

# Exploring the Relevance of Intangible Assets and Capital Structure

Yi-Ting Peng, Jia-Ying Zhang, and Justine S. Chang

**Abstract**—With the rapid development of technology, intangible assets play an increasingly important role in company nowadays. In the past, the reason why intangible assets were less used by companies as financing tools is largely because intangible assets have higher risks than tangible assets. This study focuses on publicly listed companies in Taiwan from 2013 to 2019 as the research object, and primarily explores whether intangible assets can be used as a company's guarantee, financing, and mortgage tool, and whether intangible assets will affect the composition of companies' capital structure. The empirical results showed that intangible assets have significant positive correlation with the company's capital structure, indicating that intangible assets can be an additional choice to companies as a financing tool when companies face financial difficulties. Therefore, in the era of knowledge economy, intangible assets are like tangible assets that can be used as collateral for loans.

**Index Terms**—Capital structure, intangible assets, relevance.

## I. INTRODUCTION

In the era of knowledge economy, as science and technology are developing rapidly, intangible assets play a very important role in today's knowledge economy. In the World Intellectual Property Report (WIPR) published by the World Intellectual Property Organization (WIPO) in November 2017 [1], it showed that one-third of the goods bought and sold came from intangible assets, which is the first time that the World Intellectual Property Organization (WIPO) evaluate the value created by intangible assets. The importance of creating company value is no longer just tangible assets of the company, but gradually shifting from tangible to intangible [2], [3]. The importance of intangible assets is already evident. In the short period from 1987 to 1998, the proportion of intangible assets in companies' total assets rose from 5% to 72% [4]. According to Ocean Tomo database, in the Standard & Poor's 500 Index, intangible assets already accounted for 84% of the market value in 2015, and under the influence of COVID-19 in 2020, intangible assets have reached 90% of market value in the S&P 500. We can understand that companies now attach more importance to intangible assets than tangible assets. At the same time, intangible assets have also been regarded by many companies as a source of competition [5]-[7], such as who can obtain

more and newer intangible assets, or who can be more competitive. The empirical study of Dzinkowsk (2000) [8] revealed that in terms of corporate investment, the importance of investing in tangible assets has fallen from 50% to 10%, while intangible assets have risen from 50% to 90%. The importance of intangible assets has become apparent.

Intangible assets are still part of the total assets, and because intangible assets are similar to tangible assets in some aspects, many studies have begun to explore whether intangible assets can replace the utility of tangible assets. In the past, intangible asset financing was classified as an uncertain and high-risk category, because intangible assets may undermine the performance of market mechanisms [9], few people would invest in intangible assets [10]. Lev's (2001) [5] research results showed that the risk of intangible assets is much higher than tangible assets and even financial assets, so he believed that trading of intangible assets does not exist in the market. The reason that tangible assets are easily used by companies as collateral for financing trading is that for bank personnel or external personnel, tangible assets have a reliable measurement standard and low risk so that creditors can assess the value of tangible assets to approve loans. Relatively speaking, tangible assets are easier and more objective than intangible assets. Therefore, creditors are more willing to issue loans to companies with higher proportion of tangible assets in total assets [11].

Nowadays, the effect of companies using intangible assets as financing loans is no worse than that of other assets, and the financing and collateral with intangible assets has been accounted for 21% [12]. The research results of Lim *et al.* (2020) [13] showed that the impact of identifiable intangible assets on capital structure is similar to that of tangible assets in many aspects. As for the relationship between the value of tangible assets and intangible assets, Corrado *et al.* (2005, 2009) [14], [15] found in research that the value of intangible assets and tangible assets invested in developed countries are very similar. Because intangible assets have the ability to create future cash flows, they can be financed through guarantees. If a company's tangible assets account for a small proportion of the company's total assets, the funds that can be financed will be relatively less than the company's intangible assets. When creditors decide to make a loan, the highest priority is to consider the value and prospects of the company. When the company has more intangible assets than tangible assets and creditors consider that intangible assets are of high value in the future and will bring high cash flow to the company, the release of financing funds will be higher. Duan *et al.* (2019) [16] research showed that intangible assets can constitute mortgage and financing, so intangible assets can not only be used as tangible assets to obtain funds as

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financing mortgage debt, but also can create future cash flow for the company. However, Lim *et al.* (2019) [17] mentioned in the study that when a company has a large number of tangible assets that can support debt, intangible assets may become relatively less important in securing mortgage debt.

The accounting treatment of intangible assets has always been the most controversial and the most difficult to evaluate in the accounting field, whether in academic research and standard setting [18]-[21]. For appraisers of banks intangible assets are not as easy to evaluate and approve for loan as tangible assets. In Taiwan whether intangible asset valuation or financing is relatively inexperienced at present, and there is relatively no standard that can be reliably measured. So, it is difficult for banks to assess and ensure the value of intangible assets for loan approval and how much fund they should lend. Therefore, if a company in Taiwan operates mainly with intangible assets, it will make the survival of the company more difficult. In August 2019, the government of Taiwan integrated Industrial Technology Research Institute (ITRI), Taiwan SME Business Bank and Small & Medium Enterprise Credit Guarantee Fund of Taiwan [22], which play the roles of intangible technology, capital and credit guarantee, respectively. It is the first case to obtain bank financing with intangible assets, in order to promote the economic and financing technology experience of intangible assets, as well as supporting small and medium-sized enterprises and the problem of innovative company funds. Comparing with Taiwan, other countries have already had cases of using intangible assets for financing. For example, in 1998, Disney issued bonds to Industrial Bank of Japan with its own brand value and successfully raised US\$725 million to build a Disney theme park. In 1997 David Bowie, the well-known rock musician, used his music album royalties from 1969 to 1990 as guarantee to issue Bowie Bonds, which were entirely bought by Pramerica Financial at a high price, and successfully funded USD550 million.

When the resources available to the firm are unique and valuable, they will increase the value of the company and bring the company a good competitive advantage [23]. Srivastava *et al.* (1997) [24] research showed that companies with higher brand image positioning can also earn higher profits and value. Investors have a good brand impression and attitude towards the company, which will reduce the overall risk of the company and provide higher stability and sustainability to company [25]. The patents of Apple and Pfizer, well-known brand image of Coca-Cola and Amazon, Walmart with a unique supply chain, and Southwest Airlines with high-efficiency business processes, all enhance the company's own competitive advantage and company value [26] in the era of knowledge economy.

Both intangible assets and tangible assets are vital important to the company's value and financial performance [27]. With more and more attention paid to intangible assets, the frequency of use of intangible assets by companies increase year after year. It is worth studying how to adjust the financing of company, how to influence the capital structure, and the degree of the impact of intangible assets on financing. Therefore, this study is mainly divided into the following two points for discussion: First, the impact of intangible assets (including identifiable intangible assets and goodwill) on the

company's capital structure? Second, in the era of knowledge economy, whether intangible assets can provide guarantees, mortgages, support debts, or even replace tangible assets?

## II. HYPOTHESIS AND METHODOLOGY

In the era of knowledge economy, the advancement of intangible asset technology has attracted more and more people's attention, making intangible assets playing a very important role in company. The research results of Lim *et al.* (2020) [13] showed that the impact of identifiable intangible assets on capital structure is similar to tangible assets in many aspects, and the value of intangible assets invested by developed countries is very similar to that of tangible assets [14], [15]. When the company's internal funds are insufficient, if the company wants to use debt financing to obtain funds, prior to lending out loans the creditors will consider whether the company's future operating conditions, the company's value and the mortgaged assets can bring cash flow to the company, to ensure that the company has the ability to repay loans and interest expense incurred on loans. Srivastava *et al.* (1997) [24] pointed out that the higher the brand image positioning of the company, it can bring higher profit and value to the company, and also higher cash flow [17]. Both intangible assets and tangible assets are very important assets to a company. Intangible assets and tangible assets will not only increase the value of the company, but also affect the company's financial performance [27]. The empirical results of Clausen and Hirth's (2016) [28] study showed that the amount of intangible assets owned by a company is related to the value of the company. Therefore, intangible assets may be the same as tangible assets, which can be used as collateral assets on a loan to obtain funds, as well as bring cash flow to the company and affect the company's capital structure. The more intangible assets a company has, the more its debt ratio will rise. Thus, this study proposes the following two hypothesis based on the impact of identifiable intangible assets and goodwill on capital structure:

*H1: There is a significant positive relationship between identifiable intangible assets and the company's capital structure.*

*H2: There is a significant positive relationship between goodwill and the company's capital structure.*

This study applied model proposed by Lim *et al.* (2020), which uses the ordinary least squares (OLS) to calculate the variable data. This study will use ordinary least squares (OLS) to establish a multiple regression model. Model (1) in the following is to explore the impact of tangible assets and intangible assets on the company's capital structure.

$$LEV_i = \alpha + \beta Tan_i + \omega Int_i + \gamma Con_i + \varepsilon_i \quad (1)$$

Model (2) is to test the first hypothesis and examine the impact of identifiable intangible assets on the company's capital structure.

$$LEV_{i,t} = \alpha_0 + \alpha_1 INT_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 PRO_{i,t} + \alpha_4 GUA_{i,t} + \alpha_5 NDTS_{i,t} + \alpha_6 GROWTH_{i,t} + \alpha_7 DIV_{i,t} + \alpha_8 CF_{i,t} + \varepsilon_{i,t} \quad (2)$$

Model (3) is to test the two hypothesis and examine the impact of goodwill on the company's capital structure.

$$LEV_{i,t} = \alpha_0 + \alpha_1 GW_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 PRO_{i,t} + \alpha_4 GUA_{i,t} + \alpha_5 NDTS_{i,t} + \alpha_6 GROWTH_{i,t} + \alpha_7 DIV_{i,t} + \alpha_8 CF_{i,t} + \varepsilon_{i,t} \quad (3)$$

Model (4) integrates identifiable intangible assets and goodwill into the regression model and examine the impact of company intangible assets (identifiable intangible assets and goodwill) on the capital structure.

$$LEV_{i,t} = \alpha_0 + \alpha_1 INT_{i,t} + \alpha_2 GW_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 PRO_{i,t} + \alpha_5 GUA_{i,t} + \alpha_6 NDTS_{i,t} + \alpha_7 GROWTH_{i,t} + \alpha_8 DIV_{i,t} + \alpha_9 CF_{i,t} + \varepsilon_{i,t} \quad (4)$$

EXPLANATION OF VARIABLES	
Variable	Variable definitions
LEV	Long - Term debt/Total assets
INT	Identifiable intangible assets/Total assets
GW	Goodwill/Total assets
SIZE	Log of total assets
PRO	Benefit after tax/Total assets
GUA	(Inventory + Fixed assets)/Total assets
NDTS	(Amortization of intangible assets + Depreciation of fixed assets)/Total assets
GROWTH	(Total assets - Total assetst-1)/Total assetst-1
DIV	Cash dividend/Total equity
CF	Cash/ Total assets

### III. DATA

This study mainly explores the relationship between intangible assets and capital structure by using publicly listed companies in Taiwan as the research object (excluding the financial and insurance industry). The study period is 7 years from 2013 to 2019. All data sources are obtained from Taiwan Economic Journal (TEJ), which provided the financial data of publicly listed companies in Taiwan Exchange and OTC (over the counter). This study deletes the financial and insurance industry, incomplete data, companies that adopt full settlement, and the 2% extreme values. The final sample consists of 10,208 observations.

### IV. EMPIRICAL RESULTS AND POLICY IMPLICATIONS

According to Table I, it mainly uses model (2) to test Hypothesis 1 and to explore the impact of identifiable intangible assets on the company's capital structure. The empirical results show that the coefficient of identifiable intangible assets is 0.131, with significant level of 1%. It means that identifiable intangible assets have mutual influence on the company's capital structure currently. When a company faces financial difficulties, if it wants to obtain funds by financing, identifiable intangible assets have been one of the assets that can be selected to be used as collateral on a loan. Therefore, this study supports Hypothesis 1, that there is a significant and positive between identifiable intangible assets and capital structure. Among the control variables, the company's size, assets guarantee value,

non-debt tax shield, and growth opportunities all show a positive relationship, and reach a significant level of 1%; while profitability, dividend policy, and cash liquidity all show a negative relationship, with significant level of 1%.

TABLE I: THE RELEVANCE OF IDENTIFIABLE INTANGIBLE ASSETS AND CAPITAL STRUCTURE

$$LEV_{i,t} = \alpha_0 + \alpha_1 INT_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 PRO_{i,t} + \alpha_4 GUA_{i,t} + \alpha_5 NDTS_{i,t} + \alpha_6 GROWTH_{i,t} + \alpha_7 DIV_{i,t} + \alpha_8 CF_{i,t} + \varepsilon_{i,t} \quad (2)$$

Variable	Coefficient	T Value
INT	0.131***	4.920
SIZE	0.015***	24.910
PRO	-0.086***	-6.695
GUA	0.123***	23.521
NDTS	0.118***	3.638
GROWTH	0.010***	6.193
DIV	-0.092***	-4.835
CF	-0.083***	-11.751
Total sample		10,208
Adjusted R2		0.215
F Value		349.731***

Note : \*\*\*, \*\*, and \* significance at the 1%, 5%, and 10% levels.

Table II mainly uses model (3) to test the second hypothesis, exploring the impact of goodwill on the company's capital structure. The empirical regression results show that the coefficient of goodwill is 0.198, with significant level of 1%. It means that goodwill has a positive effect on the company's capital structure, in other words, goodwill will rise as the company's debt ratio increases. Therefore, this study supports Hypothesis 2, that there is a significant and positive between goodwill and capital structure. Among the control variables, the company's size, assets guarantee value, non-debt tax shield, and growth opportunities all show a positive relationship, and reach a significant level of 1%; while profitability, dividend policy, and cash liquidity all show a negative relationship, with significant level of 1%.

TABLE II: THE RELEVANCE OF GOODWILL AND CAPITAL STRUCTURE

$$LEV_{i,t} = \alpha_0 + \alpha_1 GW_{i,t} + \alpha_2 SIZE_{i,t} + \alpha_3 PRO_{i,t} + \alpha_4 GUA_{i,t} + \alpha_5 NDTS_{i,t} + \alpha_6 GROWTH_{i,t} + \alpha_7 DIV_{i,t} + \alpha_8 CF_{i,t} + \varepsilon_{i,t} \quad (3)$$

Variable	Coefficient	T Value
GW	0.198***	5.999
SIZE	0.014***	24.016
PRO	-0.093***	-7.329
GUA	0.122***	23.611
NDTS	0.130***	4.060
GROWTH	0.010***	6.167
DIV	-0.086***	-4.531
CF	-0.084***	-11.936
Total sample		10,208
Adjusted R2		0.216
F Value		351.604***

Note : \*\*\*, \*\*, and \* significance at the 1%, 5%, and 10% levels.

Table III uses the regression model (4) of that include both identifiable intangible assets and goodwill at the same time to explore the impact of intangible assets (identifiable intangible assets and goodwill) on the company's capital structure. The empirical regression results show that identifiable intangible assets and goodwill have a positive relationship with the company's capital structure, and reach a

statistically significant level of 1%. This result has more sufficient evidence to prove that intangible assets can be used to guarantee and mortgage when the company is financing. Therefore, the current intangible assets can not only bring cash flow to the company and create company value, but also affect the composition of the company's capital structure. Among the control variables, the company's size is significantly and positively correlated with the company's capital structure, which means that, for creditors, the larger the company the lower information asymmetry and more stable cash flow are, and the risk of facing default and bankruptcy is lower [29], [30]. Therefore, when company's size gets larger it provides more assurance to the creditors in terms of guaranteed mortgages. There is a significant negative relationship between profitability and the company's capital structure, indicating that companies with higher profitability use less financing to obtain funds, so the company's debt ratio will be lower. The assets guarantee value has positive relationship with the company's capital structure, the same as results of most studies [29], [31]-[33]. This study shows a significant positive relationship between non-debt tax shields and capital structure, which is different from most scholars' research. In the past only a small number of researchers believed that companies with more non-debt tax shields will have more assets that can be used by the company to finance. Thus, the company's debt ratio will rise as the amount of non-debt tax shields grows. The coefficient of growth opportunity is positive and also reach significant level. This result proves the view of K öksal and Orman (2015) [34] that for companies with higher growth opportunities, their internal funds are not enough to support the company's need, so the company will obtain funds by financing. The dividend policy has a significant negative relationship with the company's capital structure, indicating that the companies with higher dividend payouts will have a lower debt ratio. This result is the same as the research result of Jensen *et al.* (1992) [35]. The coefficient of cash liquidity is -0.082, and reach a significant level, which is consistent with the results of Lim *et al.* (2020) [13], who proposed that companies with stable cash liquidity can support higher debts. Therefore, the companies with higher cash liquidity have a lower debt ratio.

TABLE III: THE RELEVANCE OF INTANGIBLE ASSETS, GOODWILL AND CAPITAL STRUCTURE

$$LEV_{i,t} = \alpha_0 + \alpha_1 INT_{i,t} + \alpha_2 GW_{i,t} + \alpha_3 SIZE_{i,t} + \alpha_4 PRO_{i,t} + \alpha_5 GUA_{i,t} + \alpha_6 NDTS_{i,t} + \alpha_7 GROWTH_{i,t} + \alpha_8 DIV_{i,t} + \alpha_9 CF_{i,t} + \varepsilon_{i,t} \quad (4)$$

Variable	Coefficient	T Value
INT	0.100***	3.667
GW	0.170***	5.022
SIZE	0.015***	24.119
PRO	-0.087***	-6.806
GUA	0.125***	23.907
NDTS	0.113***	3.491
GROWTH	0.010***	5.921
DIV	-0.091***	-4.802
CF	-0.082***	-11.658
Total sample		10,208
Adjusted R2		0.217
F Value		314.413***

Note : \*\*\*, \*\*, and \* significance at the 1%, 5%, and 10% levels.

## V. CONCLUSIONS

In the era of knowledge economy, as the proportion of intangible assets in total assets of companies gradually increases, the role of intangible assets has become increasingly important in today's society. The main purpose of this study is to explore in present how intangible assets affect the company's capital structure and whether the intangible assets can be used as collateral assets when the company makes financing decisions. We found that intangible assets (identifiable intangible assets and goodwill) are significantly positively related with the company's capital structure. In other words, when a company has more intangible assets, the company's debt ratio will be higher, and the company's capital structure is affected by intangible assets, not just affected by tangible assets. With the coming of the artificial intelligence (AI) era and the advancement of science and technology, the high-tech industry has regarded intangible assets as one of the company's core competitiveness. The importance of intangible assets has been inexpressible. Moreover, this study shows that intangible assets have already can be used as a tool for companies to make financing decisions. Therefore, the utility of intangible assets is not only the same as tangible assets that can create value for the company, but also can bring the company's future cash flow and also as collateral on a loan. The importance of intangible assets is more than ever.

## CONFLICT OF INTEREST

The authors declare no conflict of interest.

## AUTHOR CONTRIBUTIONS

Yi-Ting Peng guided; Jia-Ying Zhang wrote the paper and analyzed the data; Yi-Ting Peng and Justine S. Chang modified; all authors had approved the final version.

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