

## The 25% Rule Still Rules: New Evidence From *Pro Forma* Analysis In Royalty Rates

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### Recent Studies in the 25% Rule and the Relevant Data Issues

The 25% rule is based on observations that royalty negotiations tend to a royalty rate that equals approximately one-quarter of the licensee’s expected operating profits derived from the technology. Over the years, the rule has been generalized, and sometimes is referred as the 25% to 33% rule, depending mainly on technology, industry normal, and other relevant issues.

The 25% rule has been a useful rule of thumb for royalty determination. However, recent efforts to empirically prove its validity have been unsatisfying. For example, Goldscheider *et al.* (2002) demonstrated that the royalty rate as a percentage of operating margin appeared to be congruent with the 25% rule, but the work stopped short of exploring more fundamental relationships between royalty rates and profit margins. Kemmerer and Lu (2008) found that profitability and royalty rates were linearly associated, but the coefficients of various profit margins were much higher than the 25% rule would imply.

The lack of convincing evidence to empirically validate the 25% rule is mainly due to the very nature of the data used in the studies. First and foremost, the royalty rates calculated by the 25% rule serve only as a starting point for royalty determination, and are subject to up- or downward adjustments based on industry-, company-, and technology-specific factors. In other words, even if the 25% rule is widely used in practice, after a series of such adjustments, the actual royalty data is a variation of the rule.

Two methods can be employed to detect the 25% rule buried in the actual data. The first method is to identify, and then quantify the effects of the factors that lead to the up- or downward adjustments. In practice, however, this is virtually impossible to generate adequate data required for statistical and econometric analysis. The other method is to use aggregate data at the industry level—collecting data for as many industries as possible—and then conducting an analysis across industries. Presumably, by calculating the average rate of a fairly large number of samples for each of many industries, the up- and downward adjustments made on any individual transaction would cancel out each other, exposing

the effects of the 25% rule. This is the approach taken by Kemmerer and Lu. They investigated the relationship between profitability and royalty rates across industries, with a particular attention to the 25% rule. The major conclusions include:

- The reported royalty rates tend to fall between 25% of gross profit margins and 25% of operating profit margins, and that the EBITDA (earnings before interest, taxes, depreciation and amortization) margin appears to be the most appropriate base for applying the 25% rule.
- Regression analyses indicated that there is a linear relationship between the reported royalty rates and various profitability measures, suggesting that the licensing market is efficient, and that the cost structure and profitability across industries have been factored into royalty rate negotiations. Because the regression coefficients did not offer direct support to the 25% rule, the interpretation was that the 25% rule is simply a special case of a general linear relationship.
- The paper revisited the empirical analysis in Goldscheider, *et al.*, in which the average royalty rates across industries amounted to 26.6% of the operating profit margins. The regression analysis on their data sets did not find any significant linear relationship, although an “imposed” linear fitting generated a percentage that is close to 25%.

In retrospect, the absence of a linear association between the data sets used by Goldscheider *et al.* is puzzling; both analyses used the royalty rate data from RoyaltySource, a prominent data vendor in the industry. Kemmerer and Lu did use different data vendors for the financial data. However, both vendors retrieve their financial data from companies’ SEC filings. Therefore, there is no reason to believe that there is significant difference between the data.

The only data-related issue that might have caused the incongruity between the two studies is the process of data mapping. Kemmerer and Lu used RoyaltySource’s industry classification, which is different from the standard classifications such as SIC and NAICS. Major financial data vendors including CompuStat and Bloomberg, by contrast, use both systems for classifications. As a result, mapping SIC-

or NAICS-based classifications onto RoyaltySource’s system is a necessary step in associating financial vendor’s data with the data from royalty data vendors.

However, reconciling the data difference between Goldscheider *et al.* and Kemmerer and Lu is not the mission of this paper. This short essay, instead, focuses on another aspect of the data used by both studies. Specifically, the data used in the studies was historical data, for both royalty rates and profit margins. Therefore, the analysis reflected a backward-looking view, *i.e.*, the royalty payment and financial performance on an *ex post* basis. In practice, however, royalty negotiation and the application of 25% rule are always forward-looking and on an *ex ante* basis. In other words, the profit margin on which the 25% rule is supposed to apply is the expected profit generated through incorporating the licensed technology, before the royalty fees paid by a licensee to a licensor. Historical data in profit margins, presumably, were calculated by subtracting all of the operating costs, including royalty payment, from sales revenue.

Obviously, there is a data mismatching problem in both Goldscheider *et al.* and Kemmerer and Lu, that is, the royalty data was associated with *ex post* profit margins, not *ex ante* ones. This leads to an interesting question—if the hypothetical “actual royalty payments” were added back and *pro forma* profit margins calculated, would the conclusions regarding 25% rule reached in Kemmerer and Lu be modified?

The rest of the essay tries to answer this question.

The *pro forma* analysis in the following sections is based on the data in Kemmerer and Lu. At this stage, a similar analysis cannot be done with the data in Goldscheider *et al.* because the raw data that Goldscheider and his co-authors used to calculate the profit margins is not available. As a result, the method designed in the next section can not be applied to the data in Goldscheider *et al.*

## Pro Forma Analysis on Royalty Rates and Profit Margins

One of the most important conclusions reached in Kemmerer and Lu is that the reported royalty rates are linearly associated with the profit margins. The regression results in the paper is summarized and presented in Table 1. For detailed data description, the characteristics of royalty rates and profit margins across industries, and the statistics of the variables in the regression models, please refer to Kemmerer and Lu.

The dependent variable for each of the three model specifications in Table 1 is the average royalty rate for an industry. The royalty rate data originally used in Kemmerer and Lu was from the December 2007 *Licensing Economics Review*. The gross margins, EBITDA margins, and EBIT (earning before interest and taxes) margins were calculated using the financial data from CompuStat in accordance with the industry classifications of RoyaltySource.

The numbers reported in Table 1 are regression coefficients. For example, for the model using the EBITDA margin, the regression equations are as follows:

$Royalty\ Rate = 0.0108 + 0.3466 * EBITDA\ Margin$ , with an intercept or constant term; or

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$Royalty\ Rate = 0.4117 * EBITDA\ Margin$ , without an intercept or constant term.

Generally, the equations above can be written as

(1)  $r = a + b * P$ , with an intercept; or

(2)  $r = b * P$ , without an intercept

Where  $r$  is royalty rate defined as the ratio of royalty payment to sales,  $P$  is profit

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**Table 1. Summary of Regression Analyses in Kemmerer and Lu (2008)**

Intercept	Independent Variables		
	Gross Margin	EBITDA Margin	EBIT Margin
1. Intercept ≠ 0			
0.00028	0.1497		
0.01080		0.3466	
0.00732			0.4798
2. Intercept = 0			
0	0.1500		
0		0.4117	
0			0.5377

margin, and  $a$  and  $b$  are linear coefficients. Now rewrite Eq. (1) as

$$(3) R/S = a + b*(S-C-R)/S$$

Where  $R$  is the actual royalty payment,  $S$  is sales, and  $C$  represents all other legitimate costs associated with a specific profit margin calculation. Eq. (3) reflects what is assumed in Kemmerer and Lu, namely, the profit margins are *ex post* margins, in which the hypothetical “actual royalty payments” have already been subtracted from sales revenue. Now we can rearrange Eq. 3:

$$(4) R/S = a/(1+b) + [b/(1+b)]*(S-C)/S$$

When the intercept  $a$  is suppressed, Eq (4) becomes

$$(5) R/S = [b/(1+b)]*(S-C)/S$$

In Eq. (4) and (5),  $(S-C)/S$  is the *pro forma* profit margin, or the profit margin with royalty payment being added back. Plugging the corresponding coefficients from Table 1 into Eq. (4) and (5), we get the “implied” coefficients based on *pro forma* profit margins. The results are summarized in Table 2.

Several important observations can be made from the *pro forma* analysis above. First, the model with EBITDA margin yields the coefficients that converge with the 25% rule. In the absence of an intercept or constant term, royalty rate accounts for about 29% of EBITDA margin. Under Eq. (4) in which an intercept is included, the coefficient of EBITDA is 25.7%. As pointed out in Kemmerer and Lu, all of the intercepts reported in Table 1 above are statistically insignificant. To a large extent, the constant terms in Table 2 are not economically significant in practice, either.<sup>1</sup>

Second, the coefficients of gross margin are 13% based on either equation. This again offers empirical evidence to the survey results published by Degnan and Horton (1997). According to the survey, when answering a hypothetical question of how much they would like to pay as royalties out of gross profits, the respondents indicated that they would be willing to pay 10% to 15%.

<sup>1</sup>For example, for an EBITDA margin of 20%, Eq. (4) would generate a royalty rate of 5.95%. If the constant term is ignored, the resulted royalty rate is 5.15%. By contrast, for the same EBITDA, Eq. (5) yields a royalty rate of 5.83%. The difference at the scale of below 1% would not be significant for the process of royalty rate determination, because a rate generated from applying 25% rule serves as a starting point only, upon which adjustments would have to be made based on other factors.

Finally, in Eq. (4) and (5), the coefficients of EBIT margin fall between 32% and 35%. We have already shown that in the equations with the EBITDA margin, the coefficients are around 25% to 29%. As a result, a plausible conclusion is that on a *pro forma* basis, royalty determination can reasonably start with 25% of EBITDA or 33% of EBIT, upon which adjustments should be made to reflect industry-, technology- or company-specific factors.

## Discussions and Conclusions

In this short essay, the regression studies in Kemmerer and Lu were revisited, and a *pro forma* analysis conducted by correcting the data mismatching and adding back hypothetical “actual royalty payments.” It seems that the use of historical data over-estimated the coefficients and led to the inconformity with the 25% rule in the earlier study. The analysis in this essay shows that the coefficients of EBITDA margin converge with the 25% rule when *pro forma* profit margins are used. More importantly, the *pro forma* analysis implies that royalty determination should start with 25% of EBITDA margin or 33% of EBIT margin.

In licensing practice, assuming that a licensee targets the known or *ex post* average profit margin in the industry and uses the margin as a benchmark to measure the technology’s profitability after royalty fees, the *pro forma* analysis above can be employed to calculate the expected profit margin before royalty fees, upon which the 25% rule shall be applied.

**Table 2. Summary of Pro Forma Analyses on Regression Models in Kemmerer and Lu**

Intercept	Independent Variables on Pro Forma Basis		
	Gross Margin	EBITDA Margin	EBIT Margin
<b>1. Based on Equation (4) and the Coefficients in Table 1</b>			
0.00024	0.1302		
0.00802		0.2574	
0.00495			0.3242
<b>2. Based on Equation (5) and the Coefficients in Table 1</b>			
0	0.1304		
0		0.2916	
0			0.3497

In other words, if the *ex post* profit margin in the industry serves as the benchmark profitability for a company's investment in a license, the *pro forma* profitability shall be estimated for the purpose of applying the 25% rule.

It is worth reiterating that the rate generated from applying the 25% rule provides only a starting point, and adjustments have to be made to reflect specific situations at technology, company, and industry level. By the same token, any rate generated from the 25% rule shall not be considered as a floor rate or cap rate. It is true that an individual royalty rate may not have been reached based on the 25% rule, or the average of the sampled rates from a specific business sector may not be close to the rate from the 25% rule. However, statistically, the mean of fairly large sample of royalty rates across a wide spectrum of industries tends to converge to the rate as implied by the 25% rule.

A recent study in pharmaceutical royalty rates by Borshell and Dawkes noticed that the range of the royalty rates from applying the 25% rule is much narrower than that of the observed rates in the industry. This is not surprising, and is actually anticipated based on the discussions above. More interestingly, applying the *pro forma* analysis to the data presented in Borshell and Dawkes' study may actually confirm the commanding of the 25% rule. For example, the authors reported a royalty rate range of 7% to 12% by applying the 25% rule to corporate EBITDA margins, and 15% to 18% when applying to project profit margins. According to the analysis in this essay, the ranges computed from the implied *pro forma* profit margins shall be 9% to 15% and 19% to 22%, respectively. Eyeballing Figure 1 and 2 in the study, the weighted average rates of their two samples may well fall into such ranges correspondingly.

Further data collection and analysis are needed to corroborate the conclusions above. Ideally, data should be collected for each specific licensing agreement and for the products or services embedding the licensed technologies, then identifying and quantifying the effects of various factors that contributed to the up- or downward adjustments. Due to the challenges in gathering such data, a more practical approach would be assembling data for more industries or business sectors. Also interesting would be to analyze the raw data in Goldscheider *et al.*—if it becomes available. ■

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## Reference

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