assets (Welpe, Lutz, & Barthel, 2007, p. 282). Although human capital was not previously considered transferable or tradable like financial assets, the model assumes that human resources represent an investment, and every investment is exposed to measurable risks, similar to those addressed in the CAPM.
With the emergence of new employment practices—such as temporary licensing of work rights, partial trading, and temporary staffing agencies—the view on human capital has evolved. Organizations increasingly seek well-trained human capital, indicating the early development of a moderate human capital market, particularly in areas like sports clubs and player selection (Roy & Shijin, 2019, p. 22).
To apply the HCAPM, human capital is represented through a portfolio that includes all the organization's employees. This portfolio reflects all potential cash flows generated from internal human capital. From another perspective, it also encompasses all alternative opportunities available to human resources. This portfolio approach aids management in making more accurate investment decisions regarding human capital, considering that the human capital market comprises reliable and highly skilled individuals. Thus, the market

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

portfolio is defined as the pool of qualified human capital available to the organization (Welpe, Lutz, & Barthel, 2007, p. 283).

Implementation Mechanism of the HCAPM

The implementation process involves estimating the expected return on human capital, along with the risk-free rate, typically reflected by treasury bill rates used for discounting investments. Additionally, the model calculates the market portfolio return and market risk, which is assessed using the beta coefficient—a risk measure based on the standard deviation of performance or the variance around the expected return. Linear regression analysis can also be used to calculate the beta value (AlAmaren, Alathamneh, & Alrjoub, 2021, p. 4).

The Human Capital Beta is a metric that shows how market changes affect the expected return on investment in human capital. Several factors influence this measure, including skills, experience, education, training, technological advancements, and broader economic variables such as inflation, unemployment, and economic growth. The beta is calculated using covariance and variance as follows (Rossi, 2016, p. 607):

Equation (3):

$$\text{Covariance} = \text{Cov}(Rh, Rm)$$

Equation (4):

$$\text{Variance} = \text{Var}(Rm)$$

Equation (5):

$$\text{Beta } (\beta) = \text{Cov}(Rh, Rm) / \text{Var}(Rm)$$

After determining the beta and the market return reflecting the portfolio's returns, the risk-free rate—represented by treasury bill rates—is used to calculate the return on human capital. According to the HCAPM, the discount rate is calculated using the following formula:

Equation (6):

$$\text{Return on Human Capital } (Rh) = Rf + \beta\, (Rm - Rf)$$

(Yara, 2016, p. 21) Risks Facing Human Capital

Human capital is subject to various risks, including underperformance, lack of qualified personnel, and rapid technological changes that demand new knowledge and skills. Additional risks include turnover, absenteeism, and health-related issues. These risks are considered from the point of hiring, based on the time value of money principle, which suggests that the longer the time horizon, the higher the uncertainty—and therefore, the greater the risk (Krushnitska, 2013, p. 41).

The model illustrates that the line connecting the market portfolio with the risk-free return represents the Human Capital Market Line. As shown in Figure (2), the return on human capital serves as a tool for evaluating an individual's value, providing a comprehensive representation of human capital.

This value is unique to each individual within the organization, leading to variability in the net present value of human capital (Welpe, Lutz, & Barthel, 2007, p. 283).

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

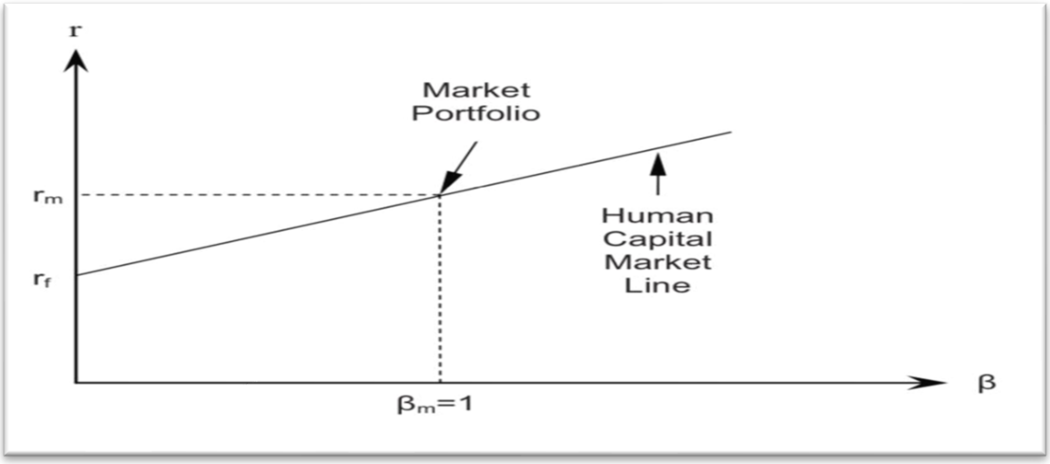

Figure (2): Human Capital Asset Pricing Model (HCAPM)
Source: Welpe, Lutz, & Barthel, 2007, p. 283

This model was market-oriented in response to the unstable environmental conditions faced by organizations. Thus, the concept of human capital valuation was developed, relying on the estimation of individuals' value based on market price and the present value of personnel costs, similar to financial accounting for other tangible organizational assets.

The market-oriented concept is among the modern models, as it addresses issues associated with the present value model, which failed to incorporate risk in its results. In this context, risk-adjusted discount rates and market benchmarking were used to account for risk. If the rate of return-to-risk in this investment aligns with the general market rate, a fair value is achieved (Hull, 2018, p. 10).

Despite the reliance on the present value model and the Human Capital Asset Pricing Model (HCAPM) in decision-making and human capital evaluation, the model is primarily an economic concept focused on the quantitative interpretation of employees. Both models have been criticized for their valuation outcomes, as they rely on the Discounted Cash Flow (DCF) method (AlAmaren, Alathamneh, & Alrjoub, 2021, p. 6). This implies the assumption that future earnings derived from human capital can be predicted and that the business environment will remain stable over time. Furthermore, these models assume constant interest rates throughout the measurement period.

These methods tend to underestimate the present value of human capital compared to its true value. The reason is that they assume future cash flows will be negative, leading to discounting these flows, and thereby reducing the projected value of human capital (Berk & Walden, 2013, p. 33). These quantitative models also overlook the importance of flexible management skills in anticipating alternative choices. As a result, they are often suitable for making immediate decisions but lack the flexibility required for dynamic environments.

TechHub Journal
ISSN 2810-2800

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

Chapter Three: Practical Aspect

3.1 Cash Flows of the Sample Physicians

The monthly cash flows are based on 50% of the total amount generated from surgical operations each month, while the remaining 50% is allocated to the hospital to cover operational costs. Table (1) presents the monthly cash flows for the physicians.

Table (1): *Monthly Cash Flows of the Sample Physicians*

month	1	2	3	4	5	6	7	8	9	10
1/2022	2,000	3,750	900	1,500	750	5,925	900	6,725	4,500	9,750
2/2022	2,250	12,500	2,875	750	1,000	1,950	825	2,100	4,500	4,500
3/2022	3,545	15,000	3,500	3,200	1,250	7,500	1,500	6,425	4,295	9,040
4/2022	4,000	11,250	800	4,952	2,500	2,625	1,125	3,300	5,000	0
5/2022	5,750	21,475	3,545	3,500	0	5,738	1,650	3,450	2,700	13,045
6/2022	6,250	19,750	5,195	6,000	0	15,000	2,372	6,750	0	13,000
7/2022	4,500	13,825	6,700	900	2,500	9,950	0	900	10,250	13,650
8/2022	5,250	22,500	3,200	5,600	4,250	10,650	1,050	5,750	8,345	11,715
9/2022	5,250	30,000	5,300	8,700	3,000	7,650	1,650	3,350	0	8,500
10/2022	4,500	17,250	9,938	1,200	2,000	12,600	1,800	4,100	3,750	9,250
11/2022	5,750	16,250	5,300	6,050	2,500	17,700	1,245	4,500	3,750	18,500
12/2022	3,000	17,500	1,688	4,100	1,275	11,550	3,177	2,600	7,500	12,000
1/2023	5,550	16,250	6,229	5,350	1,000	6,150	750	2,100	3,250	5,950
2/2023	3,250	16,250	3,044	5,150	2,855	6,050	927	450	750	6,415
3/2023	2,250	13,750	4,362	5,150	3,000	10,350	3,450	2,900	9,500	19,650
4/2023	2,500	10,000	0	7,350	2,225	0	1,366	967	1,250	6,820
5/2023	2,300	11,250	6,488	5,100	1,780	4,515	3,300	4,350	10,750	11,000
6/2023	3,553	10,000	4,088	1,250	750	0	1,950	1,527	3,750	11,000
7/2023	3,750	14,500	2,438	5,350	2,716	2,400	4,350	5,750	8,000	12,000

8/2023	4,750	17,500	7,689	2,500	3,299	6,600	3,300	2,850	11,250	21,275
9/2023	5,750	14,000	2,518	2,500	2,000	5,268	1,200	7,050	5,750	8,200
10/2023	4,588	18,775	4,576	1,250	1,563	7,200	2,850	3,750	2,250	13,450
11/2023	3,500	16,250	1,200	0	5,109	4,950	2,150	3,800	8,000	12,215
12/2023	2,750	10,000	5,391	6,250	5,660	750	1,500	4,350	4,750	5,700
1/2024	3,250	43,750	2,864	0	5,450	7,350	1,500	5,250	18,500	14,768
2/2024	4,000	28,550	5,026	0	4,250	6,168	1,350	5,000	20,825	20,250
3/2024	4,550	28,250	2,600	3,850	5,000	4,950	2,850	3,900	33,950	2,500
4/2024	5,250	12,000	2,738	4,750	6,488	9,950	1,200	6,000	10,868	9,250
5/2024	6,050	26,700	1,800	4,650	5,000	8,588	1,650	6,850	13,109	3,250
6/2024	6,500	20,000	7,150	9,550	1,700	14,100	1,050	3,000	7,250	750
total	126,136	528,825	119,142	116,452	80,870	214,177	53,987	119,794	228,342	307,393
average	4204.533	17627.5	3971.4	3881.733	2695.667	7139.233	1799.567	3993.133	7611.4	10246.43
var	1730669	59114556	5070417	6390723	2966225	18378628	950018.9	3435072	47705956	28763276

month	11	12	13	14	15	16	17	18	19	20
1/2022	13,900	1,200	1,950	4,200	9,900	450	0	4,750	2,250	10,825
2/2022	20,250	0	0	2,250	29,100	1,575	0	2,250	2,100	6,000
3/2022	17,895	3,350	1,875	7,100	28,550	2,175	0	11,075	3,900	9,460
4/2022	15,975	5,625	750	3,181	25,075	2,825	772	8,645	2,400	7,775
5/2022	11,700	4,500	0	2,975	27,850	3,075	2,197	4,750	4,050	7,250
6/2022	13,317	5,100	1,950	4,050	41,900	7,176	3,751	6,750	6,150	5,500
7/2022	10,540	4,100	450	2,000	13,368	1,200	1,554	8,050	5,750	7,025
8/2022	17,245	6,150	1,200	3,350	27,150	900	3,037	6,500	9,200	12,905
9/2022	10,602	3,900	0	3,200	35,325	1,650	1,572	1,350	8,000	9,366
10/2022	14,525	5,150	2,700	4,650	29,450	3,150	3,069	2,600	2,500	7,221
11/2022	20,900	5,350	2,550	900	32,000	2,700	4,113	5,450	1,500	8,020

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

12/2022	1,325	3,600	1,350	6,050	18,250	750	3,930	4,250	5,815	9,025
1/2023	12,810	4,450	450	4,400	18,350	3,500	1,179	6,365	3,100	8,961
2/2023	8,750	4,200	1,050	2,000	18,700	3,750	1,497	12,500	4,100	6,388
3/2023	7,250	6,795	2,250	4,500	20,350	2,200	3,501	16,765	2,000	8,411
4/2023	10,450	6,800	1,950	2,450	16,050	1,200	768	12,985	3,600	11,175
5/2023	10,930	7,350	900	3,300	29,800	5,038	5,091	16,515	2,100	8,968
6/2023	10,820	6,800	1,200	4,650	34,150	2,595	2,513	16,300	6,107	9,447
7/2023	3,635	6,900	4,650	7,900	31,718	2,250	1,589	13,775	1,000	8,175
8/2023	19,595	6,750	4,650	4,950	59,338	1,500	4,989	13,895	6,438	7,019
9/2023	15,250	3,450	1,800	4,400	30,795	2,000	2,010	12,325	8,150	10,895
10/2023	15,110	6,200	3,375	4,350	24,400	3,000	1,668	11,575	4,100	10,840
11/2023	11,000	9,400	1,350	450	32,903	0	2,716	17,975	6,995	6,330
12/2023	10,587	4,850	900	5,300	23,218	2,250	1,583	16,218	6,088	4,565
1/2024	14,300	5,700	1,800	900	24,700	3,000	1,964	22,100	5,981	12,033
2/2024	12,432	4,050	900	8,550	21,300	1,950	2,013	10,100	4,965	4,905
3/2024	9,900	8,400	1,650	3,850	13,600	777	2,345	16,545	5,480	7,226
4/2024	10,300	8,918	900	6,700	15,100	4,650	1,135	7,000	5,680	6,630
5/2024	9,045	6,750	1,950	450	22,100	1,950	1,925	7,350	6,130	6,775
6/2024	7,450	3,900	450	2,450	10,550	3,600	533	4,975	1,700	9,955
total	367,788	159,688	46,950	115,456	765,040	72,836	63,014	301,683	137,329	249,070
average	12259.6	5322.933	1565	3848.533	25501.33	2427.867	2100.467	10056.1	4577.633	8302.333
var	19499487	4125743	1332650	4136271	99322812	2137686	1818052	28480778	4666175	4307986

This table illustrates the investment costs, reflecting the monthly salaries of senior consultants in the first grade. The salaries range from phase (1) to phase (11) according to the 2015 state employee salary system, with amounts ranging between 2,500 and 3,500.

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

Table (2):
Investment Costs Reflecting the Monthly Salaries of Senior Consultants

Dr	2022	2023	2024	total	average
1	2700	2800	2900	8400	2780
2	2900	3000	3100	9000	2980
3	2100	2200	2300	6600	2180
4	2200	2300	2400	6900	2280
5	2700	2800	2900	8400	2780
6	3000	3100	3200	9300	3080
7	2000	2100	2200	6300	2080
8	2700	2800	2900	8400	2780
9	2600	2700	2800	8100	2680
10	2300	2400	2500	7200	2380
11	2500	2600	2700	7800	2580
12	2400	2500	2600	7500	2480
13	1900	2000	2100	6000	1980
14	2200	2300	2400	6900	2280
15	2800	2900	3000	8700	2880
16	2100	2200	2300	6600	2180
17	1900	2000	2100	6000	1980
18	2400	2500	2600	7500	2480
19	2200	2300	2400	6900	2280
20	2200	2300	2400	6900	2280

It can be seen from Tables 1 and 2 that seniority in the medical specialty is not the only factor influencing cash flows. For example, Doctor No. (6) is the oldest in their specialty, yet does not achieve the highest cash flow. On the other hand, Doctors (15) and (2) show a correlation between experience level and monthly cash flow.

3-2 Human Capital Asset Pricing Model (HCAPM)

This model relies on calculating the present value, taking into account various factors such as risks and market return rates. It assumes a portfolio consisting of 20 doctors over a 30-month period, based on the Capital Asset Pricing Theory (CAPM). This model also calculates the net present value more accurately than the first model, as the present value of each individual is determined based on the human capital return rate, which is used as a discount rate for evaluating human resources. Thus, the results take into account the risks associated with human capital, as well as market fluctuations and economic factors.

The CAPM model will be used based on the monthly cash flows of the doctors, where it is assumed that these cash flows represent the doctors' revenues for the same study period. The return on investment for each doctor will be calculated by dividing the monthly returns by the monthly investment cost. A portfolio of human capital will be created consisting of 20 doctors per month, in order to calculate the market return rate and the beta of each doctor. Subsequently, the HCAPM equation will be applied to calculate the human capital return rate, which will be used as the discount rate.

TechHub Journal ISSN 2810-2800

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

Calculating the return on human capital based on the following variables:
1. Calculating the Monthly Portfolio Return
The monthly portfolio consists of 20 doctors, each with a monthly return on investment, as shown in Table (3). The monthly portfolio return rate is calculated as R(i) ÷ 20. This process is repeated to form 30 portfolios over the study period. Finally, the average market return is calculated by dividing the monthly portfolio returns by 30, i.e., Rm’ = Rm ÷ 30.

Table No. (3): Return on Investment

Return Investment	1	2	3	4	5	6	7	8	9	10
R1	0.741	1.293	0.429	0.682	0.278	1.975	0.450	2.491	1.731	4.239
R2	0.833	4.310	1.369	0.341	0.370	0.650	0.413	0.778	1.731	1.957
R3	1.313	5.172	1.667	1.455	0.463	2.500	0.750	2.380	1.652	3.930
R4	1.481	3.879	0.381	2.251	0.926	0.875	0.563	1.222	1.923	0.000
R5	2.130	7.405	1.688	1.591	0.000	1.913	0.825	1.278	1.038	5.672
R6	2.315	6.810	2.474	2.727	0.000	5.000	1.186	2.500	0.000	5.652
R7	1.667	4.767	3.190	0.409	0.926	3.317	0.000	0.333	3.942	5.935
R8	1.944	7.759	1.524	2.545	1.574	3.550	0.525	2.130	3.210	5.093
R9	1.944	10.345	2.524	3.955	1.111	2.550	0.825	1.241	0.000	3.696
R10	1.667	5.948	4.732	0.545	0.741	4.200	0.900	1.519	1.442	4.022
R11	2.130	5.603	2.524	2.750	0.926	5.900	0.623	1.667	1.442	8.043
R12	1.111	6.034	0.804	1.864	0.472	3.850	1.589	0.963	2.885	5.217
R13	1.982	5.417	2.831	2.326	0.357	1.984	0.357	0.750	1.204	2.479
R14	1.161	5.417	1.384	2.239	1.020	1.952	0.441	0.161	0.278	2.673
R15	0.804	4.583	1.983	2.239	1.071	3.339	1.643	1.036	3.519	8.188
R16	0.893	3.333	0.000	3.196	0.795	0.000	0.650	0.345	0.463	2.842
R17	0.821	3.750	2.949	2.217	0.636	1.456	1.571	1.554	3.981	4.583
R18	1.269	3.333	1.858	0.543	0.268	0.000	0.929	0.545	1.389	4.583
R19	1.339	4.833	1.108	2.326	0.970	0.774	2.071	2.054	2.963	5.000
R20	1.696	5.833	3.495	1.087	1.178	2.129	1.571	1.018	4.167	8.865
R21	2.054	4.667	1.145	1.087	0.714	1.699	0.571	2.518	2.130	3.417
R22	1.639	6.258	2.080	0.543	0.558	2.323	1.357	1.339	0.833	5.604
R23	1.250	5.417	0.545	0.000	1.825	1.597	1.024	1.357	2.963	5.090
R24	0.982	3.333	2.450	2.717	2.021	0.242	0.714	1.554	1.759	2.375
R25	1.121	14.113	1.245	0.000	1.879	2.297	0.682	1.810	6.607	5.907
R26	1.379	9.210	2.185	0.000	1.466	1.928	0.614	1.724	7.438	8.100
R27	1.569	9.113	1.130	1.604	1.724	1.547	1.295	1.345	12.125	1.000
R28	1.810	3.871	1.190	1.979	2.237	3.109	0.545	2.069	3.881	3.700
R29	2.086	8.613	0.783	1.938	1.724	2.684	0.750	2.362	4.682	1.300
R30	2.241	6.452	3.109	3.979	0.586	4.406	0.477	1.034	2.589	0.300
total	46.372	178.874	57.776	55.136	33.817	75.744	32.912	51.075	92.966	139.462

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

Return Investment	11	12	13	14	15	16	17	18	19	20
R1	5.560	0.500	1.026	1.909	3.536	0.214	0.000	1.979	1.023	4.920
R2	8.100	0.000	0.000	1.023	10.393	0.750	0.000	0.938	0.955	2.727
R3	7.158	1.396	0.987	3.227	10.196	1.036	0.000	4.615	1.773	4.300
R4	6.390	2.344	0.395	1.446	8.955	1.345	0.406	3.602	1.091	3.534
R5	4.680	1.875	0.000	1.352	9.946	1.464	1.156	1.979	1.841	3.295
R6	5.327	2.125	1.026	1.841	14.964	3.417	1.974	2.813	2.795	2.500
R7	4.216	1.708	0.237	0.909	4.774	0.571	0.818	3.354	2.614	3.193
R8	6.898	2.563	0.632	1.523	9.696	0.429	1.598	2.708	4.182	5.866
R9	4.241	1.625	0.000	1.455	12.616	0.786	0.827	0.563	3.636	4.257
R10	5.810	2.146	1.421	2.114	10.518	1.500	1.615	1.083	1.136	3.282
R11	8.360	2.229	1.342	0.409	11.429	1.286	2.165	2.271	0.682	3.645
R12	0.530	1.500	0.711	2.750	6.518	0.357	2.068	1.771	2.643	4.102
R13	4.927	1.780	0.225	1.913	6.328	1.591	0.590	2.546	1.348	3.896
R14	3.365	1.680	0.525	0.870	6.448	1.705	0.749	5.000	1.783	2.777
R15	2.788	2.718	1.125	1.957	7.017	1.000	1.751	6.706	0.870	3.657
R16	4.019	2.720	0.975	1.065	5.534	0.545	0.384	5.194	1.565	4.859
R17	4.204	2.940	0.450	1.435	10.276	2.290	2.546	6.606	0.913	3.899
R18	4.162	2.720	0.600	2.022	11.776	1.180	1.257	6.520	2.655	4.107
R19	1.398	2.760	2.325	3.435	10.937	1.023	0.795	5.510	0.435	3.554
R20	7.537	2.700	2.325	2.152	20.461	0.682	2.495	5.558	2.799	3.052
R21	5.865	1.380	0.900	1.913	10.619	0.909	1.005	4.930	3.543	4.737
R22	5.812	2.480	1.688	1.891	8.414	1.364	0.834	4.630	1.783	4.713
R23	4.231	3.760	0.675	0.196	11.346	0.000	1.358	7.190	3.041	2.752
R24	4.072	1.940	0.450	2.304	8.006	1.023	0.792	6.487	2.647	1.985
R25	5.296	2.192	0.857	0.375	8.233	1.304	0.935	8.500	2.492	5.014
R26	4.604	1.558	0.429	3.563	7.100	0.848	0.959	3.885	2.069	2.044
R27	3.667	3.231	0.786	1.604	4.533	0.338	1.117	6.363	2.283	3.011
R28	3.815	3.430	0.429	2.792	5.033	2.022	0.540	2.692	2.367	2.763
R29	3.350	2.596	0.929	0.188	7.367	0.848	0.917	2.827	2.554	2.823
R30	2.759	1.500	0.214	1.021	3.517	1.565	0.254	1.913	0.708	4.148
total	154.141	76.095	36.682	64.651	281.488	49.390	48.902	138.733	79.226	129.414

According to Table No. (4), the portfolio return rate increases despite the absence of the return rate for some doctors, which equals zero. The highest return rate for the doctor's portfolio occurs in month (20), corresponding to (30/8/2023), with a return of (4.040). This is followed by month (25), which represents (30/1/2024), with a return rate of (3.543), despite the return rate for Doctor (4) being zero. Next is month (6), corresponding to (30/6/2022), with a return rate of (3.372), despite the return rates for Doctors (5) and (9) being zero. It is also observed that the portfolio return rates are nearly equal in most months.

The lowest returns for the market portfolio were (1.749) in the first month (30/1/2022), while in the second month, they were (1.882) on (28/2/2022). This month is distinguished by the

TechHub Journal ISSN 2810-2800
TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

presence of three doctors, namely (12), (13), and (17), who achieved a return rate of zero. This demonstrates that achieving the highest returns does not necessarily require all doctors in the portfolio to have a return rate, as there may be portfolios containing zero returns, yet still achieving a high return rate. Additionally, the table shows the calculation of the variance in market returns using the formula Rm var =

Table No. (4): Market Return Rate

month	Total cash flows Rm	Market Return Rate	Rm-Rm`	(Rm-Rm`)^2
1	34.975	1.749	-0.939	0.882
2	37.636	1.882	-0.806	0.650
3	55.969	2.798	0.110	0.012
4	43.010	2.150	-0.538	0.289
5	51.129	2.556	-0.132	0.017
6	67.447	3.372	0.684	0.468
7	46.881	2.344	-0.344	0.118
8	65.948	3.297	0.609	0.371
9	58.196	2.910	0.222	0.049
10	56.342	2.817	0.129	0.017
11	65.425	3.271	0.583	0.340
12	47.739	2.387	-0.301	0.091
13	44.830	2.242	-0.447	0.199
14	41.626	2.081	-0.607	0.368
15	57.992	2.900	0.211	0.045
16	39.378	1.969	-0.719	0.517
17	59.078	2.954	0.266	0.071
18	51.716	2.586	-0.102	0.010
19	55.611	2.781	0.092	0.009
20	80.800	4.040	1.352	1.828
21	55.803	2.790	0.102	0.010
22	56.143	2.807	0.119	0.014
23	55.616	2.781	0.093	0.009
24	47.854	2.393	-0.295	0.087
25	70.861	3.543	0.855	0.731
26	61.099	3.055	0.367	0.135
27	59.386	2.969	0.281	0.079
28	50.275	2.514	-0.174	0.030
29	51.318	2.566	-0.122	0.015
30	42.774	2.139	-0.549	0.302
Total		80.643	0.000	7.764
Rm`		2.688		
var				0.268

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

2- Beta Calculation (β) for the Doctor
The variance for 20 doctors was calculated according to Table No. (5) by analyzing the returns of each doctor to compare them with the market returns. As shown in Table No. (6), the highest variance between the market returns and Doctor No. (15) was recorded at (1.228), indicating a strong correlation between the doctor's performance and the market's performance. Following that, Doctor No. (10) had a variance of (0.751), followed by Doctor No. (2) with a variance of (0.704), then Doctor No. (9) with a variance of (0.430), and Doctor No. (18) with a variance of (0.352).

The variance values for the rest of the sample range between (0.255) and (0.006), all of which are positive, indicating that the doctors' returns move in line with the market direction. In other words, if the market returns increase, the doctors' returns will also rise. This suggests that the doctors' returns are affected by general market factors, except for Doctor No. (4), who shows a negative variance, meaning that his returns move in the opposite direction to the market returns, with a variance of (-0.064). By analyzing the variance, the beta coefficient for each doctor can be calculated to determine their exposure to market risks.

Table No. (5): Doctor's Return

Dr	1	2	3	4	5	6	7	8	9	10
Return total Ri	46.372	178.874	57.776	55.136	33.817	75.744	32.912	51.075	92.966	139.462
Ri` average	1.546	5.962	1.926	1.838	1.127	2.525	1.097	1.702	3.099	4.649
(Ri-Ri)`1	-0.805	-4.669	-1.497	-1.156	-0.849	-0.550	-0.647	0.788	-1.368	-0.410
(Ri-Ri)`2	-0.712	-1.652	-0.557	-1.497	-0.757	-1.875	-0.685	-0.925	-1.368	-2.692
(Ri-Ri)`3	-0.233	-0.790	-0.259	-0.383	-0.664	-0.025	-0.347	0.677	-1.447	-0.718
(Ri-Ri)`4	-0.064	-2.083	-1.545	0.413	-0.201	-1.650	-0.535	-0.480	-1.176	-4.649
(Ri-Ri`)`5	0.584	1.443	-0.238	-0.247	-1.127	-0.612	-0.272	-0.425	-2.060	1.023
(Ri-Ri`)`6	0.769	0.848	0.548	0.889	-1.127	2.475	0.089	0.798	-3.099	1.003
(Ri-Ri)`7	0.121	-1.195	1.265	-1.429	-0.201	0.792	-1.097	-1.369	0.843	1.286
(Ri-Ri)`8	0.399	1.796	-0.402	0.708	0.447	1.025	-0.572	0.427	0.111	0.445
(Ri-Ri)`9	0.399	4.382	0.598	2.117	-0.016	0.025	-0.272	-0.462	-3.099	-0.953
(Ri-Ri`)10	0.121	-0.014	2.806	-1.292	-0.386	1.675	-0.197	-0.184	-1.657	-0.627
(Ri-Ri`)11	0.584	-0.359	0.598	0.912	-0.201	3.375	-0.475	-0.036	-1.657	3.395
(Ri-Ri`)12	-0.435	0.072	-1.122	0.026	-0.655	1.325	0.491	-0.740	-0.214	0.569
(Ri-Ri`)13	0.436	-0.546	0.905	0.488	-0.770	-0.541	-0.740	-0.952	-1.895	-2.170
(Ri-Ri`)14	-0.385	-0.546	-0.542	0.401	-0.108	-0.573	-0.656	-1.542	-2.821	-1.976
(Ri-Ri`)15	-0.742	-1.379	0.057	0.401	-0.056	0.814	0.546	-0.667	0.420	3.539
(Ri-Ri`)16	-0.653	-2.629	-1.926	1.358	-0.333	-2.525	-0.447	-1.357	-2.636	-1.807
(Ri-Ri`)17	-0.724	-2.212	1.023	0.380	-0.492	-1.068	0.474	-0.149	0.883	-0.065
(Ri-Ri`)18	-0.277	-2.629	-0.068	-1.294	-0.859	-2.525	-0.168	-1.157	-1.710	-0.065
(Ri-Ri`)19	-0.206	-1.129	-0.818	0.488	-0.157	-1.751	0.974	0.351	-0.136	0.351
(Ri-Ri`)`20	0.151	-0.129	1.569	-0.751	0.051	-0.396	0.474	-0.685	1.068	4.216
(Ri-Ri`)`21	0.508	-1.296	-0.781	-0.751	-0.413	-0.825	-0.526	0.815	-0.969	-1.232
(Ri-Ri`)22	0.093	0.296	0.154	-1.294	-0.569	-0.202	0.260	-0.363	-2.266	0.955

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

(Ri-Ri`)23	-0.296	-0.546	-1.380	-1.838	0.697	-0.928	-0.073	-0.345	-0.136	0.441
(Ri-Ri`)24	-0.564	-2.629	0.525	0.880	0.894	-2.283	-0.383	-0.149	-1.340	-2.274
(Ri-Ri`)25	-0.425	8.150	-0.681	-1.838	0.752	-0.228	-0.415	0.108	3.508	1.258
(Ri-Ri`)26	-0.166	3.247	0.259	-1.838	0.338	-0.597	-0.483	0.022	4.339	3.451
(Ri-Ri``)27	0.023	3.150	-0.795	-0.234	0.597	-0.978	0.198	-0.358	9.026	-3.649
(Ri-Ri`)28	0.265	-2.091	-0.735	0.141	1.110	0.585	-0.552	0.366	0.783	-0.949
(Ri-Ri`)29	0.540	2.650	-1.143	0.100	0.597	0.159	-0.347	0.660	1.583	-3.349
(Ri-Ri``)30	0.696	0.489	1.183	2.141	-0.541	1.881	-0.620	-0.668	-0.510	-4.349

Dr	11	12	13	14	15	16	17	18	19	20
Return total	154.141	76.095	36.682	64.651	281.488	49.390	48.902	138.733	79.226	129.414
average	5.138	2.537	1.223	2.155	9.383	1.646	1.630	4.624	2.641	4.314
(Ri-Ri`)1	0.422	-2.037	-0.196	-0.246	-5.847	-1.432	-1.630	-2.645	-1.618	0.607
(Ri-Ri`)2	2.962	-2.537	-1.223	-1.132	1.010	-0.896	-1.630	-3.687	-1.686	-1.587
(Ri-Ri`)3	2.020	-1.141	-0.236	1.072	0.813	-0.611	-1.630	-0.010	-0.868	-0.014
(Ri-Ri`)4	1.252	-0.193	-0.828	-0.709	-0.428	-0.301	-1.224	-1.022	-1.550	-0.780
(Ri-Ri`)5	-0.458	-0.662	-1.223	-0.803	0.563	-0.182	-0.474	-2.645	-0.800	-1.018
(Ri-Ri`)6	0.189	-0.412	-0.196	-0.314	5.581	1.771	0.344	-1.812	0.155	-1.814
(Ri-Ri`)7	-0.922	-0.828	-0.986	-1.246	-4.609	-1.075	-0.812	-1.270	-0.027	-1.121
(Ri-Ri`)8	1.760	0.026	-0.591	-0.632	0.313	-1.218	-0.032	-1.916	1.541	1.552
(Ri-Ri`)9	-0.897	-0.912	-1.223	-0.700	3.233	-0.861	-0.803	-4.062	0.996	-0.057
(Ri-Ri`)10	0.672	-0.391	0.198	-0.041	1.135	-0.146	-0.015	-3.541	-1.504	-1.032
(Ri-Ri`)11	3.222	-0.307	0.119	-1.746	2.046	-0.361	0.535	-2.354	-1.959	-0.668
(Ri-Ri`)12	-4.608	-1.037	-0.512	0.595	-2.865	-1.289	0.438	-2.854	0.002	-0.212
(Ri-Ri`)13	-0.211	-0.757	-0.998	-0.242	-3.055	-0.055	-1.041	-2.078	-1.293	-0.418
(Ri-Ri`)14	-1.773	-0.857	-0.698	-1.285	-2.935	0.058	-0.882	0.376	-0.858	-1.536
(Ri-Ri`)15	-2.350	0.181	-0.098	-0.199	-2.366	-0.646	0.120	2.082	-1.771	-0.657
(Ri-Ri`)16	-1.119	0.183	-0.248	-1.090	-3.848	-1.101	-1.246	0.570	-1.076	0.545

TechHub Journal ISSN 2810-2800

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

(Ri-Ri`)17	-0.934	0.403	-0.773	-0.720	0.893	0.644	0.915	1.982	-1.728	-0.415
(Ri-Ri`)18	-0.976	0.183	-0.623	-0.133	2.393	-0.467	-0.374	1.896	0.014	-0.206
(Ri-Ri`)19	-3.740	0.223	1.102	1.280	1.554	-0.624	-0.836	0.886	-2.206	-0.759
(Ri-Ri`)20	2.399	0.163	1.102	-0.003	11.078	-0.965	0.864	0.934	0.158	-1.262
(Ri-Ri`)21	0.727	-1.157	-0.323	-0.242	1.236	-0.737	-0.625	0.306	0.903	0.423
(Ri-Ri`)22	0.674	-0.057	0.465	-0.264	-0.969	-0.283	-0.796	0.006	-0.858	0.399
(Ri-Ri`)23	-0.907	1.223	-0.548	-1.959	1.963	-1.646	-0.272	2.566	0.400	-1.562
(Ri-Ri`)24	-1.066	-0.597	-0.773	0.149	-1.377	-0.624	-0.839	1.863	0.006	-2.329
(Ri-Ri`)25	0.158	-0.344	-0.366	-1.780	-1.150	-0.342	-0.695	3.876	-0.149	0.700
(Ri-Ri`)26	-0.534	-0.979	-0.794	1.407	-2.283	-0.799	-0.672	-0.740	-0.572	-2.270
(Ri-Ri`)27	-1.471	0.694	-0.437	-0.551	-4.850	-1.309	-0.513	1.739	-0.358	-1.303
(Ri-Ri`)28	-1.323	0.893	-0.794	0.637	-4.350	0.375	-1.090	-1.932	-0.274	-1.551
(Ri-Ri`)29	-1.788	0.060	-0.294	-1.968	-2.016	-0.799	-0.713	-1.798	-0.087	-1.491
(Ri-Ri`)30	-2.379	-1.037	-1.008	-1.134	-5.866	-0.081	-1.376	-2.711	-1.933	-0.166

Table No. (6): Doctor's Variance00:46

Dr	1	2	3	4	5	6	7	8	9	10
1COV	0.756	4.386	1.406	1.086	0.798	0.516	0.608	-0.740	1.285	0.385
2COV	0.574	1.332	0.449	1.207	0.610	1.512	0.552	0.746	1.103	2.171
3COV	-0.026	-0.087	-0.029	-0.042	-0.073	-0.003	-0.038	0.075	-0.160	-0.079
4COV	0.035	1.120	0.831	-0.222	0.108	0.887	0.287	0.258	0.632	2.499
5COV	-0.077	-0.190	0.031	0.033	0.148	0.081	0.036	0.056	0.271	-0.135
6COV	0.526	0.580	0.375	0.609	-0.771	1.694	0.061	0.546	-2.120	0.687
7COV	-0.042	0.411	-0.435	0.492	0.069	-0.272	0.377	0.471	-0.290	-0.442
8COV	0.243	1.094	-0.245	0.431	0.272	0.625	-0.349	0.260	0.067	0.271
9COV	0.088	0.972	0.133	0.469	-0.004	0.006	-0.060	-0.102	-0.687	-0.211
10COV	0.016	-0.002	0.362	-0.167	-0.050	0.216	-0.025	-0.024	-0.214	-0.081
11COV	0.341	-0.209	0.349	0.532	-0.117	1.968	-0.277	-0.021	-0.966	1.980
12COV	0.131	-0.022	0.338	-0.008	0.197	-0.399	-0.148	0.223	0.065	-0.171
13COV	-0.195	0.244	-0.404	-0.218	0.344	0.242	0.330	0.425	0.846	0.969
14COV	0.234	0.331	0.329	-0.243	0.065	0.348	0.398	0.936	1.712	1.199

TechHub Journal
ISSN 2810-2800

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

15COV	-0.157	-0.292	0.012	0.085	-0.012	0.172	0.115	-0.141	0.089	0.748
16COV	0.470	1.891	1.385	-0.976	0.239	1.816	0.321	0.976	1.896	1.300
17COV	-0.193	-0.588	0.272	0.101	-0.131	-0.284	0.126	-0.040	0.235	-0.017
18COV	0.028	0.269	0.007	0.132	0.088	0.258	0.017	0.118	0.175	0.007
19COV	-0.019	-0.104	-0.076	0.045	-0.015	-0.162	0.090	0.032	-0.013	0.032
20COV	0.204	-0.175	2.121	-1.015	0.069	-0.535	0.641	-0.926	1.444	5.699
21COV	0.052	-0.132	-0.080	-0.077	-0.042	-0.084	-0.054	0.083	-0.099	-0.126
22COV	0.011	0.035	0.018	-0.154	-0.068	-0.024	0.031	-0.043	-0.270	0.114
23COV	-0.027	-0.051	-0.128	-0.170	0.065	-0.086	-0.007	-0.032	-0.013	0.041
24COV	0.166	0.777	-0.155	-0.260	-0.264	0.674	0.113	0.044	0.396	0.672
25COV	-0.363	6.968	-0.582	-1.571	0.643	-0.195	-0.355	0.092	2.999	1.076
26COV	-0.061	1.191	0.095	-0.674	0.124	-0.219	-0.177	0.008	1.592	1.266
27COV	0.007	0.886	-0.224	-0.066	0.168	-0.275	0.056	-0.101	2.538	-1.026
28COV	-0.046	0.365	0.128	-0.025	-0.194	-0.102	0.096	-0.064	-0.136	0.165
29COV	-0.066	-0.324	0.140	-0.012	-0.073	-0.019	0.042	-0.081	-0.193	0.409
30COV	-0.382	-0.269	-0.650	-1.176	0.297	-1.034	0.341	0.367	0.280	2.389
total(Rm`-Rm)(R-`R)	2.227	20.408	5.774	-1.856	2.493	7.320	3.150	3.402	12.463	21.789
$\frac{\sum(\mathbf{Ri}-\mathbf{Ri`})(\mathbf{Rm}-\mathbf{Rm`})}{n-1}$	0.077	0.704	0.199	-0.064	0.086	0.252	0.109	0.117	0.430	0.751

Dr	11	12	13	14	15	16	17	18	19	20
1COV	-0.396	1.913	0.184	0.231	5.492	1.345	1.531	2.485	1.520	-0.570
2COV	-2.388	2.045	0.986	0.913	-0.814	0.723	1.314	2.973	1.360	1.279
3COV	0.223	-0.126	-0.026	0.118	0.090	-0.067	-0.180	-0.001	-0.096	-0.002
4COV	-0.673	0.104	0.445	0.381	0.230	0.162	0.658	0.550	0.833	0.419
5COV	0.060	0.087	0.161	0.106	-0.074	0.024	0.062	0.348	0.105	0.134
6COV	0.129	-0.282	-0.134	-0.215	3.819	1.212	0.235	-1.240	0.106	-1.241
7COV	0.317	0.285	0.339	0.429	1.586	0.370	0.279	0.437	0.009	0.386
8COV	1.072	0.016	-0.360	-0.385	0.191	-0.742	-0.019	-1.168	0.939	0.946
9COV	-0.199	-0.202	-0.271	-0.155	0.717	-0.191	-0.178	-0.901	0.221	-0.013
10COV	0.087	-0.050	0.026	-0.005	0.146	-0.019	-0.002	-0.457	-0.194	-0.133
11COV	1.879	-0.179	0.070	-1.018	1.193	-0.210	0.312	-1.373	-1.142	-0.390
12COV	1.388	0.312	0.154	-0.179	0.863	0.388	-0.132	0.859	-0.001	0.064
13COV	0.094	0.338	0.446	0.108	1.364	0.025	0.465	0.928	0.577	0.187
14COV	1.076	0.520	0.423	0.780	1.781	-0.035	0.535	-0.228	0.521	0.932
15COV	-0.497	0.038	-0.021	-0.042	-0.500	-0.137	0.025	0.440	-0.375	-0.139
16COV	0.805	-0.132	0.178	0.784	2.768	0.792	0.896	-0.410	0.774	-0.392
17COV	-0.248	0.107	-0.205	-0.191	0.237	0.171	0.243	0.527	-0.459	-0.110
18COV	0.100	-0.019	0.064	0.014	-0.245	0.048	0.038	-0.194	-0.001	0.021
19COV	-0.346	0.021	0.102	0.118	0.144	-0.058	-0.077	0.082	-0.204	-0.070
20COV	3.243	0.221	1.490	-0.004	14.977	-1.304	1.169	1.262	0.214	-1.706
21COV	0.074	-0.118	-0.033	-0.025	0.126	-0.075	-0.064	0.031	0.092	0.043
22COV	0.080	-0.007	0.055	-0.031	-0.115	-0.034	-0.095	0.001	-0.102	0.048

23COV	-0.084	0.113	-0.051	-0.182	0.182	-0.153	-0.025	0.238	0.037	-0.145
24COV	0.315	0.176	0.228	-0.044	0.407	0.184	0.248	-0.550	-0.002	0.688
25COV	0.135	-0.294	-0.313	-1.522	-0.983	-0.292	-0.594	3.313	-0.127	0.598
26COV	-0.196	-0.359	-0.291	0.516	-0.838	-0.293	-0.246	-0.271	-0.210	-0.833
27COV	-0.414	0.195	-0.123	-0.155	-1.364	-0.368	-0.144	0.489	-0.101	-0.366
28COV	0.231	-0.156	0.138	-0.111	0.758	-0.065	0.190	0.337	0.048	0.270
29COV	0.218	-0.007	0.036	0.240	0.246	0.098	0.087	0.220	0.011	0.182
30COV	1.307	0.569	0.554	0.623	3.223	0.045	0.756	1.489	1.062	0.091
total(Rm`-Rm)(R-`R)	7.392	5.130	4.252	1.096	35.607	1.542	7.288	10.217	5.414	0.179
$\frac{\sum(\text{Ri}-\text{Ri`})(\text{Rm}-\text{Rm`})}{n-1}$	0.255	0.177	0.147	0.038	1.228	0.053	0.251	0.352	0.187	0.006

Calculation of Present Value According to HCAPM The table illustrates the Beta value for each doctor, which measures the sensitivity or volatility of the doctor's returns compared to market returns. The data indicate that Doctor (15) has the highest cash flow and variance, resulting in a high Beta value of 4.586. This reflects his exposure to very high risks, but also achieving the highest returns, meaning that his income is strongly linked to the market and systematic risks. The Beta values for Doctor (10) and Doctor (2) are 2.806 and 2.628, respectively, indicating that their returns are more volatile than the market, but they face lower risks compared to Doctor (15), suggesting a moderate level of risk with good returns.
On the other hand, Doctors (9) and (18) have Beta values of 1.605 and 1.316, respectively, which are close to 1, indicating complete alignment with the market. This means they are equally affected by market movements, making them relatively stable.
The results show that most doctors in the study sample have Beta values below 1, indicating that their returns are less volatile than the market and reflect lower risks, with Beta values ranging from 0.952 to 0.141. Additionally, Beta values could be zero, which means that the doctor's returns are not correlated with market movements, as seen with Doctor (20) whose Beta value is 0.023. In contrast, Doctor (4) has a negative Beta value, meaning his returns move in the opposite direction of the market, providing a hedge against market risks and fluctuations. Moreover, the risk-free rate (Rf) is 0.04755, as announced by the Central Bank of Iraq on June 30, 2024. This reflects the latest interest rate for treasury bills during the study period and is considered as a fixed discount rate.

3- Human Capital Return and Present Value

The model relies on a linear relationship between Beta and the expected return, meaning that as Beta (and thus the risk) increases, the expected return on human capital rises, leading to a higher discount rate. The increase in Beta corresponds to more volatile returns, indicating higher risks. In this model, risk is the key factor: the lower the risk, the higher the present value.
We observe that Doctor (20) achieves the highest present value of 116.755 due to lower risk, with a Beta of zero, meaning he is unaffected by market movements, even though he does not have the highest cash flows.
The results from the model show that the focus is not on cash flows alone, but rather on achieving higher present values for doctors with lower risks. When the expected return rises, the discount rate increases due to higher risks, which leads to a significant discount of their cash flows. Therefore, the present values for doctors with higher cash flows and more volatility suffer from higher risks, resulting in lower present values. For example, Doctors (2) and (15) have

TechHub Journal Vol. 7, pp. 262-283 (2024)
ISSN: 2810-2800
www.techhubresearch.com

present values of 22.330 and 21.395, respectively, while Doctor (14), who generates lower cash flow, has a present value of 45.515 due to the lower risks associated with him.

It is clear that the present value of Doctor (11), according to the Human Capital Asset Pricing Model (HCAPM), is 43.281, while the lowest value is for Doctor (17) at 13.869, indicating exposure to medium risks and low cash flow. The expected return on human capital, which serves as a tool to assess the financial value of human capital through the discount rate, affects the financial evaluation of human capital. The higher the expected return, the lower the present value, indicating an inverse relationship due to the impact of systematic risks, as shown in Table No. (7): Calculation of Present Value According to HCAPM

Dr	**B=** $\frac{Cov(Ri,Rm)}{Var(Rm)}$	**Rf**	**Rm-Rf**	**Rm**	**Rf+B(Rm-Rf)**	Present Value **HCAPM**
1	0.287	0.048	2.641	2.688	0.805	25.693
2	2.628	0.048	2.641	2.688	6.988	22.393
3	0.744	0.048	2.641	2.688	2.011	19.186
4	-0.239	0.048	2.641	2.688	0.584	34.815
5	0.321	0.048	2.641	2.688	0.895	17.843
6	0.943	0.048	2.641	2.688	2.537	21.414
7	0.406	0.048	2.641	2.688	1.119	15.534
8	0.438	0.048	2.641	2.688	1.205	23.167
9	1.605	0.048	2.641	2.688	4.286	17.587
10	2.806	0.048	2.641	2.688	7.458	16.489
11	0.952	0.048	2.641	2.688	2.561	43.281
12	0.661	0.048	2.641	2.688	1.792	27.254
13	0.548	0.048	2.641	2.688	1.493	14.711
14	0.141	0.048	2.641	2.688	0.420	45.515
15	4.586	0.048	2.641	2.688	12.157	21.395
16	0.199	0.048	2.641	2.688	0.572	31.420
17	0.939	0.048	2.641	2.688	2.526	13.869
18	1.316	0.048	2.641	2.688	3.522	30.678
19	0.697	0.048	2.641	2.688	1.889	27.425
20	0.023	0.048	2.641	2.688	0.108	116.755

Chapter Four: Conclusions and Recommendations

4-1 Conclusions

1. Human capital is an intangible asset that can be measured using several quantitative models to determine its financial value, which facilitates decision-making regarding investment in human resources.
2. Evaluating the contribution of human resources is essential for enhancing the development of organizational value and improving performance within the organization.
3. The Capital Asset Pricing Model (CAPM) considers the risk dimension through simplified assumptions, relying on the required rate of return to assess human capital. However, it assumes the existence of a balanced market without taking into account future decision options.
4. The research demonstrates that relying on a single model may not be sufficient for the financial evaluation of doctors. The Capital Asset Pricing Model (CAPM) can serve as an initial

step to understand the intrinsic value of human capital, but combining its results with multiple modern models provides a more accurate estimate.

4-2 Recommendations

1. Contributing to the intellectual debate on measuring the financial value of human capital and enhancing both the theoretical and practical aspects of financial evaluation models for human capital.
2. The research suggests adopting an integrated approach that combines various modern models. This approach allows companies to estimate the value of their investments in human capital in a flexible and gradual manner, as traditional methods do not provide precise and objective evaluations.
3. The research recommends the need for further studies to understand how to handle risks associated with human capital, particularly concerning public policies that support investments in education and human resource training.
4. The Capital Asset Pricing Model (CAPM) does not consider the possibility of future decision adjustments. Therefore, evaluation decisions should be supported using the Real Options Model and incorporating delay options.

References:

1- Abu Raghif, Kifah Ali Issa, "A Proposed Model for Option Pricing in the Context of Return and Risk: An Applied Study," Ph.D. Thesis, Faculty of Management and Economics, Al-Mustansiriya University, 2018.
2- AlAmaren, A. S., Alathamneh, M. S., & Alrjoub, A. M. S. (2021). Estimating beta and the security market line CAPM test for Dow Jones 30 during the period (2015-2019). Journal of Management Information and Decision Sciences, 24(S6), 1-7.
3- Al-Freiji, Haider Naima Ghali, "Using Financial Engineering Tools in Managing the Balance Sheet Gap for a Sample of Iraqi Banks: An Applied Study," Ph.D. Thesis, Faculty of Management and Economics, Al-Mustansiriya University, 2001.
4- Aliu, J., & Aigbavboa, C. (2019). Examining the roles of human capital theory: What next for the construction industry? Journal of Physics: Conference Series, 1378(2), 022057
5- Arkan, T. (2016). Human resources accounting: A suggested model for measurement and valuation. Finanse, Rynki Finansowe, Ubezpieczenia, 1(79), 173-193.
6- Berk, J. B., & Walden, J. (2013). Limited capital market participation and human capital risk. Review of Asset Pricing Studies, 3(1), 1-38.
7- Chen, J. (2022). Application and thinking about capital asset pricing model. In Y. Jiang et al. (Eds.), Proceedings of the International Conference on Economic Development and Business Culture (ICEDBC 2022) (AEBMR 225, pp. 52–56).
8- Dadd, D., & Hinton, M. (2022). Performance measurement and evaluation: Applying return on investment (ROI) to human capital investments. International Journal of Productivity and Performance Management
9- Das, S. C., & Topno, H. (2012). Valuation of Human Capital: An Analysis of Practicing Models. KAIM Journal of Management and Research, 4(1-2), 96
10- Dinçer, H., & Yüksel, S. (Eds.). (2021). Financial strategies in competitive markets: Multidimensional approaches to financial policies for local companies.
11- Hull, J. C. (2018). Risk management and financial institutions (5th ed.). John Wiley & Sons.

12- Krushnitska, G. (2013). Analysis of methods for human capital assessment at the micro level. Scientific Proceedings of Ruse University, 52(5.1).
13- Kucharíková, A., Tokaríková, E., & Blašková, M. (2015). Human capital management – Aspect of the human capital efficiency in university education. Procedia - Social and Behavioral Sciences, 177, 48-60
14- Mate-Kole, H. M. (2014). Valuation of human capital in the sports industry: A study of the Ghanaian football sector (Bachelor's thesis, Ashesi University College).
15- Obara, L. C., & Gabriel, J. M. O. (2013). Human asset accounting treatment and corporate profitability evaluation—A literary reflection. British Journal of Economics, Finance and Management Sciences, 8(1), 29-39.
16- Piao, X., & Managi, S. (2022). Evaluation of employee occupational stress by estimating the loss of human capital in Japan. BMC Public Health, 22, 411
17- Rossi, M. (2016). The capital asset pricing model: A critical literature review. Global Business and Economics Review, 18(5), 604-625.
18- Roy, R., & Shijin, S. (2019). Is human capital the sixth factor? Evidence from US data. ACRN Journal of Finance and Risk Perspectives, 8, 21–55.
19- Welpe, I., Lutz, S., & Barthel, E. (2007). The theory of real options as theoretical foundation for the assessment of human capital in organizations. Zeitschrift für Personalforschung (ZfP), 21(3), 274-294. Rainer Hampp Verlag.
20- Yarah, Samir Abdul-Sahib, "Optimal Investment Portfolio Selection: A Proposed Model - An Applied Study," Ph.D. Thesis, Faculty of Management and Economics, Al-Mustansiriya University.