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Case Study: The Adjusted Valuation of the High-tech Newly-listed Company in Mainland China

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Abstract: Given the enormous contribution of high-tech startups to social development, a systematic approach to accurately evaluate these companies is significant for venture capital firms, equity investors, and other investors in the market. However, the conventional methods, including the cost and income approaches, cannot fulfill the valuation goal without any development due to the insufficient financial information and future uncertainty of these firms. This paper investigates a new valuation method that combines the beta coefficient adjustment and future cash flow scenario discussion. This newly established method is employed to value one of the most influential newly listed semiconductor firms: Semiconductor Manufacturing International Corporation in mainland China. If this new combination works well for firms under such circumstances, analytics could apply similar ideas to handle the lack of historical data and uncertainty of future cash flows.

Keywords: valuation approach, beta, startups, high-tech company

1. Introduction

This paper aims to value a newly listed high-tech corporation, Semiconductor Manufacturing International Corporation (SMIC), using The First Chicago Method (FCM) and adjusted beta coefficient in the future five years. Startups are "new businesses starting from scratch" [1]. To elaborate, startups refer to businesses with a relatively comprehensive structure, business plan, or even innovative technology that have not lasted for many years. Startups in today's economy are of great significance due to their massive contribution to economic value [2]. Moreover, they are also integral participants in technology innovation [3] and job creation [4]. Given their enormous contribution and widespread worldwide, it is essential to find a reasonable method to measure their value accurately. However, because of the insufficient information of historical financial data plus the difficulty of evaluating intangible assets, especially for high-tech startups, conventional valuation methods could not work appropriately and get accurate results [5]. This paper combines beta coefficient adjustment and the FCM to address the problem. After finishing the adjustment of beta, an adjusted discount rate is acquired. Then, applying the adjusted discount rate to future cash flow forecasts, the appropriate enterprise value and stock price estimation are available.

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2. Literature Review

2.1. Innovative Valuation Methods Are Needed

An accurate valuation of startups is essential to investors and founders. Venture capital companies need an explicit estimation of the firm's future value to determine their investment strategy and optimal Initial Public Offering (IPO) opportunity. Founders need such information because it measures their probability of transforming their vision into fact [6]. However, startups have insufficient information regarding the past performance and market data, especially those related to peer companies [5]. The cost approach is the least likely way to assess startups' value successfully because they are undercapitalized and need future development. In addition, their initial capital structures are not stable enough to retrieve the weighted average cost of capital (WACC) [7].

Furthermore, the income approach, to be more specific, the conventional Discounted Cash Flow model (DCF), tends to default when valuing startups because of the absence of reliable forecasts about future cash flows and appropriate discount rates [8]. Furthermore, the DCF model is unsuitable due to its preassumption regarding the payoff of specific projects [9]. However, in terms of startups, especially high-tech startups, the profit cannot be fixated, and therefore DCF model is not plausible under such circumstances. Moreover, conventional CAPM is inadequate because of the inaccurate beta coefficient and inconsistency between startups and peers in the same industry [7]. In other words, startups have different features from peers, so the market premium and beta sectors cannot represent the actual situation well. Alternatively, the specific business risk sometimes outweighs the market risk, so the market coefficient is unreliable. To handle these problems, some innovative measures should be employed to value startups in the high-tech field.

2.2. Target Solutions

The first task for any valuation is getting sufficient information [10]. Building appropriate contextualization and recognizing business facts are also significant [11]. Moreover, the factors of investee companies' environment should be carefully considered when investigating the value of the project [5]. In other words, the industrial environment in which startups are fostered and brought up is crucial. To sum up, based on the literary works mentioned above, there are two challenges to overcome: 1) Specification cannot be demonstrated. Therefore, we need a better method to illustrate a firm's most fitting and appropriate feature; 2) Future performance cannot be determined. Therefore, a wise way to represent different scenarios should be found to estimate the future situation better.

2.3. Beta Coefficient Adjustment

The variance of a particular security’s return with that of the market portfolio divided by the variance return on the market portfolio equals beta [12]. For simplicity, the beta coefficient measures the responsiveness of a security return to that of a portfolio in the market. Moreover, the discount factor of startups equals the cost of equity because there is usually no debt financing for startups [13]. Before any adjustment, a basic beta coefficient could be calculated by plotting the historical (e.g., past five years) risk-free rate (Rf) and market premium into the Capital Asset Pricing Model (CAPM) formula [13]. After obtaining the essential beta, the result will be adjusted based on the target firm's risk profile. Moreover, the risk profile contains all the relevant categories, including technology, product, implementation, organization, and financial aspects, which can be retrieved from a firm's business plan and financial statements [13].

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2.4. The Advantage of Using the First Chicago Method (FCM)

Established by the Equity Group of the First Chicago National Bank, the First Chicago Method generates scenarios to project future cash flows and converts them to present value [14]. Specifically, three values are weighted by corresponding probabilities of scenarios: "success," "survival," and "failure" and then added together [14]. The FCM method is a situation-specific approach that combines market-oriented and fundamental analytical methods [15]. Moreover, it is helpful to evaluate dynamic growth startups and is often used by VCs and private equity investors. Probability estimation provides the analytics freedom and opportunity to consider events with a low possibility of occurring but significantly impacting the whole valuation process. Therefore, the allocation of the weighted probability of each case is significant [15]. What matters most is that by applying FCM, analytics demonstrate a relatively clear picture of future cash flows. The weighted probability of three scenarios handles the uncertainty of future cash flows.

3. Case Analysis

3.1. Basic Information about Semiconductor Manufacturing International Corporation (SMIC)

Even though Semiconductor Manufacturing International Corporation (SMIC) is a newly listed corporation on the Science Innovation Board of the Shanghai Stock Exchange, it is one of the world's leading integrated circuit wafer foundry enterprises and a leader in the integrated circuit manufacturing industry in mainland China [16]. The target company is distinguished by its capability of processing manufacturing, production advantage, and service-supporting facilities. The corporation's headquarters is located in Shanghai and has several subordinary wafer factories in Beijing, Shanghai, Tianjin, and Shenzhen. The company has also set up marketing offices in the United States, Europe, Japan, and Taiwan to provide customer services. Additionally, a representative office has been established in Hongkong, China [16]. Initially, it seems that this company is well established and, therefore, has nothing to do with startups. However, it went public with the Science Innovation Board of the Shanghai Stock Exchange in July 2020. Searching different sources that have disclosures about the public firms in mainland China, we can hardly find sufficient information regarding our target firm, especially previous financial information that is highly needed for valuation. In other words, the non-transparency and inadequate information disclosure caused by late listing do bring problems for valuation. Moreover, the problem (insufficient information) is similar to that of the valuation of startups.

Moreover, considering the nature of high-tech companies, the future is uncertain. To begin with, China's reliance on other developed countries for importing semiconductors is evident due to the lack of core technology. Even though the Chinese government has invested enormous amounts of money in the innovative development of semiconductors, the desired outcome is still on its way. Firms like SMIC are highly needed in support of industry development. Companies that receive funding from expanding the production of advanced chips in China are prohibited by clauses issued by US legislation [17]. Given Taiwan's dominant role in semiconductor supply, it would be difficult for mainland China to find alternative suppliers to support its semiconductor manufacturing development [18]. Therefore, Chinese domestic semiconductor firms face various threats due to the instability of the international environment. How can SMIC transform such threats into opportunities? Moreover, in what kind of way can such transformation reflect on the future cash flows? Such questions will be further investigated in the following parts.

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3.2. Beta Coefficient Adjustment of the Target Company

Even though it is impossible to calculate an accurate beta coefficient by regression, we can still get an essential beta based on historical data. For SMIC, the 5-yr essential levered beta is 0.46 [19].

As mentioned, beta will be adjusted according to risk profiles, including the company's information disclosure of its technology, products, implementation, organization, and financial situation. Moreover, depending on each factor's specific influence on the overall risk, each subcategory can lead to a plus or minus impact on the compensation that a potential investor requires and, therefore, a corresponding adjustment of the beta coefficient [13].

Apply the beta coefficient adjustment model [13]: To begin with, under the category of technology, there are four subcategories: maturity, comparative advantage, scientist's reputation, as well as patent protection. Each of them is stratified into five criteria and is allocated corresponding adjustment scales. Taking patent protection as an example, as maintained in the annual report, SMIC has successfully developed a variety of technology nodes from 0.35 microns to FinFET, mainly applied to the logic process technology platform and the characteristic process technology platform. According to SMIC, as of the reporting period, a total of 18347 patents have been applied for, 12778 patents have been approved, and 1864 R & D personnel, accounting for 9.6% of the company's total employees, with an average salary of 154000 yuan [16]. Therefore, a safe conclusion could be drawn that the basic patent has already been granted. Moreover, the company is going through an extensive R&D period. Therefore, according to the table in the appendix, an adjustment of -0.5 could be applied.

Similarly, products' subcategories measure product benefits, unique selling propositions, scalability, and competition. Focusing on competition adjustment, from "+1" to "-1", five scales are allocated to the company's situation of "currently strong" to "long-term low." The target firm is one of mainland China's most influential semiconductor producers. Therefore, it should belong to "currently strong" and have a "+1" beta adjustment.

When investigating the "organization" aspect, three subcategories: competency of the management team, headquarter location, and process efficiency, are taken into consideration. Specifically, in terms of competency of the management team, five scales are: with significant flaws, with some flaws, complete, complete and competent, and very competent, respectively. However, given the firm's management team's comprehensive structure and the newly listed fact, the fourth option, which is complete and competent, is applied here. Therefore, an adjustment of "-0.5" takes place.

The last example of an illustration is the finance field. This is the most prominent part among these categories. Four subcategories are sales plan, cost plan, profitability, and liquidity plan, respectively. To be more specific in the profitability part, the five corresponding scales are low, risk of low profitability, about average, currently high, and fundamentally high. An average result is retrieved by comparing and contrasting the target firm's profitability ratios (like ROA and ROE) with its peers. These high-tech startups in mainland China are still dedicated to R&D. Therefore, relatively low profitability is understandable during such periods. Accordingly, an adjustment of "0" is applied here.

Regarding those other criteria, including other subcategories and the implementation part that are not mentioned in the previous text, this paper finds the answer to adjustments from the company's annual report, including its business plan and financial statement.

After these adjustments, the adjusted levered beta coefficient of 0.96 is obtained.

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3.3. Substitute Adjusted Beta into CAPM Model and Calculate WACC

We apply the monthly return of the Chinese government bond as the risk-free return. According to the iFLYTEK database, Rf equals 3.5%. Moreover, the current level of overall Chinese market return is about 11%. Therefore, the risk premium equals 7.5%. Plotting these factors into the CAPM formula, the cost of equity of 10.7% is obtained.

Therefore, the equity cost after the beta adjustment is 10.7%.

Table 1: WACC assumption & calculation [source: iFLYTEK database].

Assumptions	Values
Tax rate	25.00%
Rf	3.50%
Levered beta	0.96
Rm	11.00%
Ke	10.70%
Kd	2.38%
Ve	29,388,574.00
Vd	6,772,367.00
WACC	9.03%

Further, we plot the value of tax rate, cost of equity, cost of debt, total equity, and total debt demonstrated in [19] into the WACC formula:

$$\text{WACC} = \frac{V_e}{V} * K_e + \frac{V_d}{V} * K_d * (1 - T) \quad (1)$$

Therefore, our target firm's required rate of return is 9.03%.

3.4. Applying the First Chicago Method

The key to applying the First Chicago Method (FCM) is the consideration of three scenarios:

The best case (optimistic scenario);

The most likely situation (general, an intermediate case);

The worst case (pessimistic scenario); [20]

$$PV_i = \sum_{t=1}^{h} \frac{CF_t^i}{(1+r)^t} + \frac{TV_i}{(1+r)^h}$$

$$PV = \sum_{i=1}^{3} P_i \, PV_i$$

“i” represents scenario index; “h” stands for the time to exit; PV is the present value; CF means the cash flow in period t; TV is the terminal value which accounts for remaining cash flows following h.

The probability allocated to each scenario is subject to reasonable estimations. However, the majority weighted probability of 65% will be allocated to the typical case, which is the most likely situation. Further, even though our target firm is newly listed, it is one of mainland China's most influential leaders in the semiconductor industry. Moreover, China is seeking efficient approaches to solve the problem, like lacking core skills and dependency on other countries in semiconductors.

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Therefore, given the advanced technology and its maturity, we allocate 20% to the optimistic case and the last 15% to the pessimistic case.

Based on the financial data from Yahoo Finance, the mathematical mean of the past three years' sales growth rate is 19%, which will be considered the average growth rate for the first five years [19]. Adjusting from the typical case, the optimistic growth rate will be set at 23%, while the pessimistic growth rate will be 15%. After the year 2027, we assume the company's organizational structure, business implementation, and financial situation will become steadier, and the growth rate (g2) for the second period, which is from the year 2027 to the infinite future, will be set at 5%. Moreover, the free cash flow of the most recent period is recorded as ￥47520000 [19], and it will be the foundation of the estimation of future cash flows.

Table 2: Positive cash flow estimation [source: iFLYTEK database].

The first period	**2022E**	**.....**	**2026E**
Free Cash Flow	58,449,600	.....	133,783,326.1
PV of FCF	53,609,689.86	.....	86,838,186.65
The second period	**2027E---**		
PV of TV	2,263,628,143		

In the optimistic scenario, The sum of the present value of the first and the second period is ￥2609760022, divided by the number of shares outstanding: ￥7836432, and the price per share is estimated as ￥333.03.

Table 3: Normal cash flow estimation [source: iFLYTEK database].

The first period	**2022E**	**.....**	**2026E**
Free Cash Flow	56,548,800	.....	113,399,525.9
PV of FCF	51,866,285.31	.....	73,607,148.84
The second period	**2027E---**		
PV of TV	1,918,732,070		

For the normal case, The sum of the present value of the first and the second period is ￥2230042398, divided by the number of shares outstanding: ￥7836432, and the price per share is estimated as ￥284.57.

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Table 4: Pessimistic cash flow estimation [source: iFLYTEK database].

The first period	**2022E**	**.....**	**2026E**
Free Cash Flow	54,648,000	.....	95,579,693.55
PV of FCF	50,122,880.76	.....	62,040,371.62
The second period	**2027E---**		
PV of TV	1,617,218,606		

Regarding the pessimistic condition, the sum of the present value of the first and the second period is ￥1896832973, divided by the number of shares outstanding: ￥7836432, and the price per share is estimated as ￥242.05.

Therefore, the estimated stock price for SMIC after the adjustment of beta and applying FCM is:

$$20\% * P_1 + 65\% * P_2 + 15\% * P_3 = ￥287.89 \quad (4)$$

4. Discussion

Combining beta adjustment and future cash flow estimation fits well to handle the problem of evaluating high-tech startups' stock value. However, there are many discussions regarding how we adjust the beta coefficient. In this paper, we employ the beta adjustment model developed by Festel, Wuermseher, and Cattaneo, in which the scale difference is 0.5. However, more accurate adjustment tables should provide more than five levels. Further, the "matching principle" should be more precisely defined. Even though finding the corresponding option that matches the beta adjustment table could be achieved, a few criteria still seem confusing. For instance, under the category of "competency of the management team," it is not easy to distinguish "complete" and "complete and competent" because we can only know it is "competent" from the company's disclosure. Otherwise, there leaves some room for subjective judgment. Both of the approaches are not objective enough to make this choice. Therefore, a more comprehensive and high-standard beta coefficient adjustment table should be developed in the future.

Finally, the probabilities weighted to different scenarios also have various options and interpretations. This part also impacts the final estimation of the firm's enterprise value. Moreover, this part cannot be done without some subjective estimation because it is all about the future. Past performance cannot provide many references to prospects. A well-defined approach to allocating probabilities more rationally is needed. In this case, the overall valuation will become more precise and consolidated.

5. Conclusion

As a result, we can foresee a considerable rise in future share prices, and the investment suggestion is to buy or hold this firm's stock. This outcome makes sense because China is seeking technical independence in terms of the industry of semiconductors and chips. SMIC is dedicated to R&D and expects to receive more government policy support and more capital investment from different investors. SMIC's comprehensive management structure and well-designed business plan also contribute to its promising growth. Regarding the valuation method, this combination of beta coefficient adjustment and FCM handles the problem of insufficient historical data and difficulty in estimating the future. Therefore, it is applicable to evaluate newly listed or newly established

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innovation firms with future risks.

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