USING THE DISCOUNTED FREE CASH FLOW MODEL, WHAT IS THE ENTERPRISE VALUE OF TWITTER?

EXECUTIVE SUMMARY

The main model discussed in this report is built around the assumption that Twitter will reduce costs in full measure. Twitter's revenues, particularly advertising, will start to decline despite positive cash flows till year 2020. As some of its costs relatively fixed, Twitter is forecasted to have negative cash flows after year 2020. Although Twitter's EBIT remains negative throughout our model spanning until year 2021, large depreciations make some of the cash flows positive. The model forecasts Twitter's cash flows until year 2020 and discounts them where growth is expected to be constant due to competitive intensity in the market. Note that forecasted cash flows happening in e.g. 5 years' time is impossible to predict with sufficient accuracy as Twitter's platform is volatile. A loss in user base will likely have a negatively reinforcing effect causing even more advertising and financial loss.

The discount rate obtained from our assumptions and model is: r_{WACC} = 8.80%, and the free cash flows are the below:

Year	**2017**	**2018**	**2019**	**2020**	**2021**
t	0	1	2	3	4
Free cash flow	41	138	103	64	(13)

The enterprise value for Twitter suggested by this model is **115 M USD**. Sensitivity analysis also supports the assumption for Twitter to have a positive net present value (NPV). The sensitivity analysis performed in the baseline case shows, however, that it is possible the NPV be negative (-$117 M USD with a lower discount rate, 6% instead of our current 8.8%). The report also builds an alternative scenario that will be provided for comparison purposes, where Twitter is able to increase its revenues and cut substantial costs. This very optimistic scenario results in an NPV of around $14 702 M USD demonstrating the massive effect on enterprise value Twitter could achieve by cutting costs significantly.

Table of contents

1 INTRODUCTION

This report is split into four parts:

1) Free cash flow calculations, 2) Discount rate calculation, 3) Enterprise value of Twitter and finally 4) Sensitivity analysis and alternative scenarios.

The first part explains the assumptions made relating to costs, revenues and depreciation taken to arrive at our estimated free cash flows for Twitter. The second part discusses assumptions relevant to the value of discount rate (r_{WACC}) and the third part introduces the formula used to calculate Twitter's enterprise value and the resulting valuation using figures from Parts 1 and 2. Finally, the report discusses how different assumptions on constant growth rate and discount rates affect Twitter's revenues and costs. The report focuses on Parts 1, 2, and 3 on the baseline case with revenue decline and appropriate cost cutting. The alternative case is introduced on Part 4 with some revenue growth and substantial cost cutting for sensitivity analysis purposes.

To simplify presentation, although non-rounded up numbers are used for our primary calculations, the figures presented in the report may involve rounding up thus figures will result in a slightly different value. However, accurate values are available on the Excel file.

It should be noted that when growth rates are reported (Example Table 1), the growth rate for a specific year (e.g. in the column '2017' it is -7.0%) means that advertising revenue in 2017 is 7% less than that of 2016. If values in tables are reported in brackets, these represent negative values (usually in USD). Finally, the year used as the current year, i.e. year 0, in the report is 2017. Lastly, unless otherwise stated, all cost and revenue figures are obtained from Twitter's annual financial statements.

Table 1: Example about growth rates (M USD)

Year	**2016**	**2017**
Growth rate	-	-7.0 %
Advertising	2 248	2 093

PART 1: FREE CASH FLOW

A key part of assessing the enterprise value of Twitter is to estimate the future cash flows of Twitter till point T, after which reliability of estimated cash flows falls. The social media services sector is highly competitive, saturated and constantly evolving. For example Instagram and Snapchat have been able to gain traction which may have resulted in Twitter's increasingly stagnating user growth (Volz & Mukherjee 2016). The size of Twitter's user base is likely to affect its cash flows. For a multi-sided platform such as Twitter, the attractiveness of its platform to advertisers is directly correlated to the number of users. This is referred to the *cross-side* network effect (Eisenmann et al 2006).

However, platforms also have *same-side* network effects (Eisenmann et al 2006). Having a large user base encourages other users to join the platform. If other social media platforms such as Facebook or Instagram continue to grow, or new entrants disrupt the market, the effect on Twitter's user base can be extensive . A transfer of a relatively small number of users to an alternative platform may discourage other users from using Twitter, consequently stalling Twitter's growth. Forecasts for Twitter's cash flows are impractical beyond a relatively small time window (under 5 years) with sufficient accuracy due to the large number of variables mentioned. In addition, the market may look very different to how it looks today. Twitter's revenues will be evaluated until year 2020 (=T), where growth rate g is assumed as a constant thereafter.. However, to calculate the net present value of an infinitely lived asset, the value for cash flows in Year T + 1 (2021) is needed. Therefore, the following sections always forecast items relevant for calculating free cash flows until year 2021.

2 REVENUE

Twitter's revenues come from different sources such as promoted tweets, promoted accounts, promoted trends and data licensing (Twitter 2016). These are aggregated into two main revenue sources: advertising and data licensing. It is important to keep these two sources separated as growth patterns are expected to differ in the short term. As shown in Figure 1, growth rates of both sources of revenues have been positive, albeit in decline. However, the growth rate of data licensing can be expected to be higher than that of advertising in the future, similar to the figures in 2016. According to Figure 2, the trend in Twitter's revenue growth rate indicates negative growth figures after year 2016. Twitter's decline is definite but it may not be as extreme as Figure 2 suggests. Past revenue figures used for both advertising and data licensing are from Twitter's annual statements (i.e. from Twitter 2017; Twitter 2016: Twitter 2015; Twitter 2014).

Figure 1: The growth rates of advertising and data licensing revenues

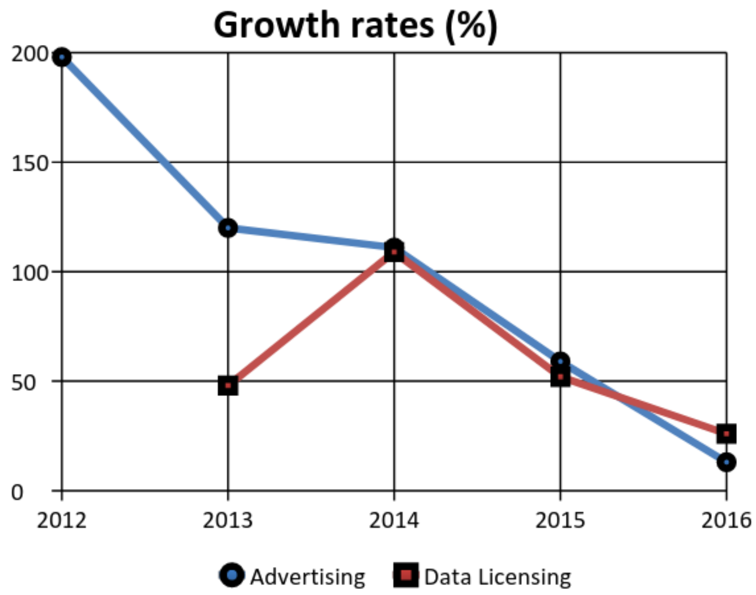
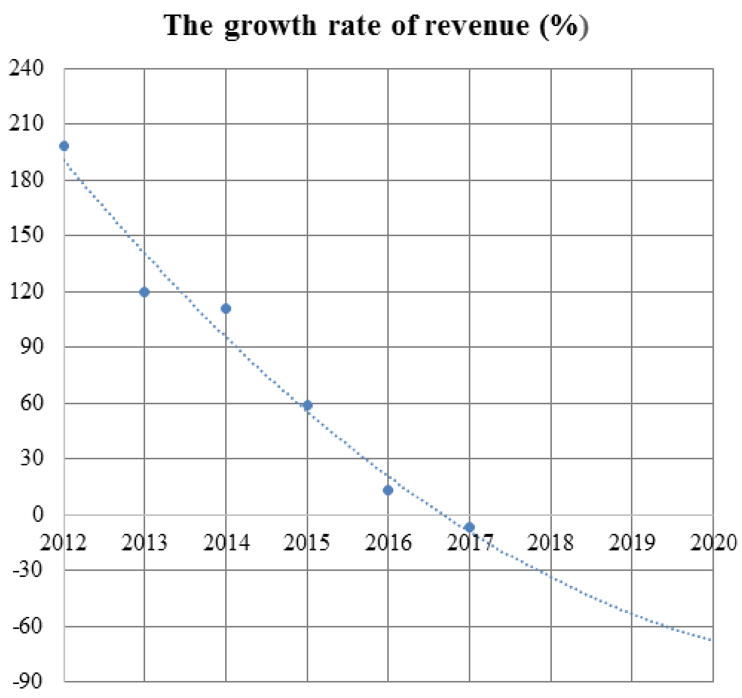


Figure 2: The growth rate of revenue (%)



2.1 Advertising

An estimate of Twitter’s annual growth rate is used to calculate its future advertising revenues. As discussed above, advertising revenue growth rate has been declining. Moreover, Twitter’s revenues fell this year for the first time, the drop being particularly driven by the fall of advertising revenue by 11% in the first-quarter (Neate 2017; Forbes 2017). Note that the fall in revenue during the first quarter may not be reflective of the whole year’s revenue growth as there seem to be an overall trend of decline in advertising revenue growth rate demonstrated in Figures 1 and 2. Twitter’s advertising revenue can be assumed to decrease, but that the decrease in revenue will be less than the 11% decline in the first quarter of the year. However, this decline is expected to increase annually as Twitter is forecasted to lose advertising revenues to competing social media platforms. Figure 3 below shows Twitter’s expected advertising revenue growth to develop until year 2021. Table 2 demonstrates the growth figures used in Figure 3, and the predicted advertising revenues based on growth figures.

Figure 3: The slow decline in advertising revenue

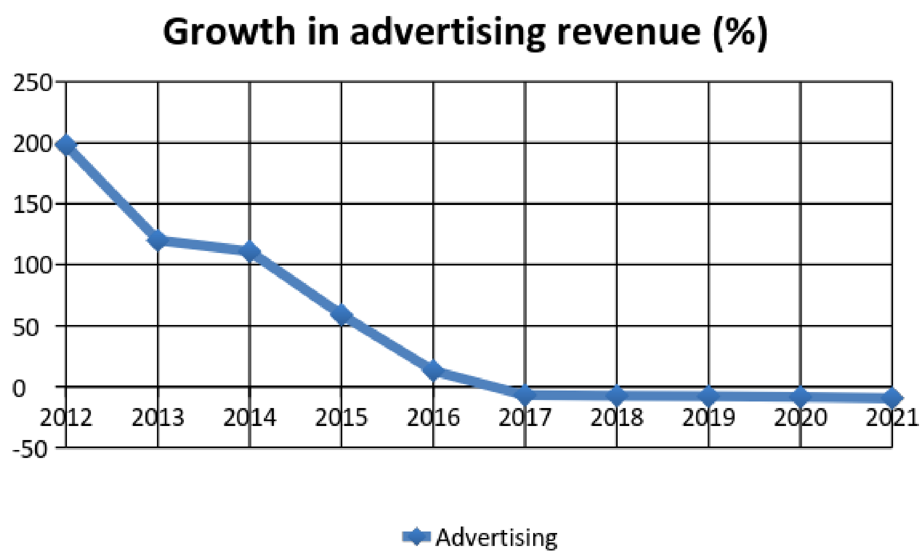


Table 2: Twitter’s estimated advertising revenues (M USD)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Growth rate	-	-7.0 %	-7.5 %	-8.0 %	-8.5 %	-9.5 %
Advertising	2 248	2 093	1 936	1 781	1 630	1 475

2.2 Data licensing

Similar to advertising, an estimated figure for data licensing annual growth rate was to calculate the data licensing revenues till year 2021. Although data licensing growth rate has been in decline since 2014, growth rate has still been higher (26%) than that of advertising (13%) in 2016. Growth rates are expected to continue to decline but remain positive even in 2021. The growth in data licensing will therefore partially offset revenue losses from advertising. Figure 4 demonstrates the how we the expected growth rate of data licensing develops while Table 3 show the effect of this development on data licensing revenues.

Figure 4: Some growth still expected for data licensing revenue

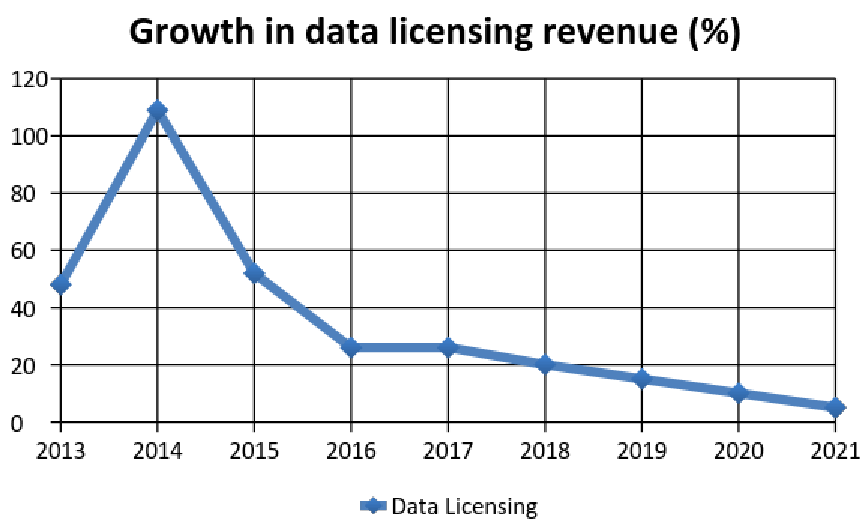


Table 3: Twitter's estimated data licensing revenues (M USD)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Growth rate	-	26%	20%	15%	10%	5%
Data licensing	282	354	425	489	537	564

2.3 Total revenue

Table 4: Twitter's estimated total revenues (M USD)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Advertising	2 248	2 093	1 936	1 781	1 630	1 475
Data licensing	282	354	425	489	537	564
Total revenue	**2 530**	**2 447**	**2 360**	**2 269**	**2 167**	**2 039**

3 COSTS

In general, Twitter has been focusing on improving its cost structure to improve profitability (Volz & Mukherjee 2017; Isaac 2016). The company has already taken actions such as laying off personnel and discontinuing R&D projects. In this model, assuming as revenues continue to decline so cost cutting will continue. This will be statede.g. when discussing R&D expenses. The main cost items for Twitter include cost of revenue, SG&A expenses, R&D expenses and depreciation. Each of these items have been evaluated separately and the cost of revenue and SG&A we have split into even smaller units of analysis. All of the past figures used are from Twitter's annual statements (i.e. from Twitter 2017; Twitter 2016: Twitter 2015; Twitter 2014). The following sections go through each of these cost items separately.

3.1 Cost of revenue

Twitter's financial statements indicate that much of their cost of revenue is fixed and cannot be reduced short-term even despite a decline in sales (see e.g. Twitter 2017 p.51). However, some of Twitter's cost of revenue such as traffic acquisition costs (TAC) are indicative, relating directly to revenue (see e.g. Twitter 2017 p.52). Therefore, separating costs of revenue into TAC (variable aspect) and cost of revenue - TAC (fixed aspect) provides more accurate analyses. Since Twitter aggregates depreciation alongside other cost items and does not record depreciations separately before EBIT in its financial statements, this report's calculations have assumed depreciation to be included in cost of revenue. Therefore, depreciation is subtracted from cost of revenue to avoid double calculations for EBIT.

3.1.1 Traffic acquisition costs, TAC

TAC costs are directly related to advertising and vary as a % of revenue (Twitter 2017). TAC figures are taken from Twitter's financial statements and values were available for 2 years (2015 and 2016). These figures are used to calculate the percentage of revenue in each of these years, as shown in table 5.

Table 5: Twitter's TAC as a % of revenue (M USD)

Year	2015	2016
TAC	122	142
Revenue	2218	2530
TAC / revenue	5.5%	5.6%

As shown in Table 5, TAC as a % of revenue was 5.5% and 5.6% in years 2015 and 2016 respectively. As these figures are very close to each other, (5.5%) as our estimate for calculating TACs until year 2021 as shown in Table 6 below.

Table 6: Twitter's predicted TAC in M USD

Year	2017	2018	2019	2020	2021
Revenue	2 447	2 360	2 269	2 167	2 039
TAC / revenue	5.5%	5.5%	5.5%	5.5%	5.5%
TAC	135	130	125	119	112

3.1.2 Depreciation

It seems that the company has been steadily increasing its depreciation that is likely due to a combination of still depreciating earlier investments with new, recently made investments (shown in Figure 5). Considering that depreciation relates to revenue (e.g. an increase in customers translates to additional, or upgrades in, data centers than can provide the basis for Figure 6. However, depreciation cannot be calculated as a % of revenue in our model, as with the decline in revenue is correlated with a decline in. At the same time, Twitter's assets are likely to be depreciated over a longer period due to the nature of the assets (e.g. a data center building is unlikely to be replaced after several years).

If one were to assume a trend in Twitter's asset depreciation, depreciation is the same for each year when there are no new investments in assets in addition to older assets are still being depreciated. As Twitter's depreciation in 2012 was c. $73 M USD and in 2016 c. $402 M USD, it seems to show that the firm has purchased new assets and much of the depreciation charge is attributed to these new sources. More recent assets will still be depreciated at least until year 2021 (the timeframe) thus depreciation cannot decrease. If revenues decline, Twitter may need to make some investments in assets. Hence, this model uses an assumption that Twitter's depreciation will increase by 5% every year until 2020, by when some of the older assets cannot be further depreciated. Thus the overall result for year 2021 will be roughly equals that of the year 2020. The values for depreciation in M USD are shown in table 7.

Figure 5: Twitter's depreciation (M USD)

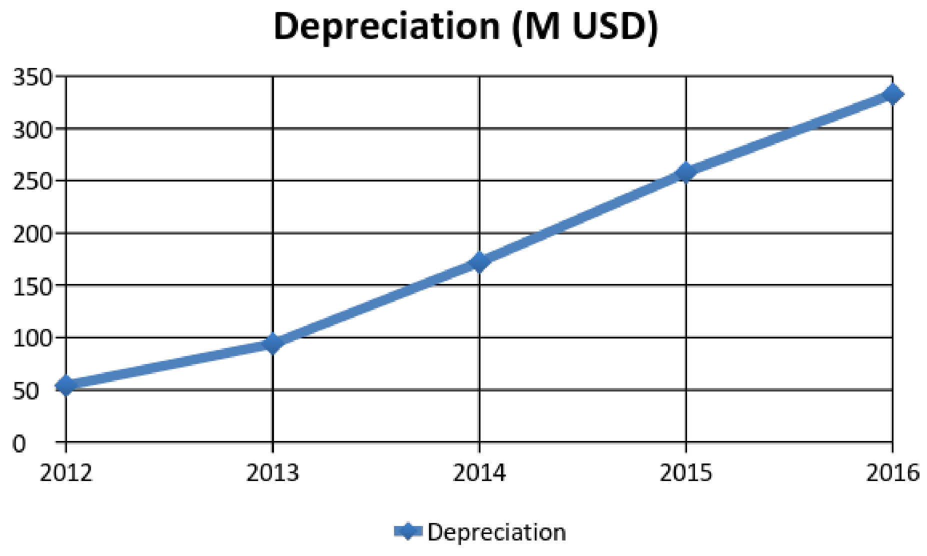


Figure 6: Twitter's depreciation / revenue (%)

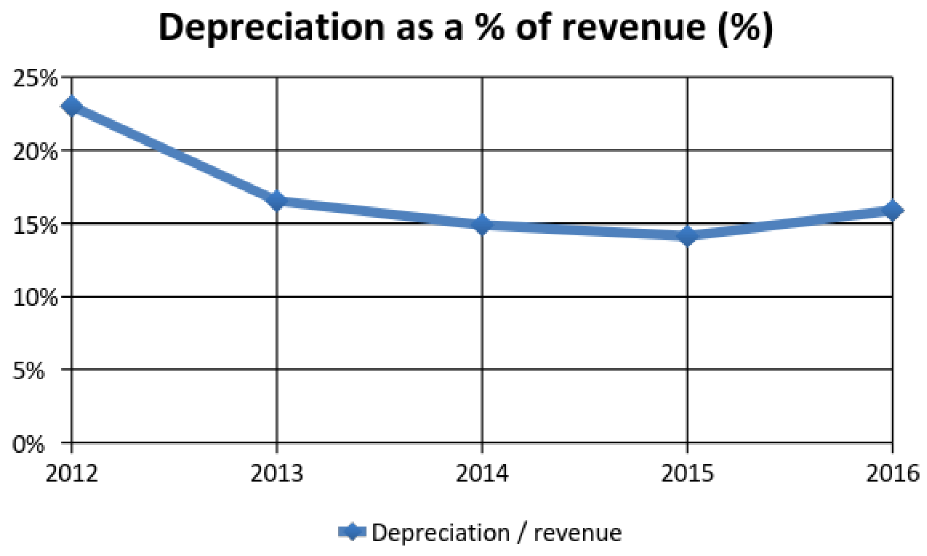


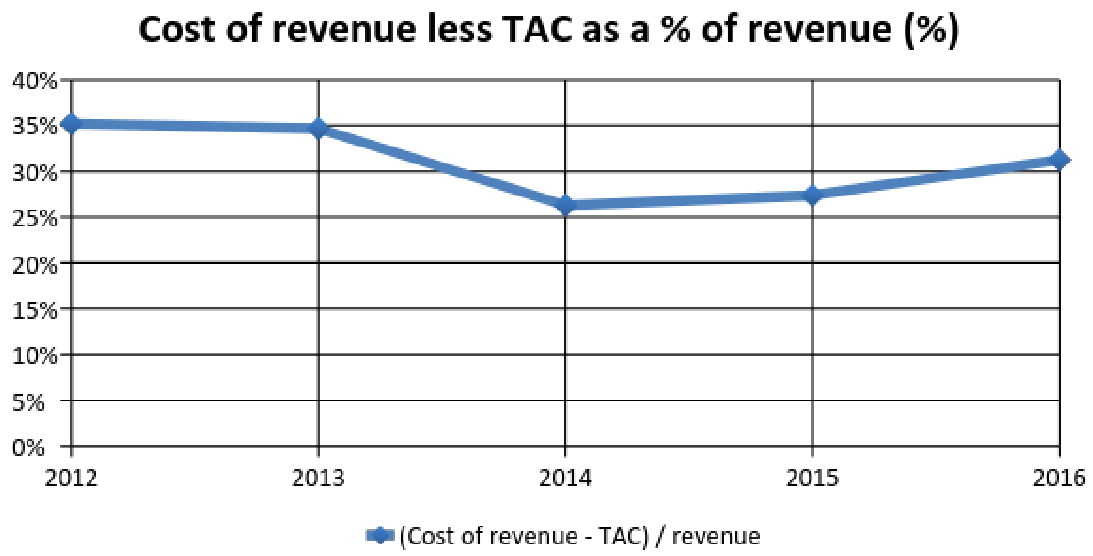
Table 7: Twitter's expected annual depreciation (M USD)

Year	**2016**	**2017**	**2018**	**2019**	**2020**	**2021**
Increase	-	5%	5%	5%	5%	0%
Depreciation	402	422	443	465	489	489

3.1.3 Cost of revenue less TAC

As noted earlier, the cost of revenue includes a variable part, TAC, which we list separately as a cost item. Twitter's financial statements do not provide figures for TAC before year 2015, but it can assumed that these were 5.5% of revenue in the earlier years to construct Figure 7. Note that although the model assumes the inclusion of depreciation in the cost of revenue value for simplification purposes, it may not be true. Therefore, no depreciation deductions are made from cost of revenue-less TAC when examining the relationship between cost of revenue -less TAC and revenue as depreciation has not been stable over the years.

Figure 7: Cost of revenue less TAC as a % of revenue (%)



As shown in Figure 7, there is no clear indication that cost of revenue-less TAC would be a set percentage of revenue (as percentages vary between 25% and 35%). Hence, calculations regarding cost of revenue as a % of revenue were not made in this model. This is also in line with Twitter's financial statements suggesting that much of the cost of revenue is relatively fixed (Twitter 2017). Since in the model presents revenues decline in USD, the cost of revenue-less TAC should not increase in USD. Concurrently, Twitter claims that its cost of revenue cannot be reduced short term despite a decline in revenue(see e.g. Twitter 2017 p.51). Consecutively, assuming that the cost of revenue-less TAC should remain as in 2016 (i.e. $790 M USD). As TAC is related to revenue in this model, the overall cost of revenue will decline slightly as TAC decreases. Table 8 below demonstrates our assumptions for cost of revenue-less TAC, TAC and how this affects the cost of revenue.

Table 8: Twitter's cost of revenue, TAC and cost of revenue less TAC (M USD)

Year	2016	2017	2018	2019	2020	2021
Cost of revenue - TAC	790	790	790	790	790	790
TAC	142	135	130	125	119	112
Cost of revenue	**932**	**925**	**920**	**915**	**909**	**902**

As mentioned earlier, depreciation will not be calculated twice in this model since depreciation is aggregated to other cost items listed before EBIT. This does not affect the EBIT value but shows depreciation as a separate line. Depreciation is then added back after EBIT. Table 9 shows the figures used for cost of revenue-less TAC less depreciation.

Table 9: Twitter's cost of revenue, TAC and cost of revenue less TAC (M USD)

Year	2016	2017	2018	2019	2020	2021
Cost of revenue - TAC	790	790	790	790	790	790
Depreciation	402	422	443	465	489	489
Cost of rev. – TAC – depr.	**388**	**368**	**347**	**325**	**301**	**301**

3.2 SG&A Expenses

Twitter's other SG&A expenses are mainly personnel related expenses and include Sales, General & Administrative and Research & Development related expenses. These are split into R&D, sales, and general & administrative expenses as these cost items are expected to follow a different pattern.

3.2.1 Research & Development expenses

R&D expense makes a substantial part of Twitter's costs, e.g. in 2016 R&D expense was c. 700 M USD. As a part of the improving their cost structure, Twitter has already cut its R&D expense by over 100 M USD between 2015 and 2016 as demonstrated by Figure 8. It has been reported to have discontinued R&D projects such as Vine along with laying off staff (Volz & Mukherjee 2017). Twitter is expected to continue cutting R&D expenses as a way to improve profitability. However it may need to maintain a decent level of R&D spending to promote innovation to remain competitive within its industry. Thus,it can be assumed that Twitterwill cut its R&D spending to 600 B USD (i.e. to same level as 2013) by 2018 and that this level will be maintained and stable. Table 10 shows Twitter's expected R&D expenses until 2021 with year 2017, shown to have the same level of R&D spending as the previous year due to large reductions also between 2015 and 2016.

Figure 8: The development of Twitter's R&D expense

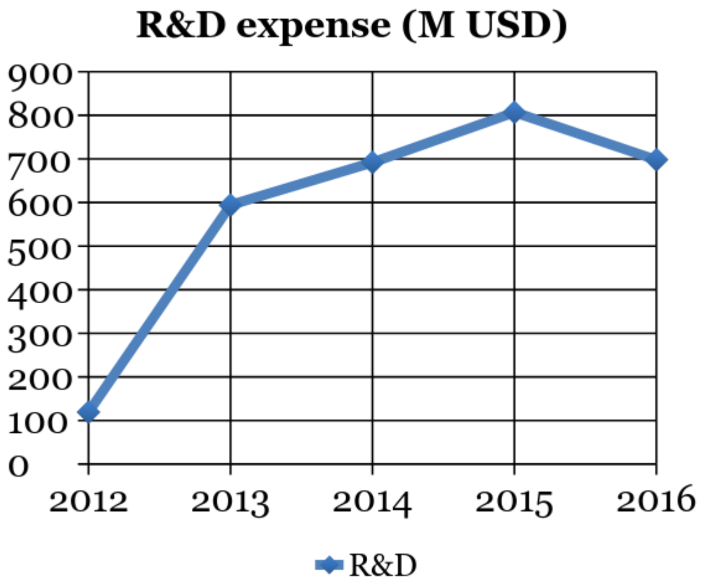


Table 10: Twitter's R&D expenses (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
R&D expense	698	600	600	600	600

3.2.2 Sales expenses

Twitter's sales (incl. marketing) expenses are large, levelling at 1215 M USD in 2016. It may be a potential source of cost cutting for Twitter as revenues decline. In 2016, Twitter laid off 10% of its workforce, mainly those from sales and marketing (Volz & Mukherjee 2017). Figure 9 demonstrates how Twitter's sales expenses as a % of revenue has been steadily declining since 2013.Twitter is expected to continue attempts to keep sales expenses low and has made 10% of its workforce redundant two years in a row, i.e. in 2015 and 2016 (Volz & Mukherjee 2017; Isaac 2016). Therefore, Twitter can maintain sales cost as a % of revenue at roughly the same (37% in 2016) level as it had. Sales costs will decrease slightly over the short term as revenue declines. Twitter can cut sales expenses a little by little annually but not by a large amount as the firm has already focused on cutting costs in this area. Table 11 shows the figures gained for sales expenses with these assumptions. As seen, the result is a c. 150 M USD decrease in sales expense between 2017 and 2021.

Figure 9: Sales expenses as a % of revenue declining (%)

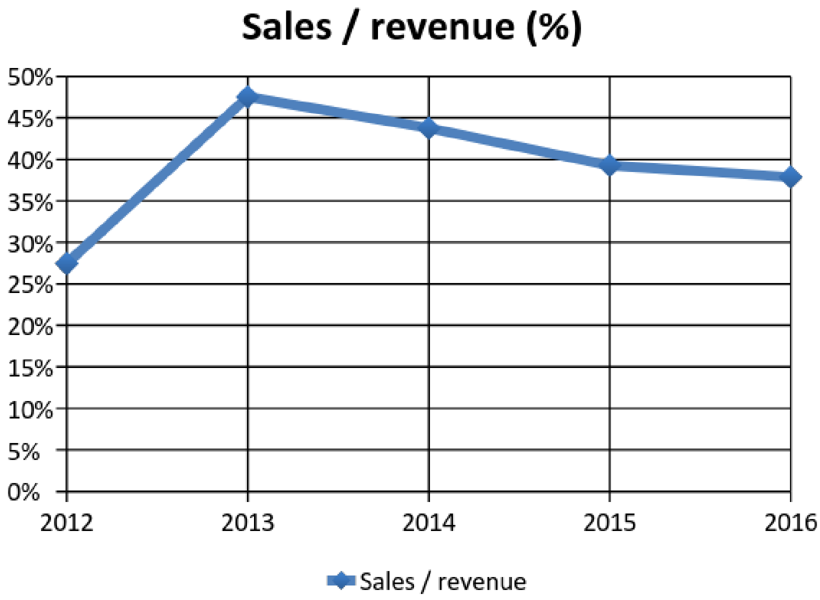


Table 11: Twitter's predicted sales expense (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Revenue	2 447	2 360	2 269	2 167	2 039
Sales expense / revenue	37%	37%	37%	37%	37%
Sales expense	905	873	840	802	754

3.2.3 General & Administrative expenses

We assume that general & administrative expenses do not vary with revenue. For example fees paid to third party accounting services are the same regardless of revenue. Assumptions are also supported by Figure 10 that shows G&A as a % of revenue has been decreasing and varied . Between 2014 and 2015 Twitter's G&A expenses increased by over 70 M USD as compared to approximately 30 M USD between 2015 and 2016 . With Twitter's cost cutting in mind, expected G&A growth to be be very small and similar to 2016. The model assume that G&A expenses in 2017 will be around 300 M USD and grow by 1% every year. Additionally, there is a level of G&A expense necessary to support Twitter's operations, therefore cost cutting will mainly be focused on R&D and sales expenses. Table 11.5 shows the resulting G&A expenses.

Figure 10: The development of G&A as a % of revenue (%)

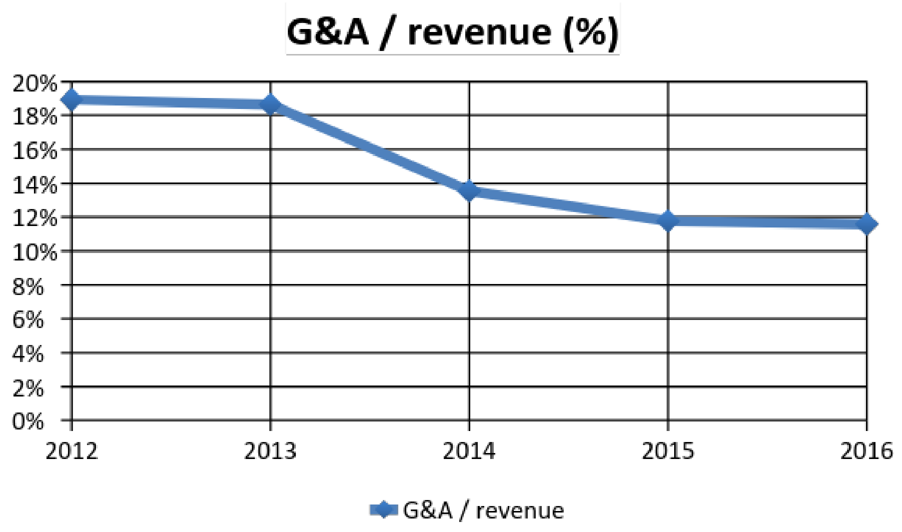


Table 11.5: Twitter's R&D expenses (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Growth	-	1%	1%	1%	1%
G&A expense	300	303	306	309	312

4 EBIT

Through combining the information from sections 2 and 3, it is possible to calculate the predicted EBIT of Twitter for years 2017 to 2021, as shown in table 12 below.

Table 12: Estimating Twitter's EBITs (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Advertising revenue	2 093	1 936	1 781	1 630	1 475
Data licensing revenue	354	425	489	537	564
- Cost of revenue – TAC	368	347	325	301	301
- TAC	135	130	125	119	112
Gross Profit	1944	1884	1820	1747	1626
- Sales expenses	905	873	840	802	754
- G&A expenses	300	303	306	309	312
- R&D expenses	698	600	600	600	600
- Depreciation	422	443	465	489	489
EBIT	**(381)**	**(336)**	**(391)**	**(453)**	**(530)**

5 INTEREST & TAXES

To calculate free cash flow, interest expenses and taxes should be deducted from EBIT. However, the interest expense is often ignored. One reason for this is that interest is paid to investors (and should be a part of free cash flow) (lecture notes p.19-20). Therefore, interest expense was not included in our model. Taxes should be deducted from EBIT. However, as Twitter's EBIT for all years 2018 until 2021 are negative, i.e. as no profits were made, no taxes were paid. The tax rate of Twitter is 40% (Damodaran). This important information for sensitivity analysis when presenting an alternate scenario to show the growth of Twitter's cash flows. In this baseline model however, the taxes are 0 USD, resulting in unlevered net income being equal to EBIT(Section 7).

6 CAPITAL EXPENDITURE & NET WORKING CAPITAL

To arrive from unlevered net income to free cash flow, adding back depreciation and deduct capital expenditure is vital. As is generally known when the firm acquires a long-term asset the cost is not booked as an expense in the acquisition year but over time as depreciation. The depreciations are not cash expenses so they need to be added back to unlevered net income when calculating the free cash flow.1 However, the cost of the acquisition, or capital expenditure, is cash that the firm has to pay out when it acquires the long-term asset. Hence, capital expenditure needs to be deducted from the unlevered net income.

Finally, the increase in net working capital is deducted. Net working capital is the difference between current assets and current liabilities. Most commonly, it is defined as follows:

$$\mathtt{NWC = Cash + Inventory + Receivables - Payables.}$$

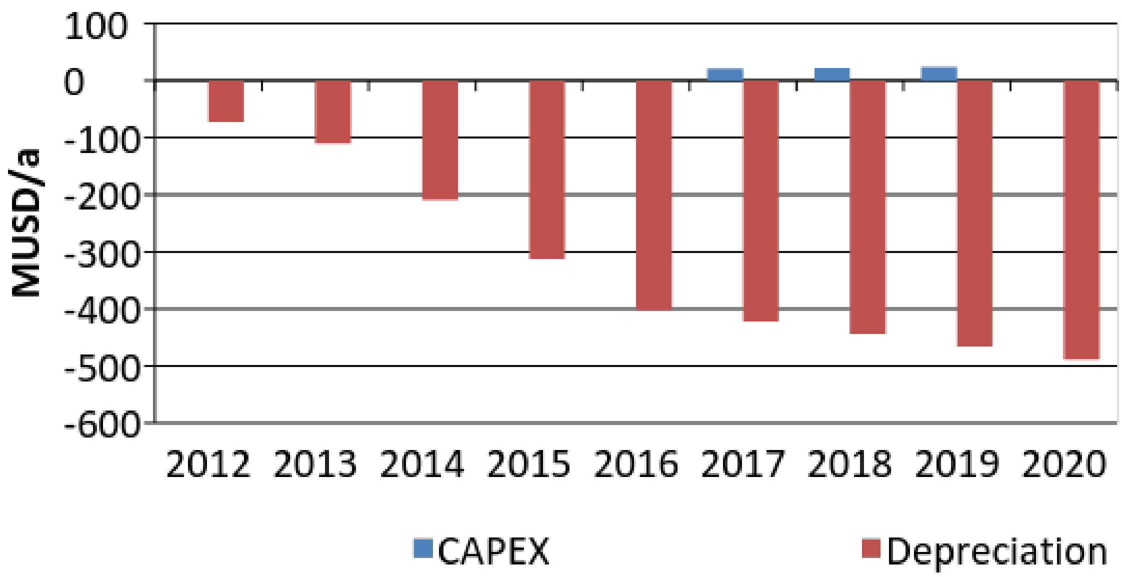
Current assets (cash, inventory, and receivables) represent items that the firm has spent money on but has not yet received revenue from. Current liabilities (mainly payables) represent items that already show up as expenses but the firm has not paid money for yet. An increase (decrease) in net working capital represents a negative (positive) cash flow for the firm which is not recognized on the income statement. Hence, the change in net working capital needs to be deducted when calculating the free cash flow. For example, buying things to inventory costs money, but is not booked as an expense before those things are sold, and the growth in inventory decreases the free cash flow.

6.1 Capital expenditure, CapEx

Given the nature of Twitter's business, the amount of traffic via the platform dictates the need for investment into assets like data centres. As the number of Twitter users (and revenue) has reached its zenith, we assume that there will be only minor future capital expenditure, and use a CapEx value of 0 USD for years 2018 to 2021.

We have assumed a typical 20 year depreciation schedule for the existing depreciations in 2016. Therefore these will continue up to 2020 in addition to the minor investments. See figure 11 below.

Figure 11: CapEx (M USD)

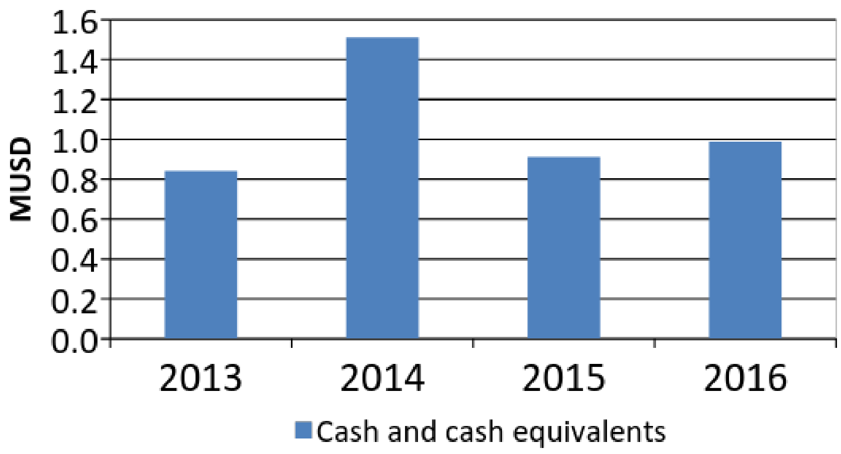


6.2 Change in net working capital, ΔNWC

The following findings regarding net working capital (NWC) has been made:

- Compared to Twitter's cost of revenue, the company has been keeping quite limited amounts of cash and cash equivalents as a reserve, which indicates that their ability to pay dividends has been very limited. However, it is the biggest NWC items so any changes in cash reserve dilute any changes in other NWC items (see the figures below)

Figure 12: Cash and equivalents (M USD)



- The company's cash conversion cycle (CCC) has been improving over since 2011 to a level below 40, especially so by increasing payment schedule to its suppliers (see figure 14). We assumed in the DCF model that they keep improving in reducing CCC and so reducing their NWC over to 2020.

Figure 13: The process

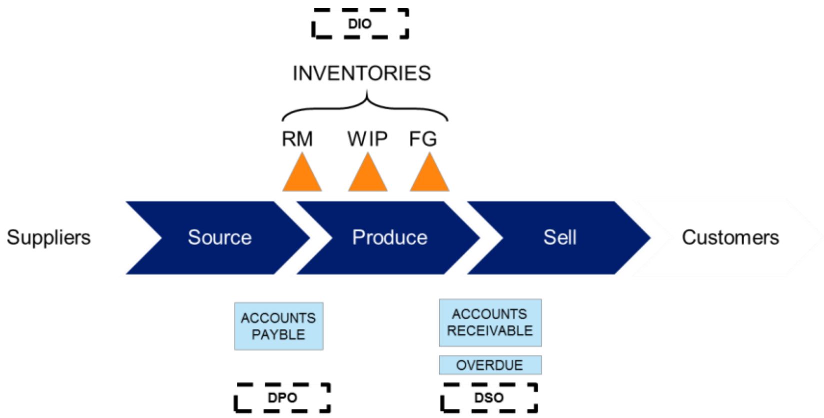


Figure 14: DSO, DIO, DPO and CCC

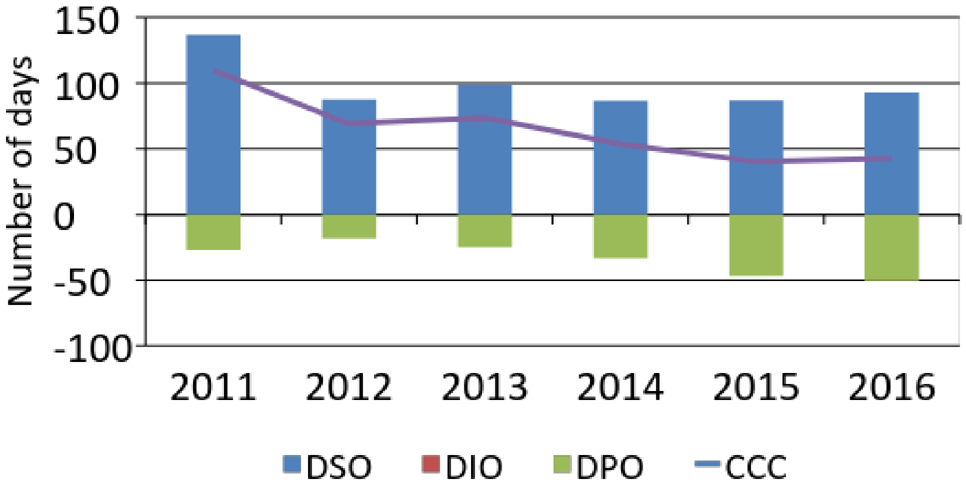


Figure 15: Net working capital

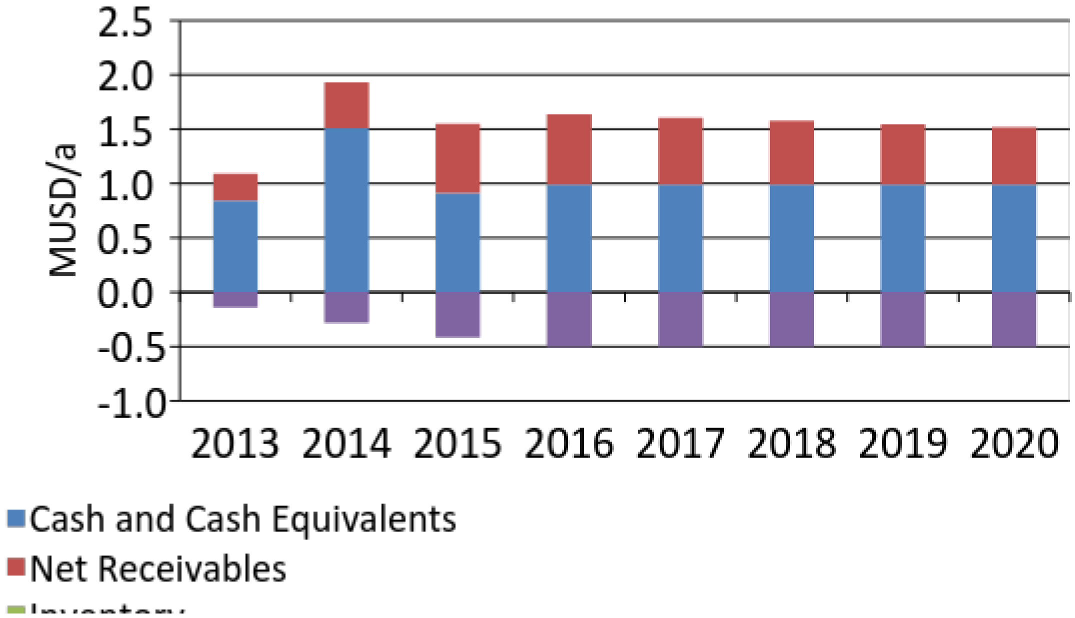


Table 13 below demonstrates the change in NWC figures used in our model based on our assumptions.

Table 13: Change in net working capital (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Change in NWC	-	(31)	(29)	(28)	(28)

7 FREE CASH FLOW

Using the information from sections 4, 5, and 6, the free cash flows until 2021 can be calculated as shown in Table 14. Here only the relevant years 2017-2021 are shown, as the year 2017 is our year 0.

Table 14: Twitter's free cash flows (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
EBIT	(381)	(336)	(391)	(453)	(530)
- Taxes	0	0	0	0	0
Unlevered net income	(381)	(336)	(391)	(453)	(530)
+ Depreciation	422	443	465	489	489
- Capital expenditure	0	0	0	0	0
- Change in NWC	0	(31)	(29)	(28)	(28)
Free cash flow	**41**	**138**	**103**	**64**	**(13)**

PART 2: THE DISCOUNT RATE

8 EQUITY COST OF CAPITAL

The equity cost of capital, r_E, can be estimated with the following equation (lecture notes p.37):

$$r_E = r_f + \beta_E \, [E(R_{Mkt}) - r_f]$$

In our model, the values of equity beta (β_E), risk free rate of return (r_f) and market risk premium ($E(R_{Mkt}) - r_f$) are:

- β_E = 1.65
- r_f = 5.03%
- $E(R_{Mkt}) - r_f$ = 3.62%

and thus the equity cost of capital is: 5.03% + 1.65 * 3.62% = **11.00%.** The following sections highlight the procedures and key assumptions related to arriving at these figures.

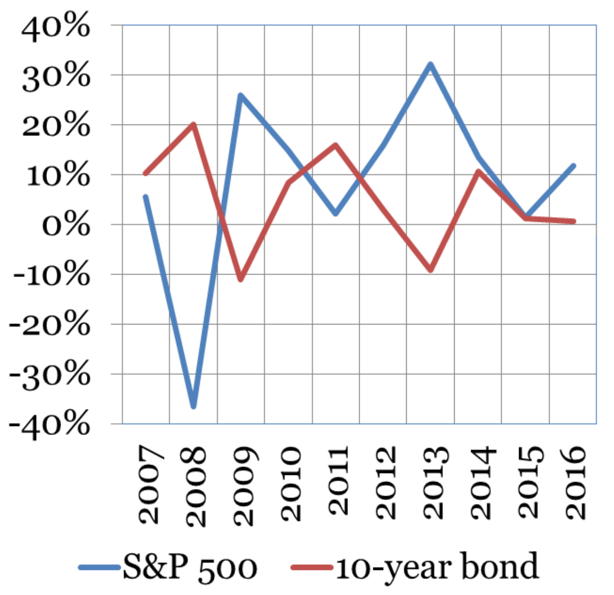
8.1 Equity beta, β_E

We based Twitter beta on Morningstar financials calculations as of 09/2017.

8.2 Risk free rate of return, r_f, and Market risk premium, $E(R_{Mkt}) - r_f$

For risk free rate and expected market return we calculated past 10 years average figures and ran their delta to get the market risk premium. Aswath Damodaran's www-portal was used as a source.

Figure 16: S&P 500 and 10-year bond



9 DEBT COST OF CAPITAL

We estimated the debt cost of capital, r_D, by utilising the equation related to yield to maturity (lecture notes p.40):

$$r_D = (1-p)y + p(y-L) = y - p\,L,$$

In our model, the yield to maturity (y), the probability that Twitter will default (p) and the loss an investor incurs in case of a default (L) are:

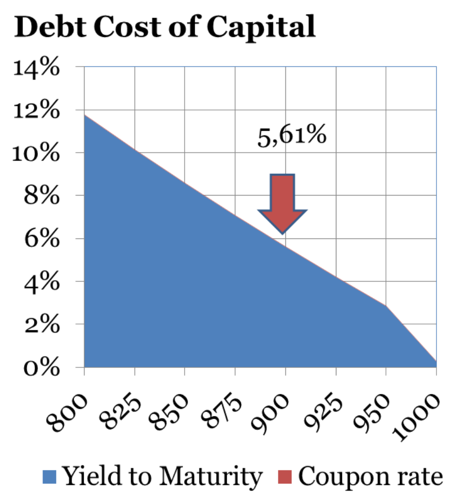
- y = 5.61%
- p = 3.68%
- L = 60%

and therefore the debt cost of capital is: 5.61% - 3.68% * 60% = **3.40%**. The following sections highlight the procedures and key assumptions related to arriving at these figures.

9.1 The yield to maturity, y

To calculate the yield to maturity, i.e. the discount rate at which NPV of investing into the bond will be zero. We used Twitter bond release data with a coupon rate of 0,25%, 2 years to maturity and face value of 1000 USD. As market values for the bond were not available, we decided to iterate the yield to maturity with different market values. The result yield to maturity of 5,61% ended up being the best in line with the exercise values and gave a market value 10% smaller than the face value. Equation 5.4 of the course booklet was used in the calculation.

Figure 16: Debt cost of capital



9.2 The probability of default, p

The company has a credit rating of BB i.e. speculative, given by Standard and Poor's. Credit rating BB translates into a probability of default of 3.68% (value p).

9.3 The loss an investor incurs in case of a default, L

Although the losses from default can be varied, the lecture notes suggest that historically the average loss has been c. 60% (p.40). We used this assumption as our estimate for L, thus L = 60% in our model.

10 WEIGHTED AVERAGE COST OF CAPITAL (WACC)

To calculate the WACC, we can use the following equation (lecture notes p.43):

$$r_{WACC} = \frac{E}{E+D} r_E + \frac{D}{E+D} r_D (1-\tau),$$

We know, that the values of r_E and r_D in our model are 11.00% and 3.40% respectively (see sections 9 and 10). We also know that Twitter's tax rate is 40% (Damodaran). The values used for equity (E) and debt (D) in our model are:

- E = 4 728 000 000
- D = 1 539 000 000

based on this, the WACC of Twitter is:

$\frac{4\ 728M}{4\ 728M+1\ 539M} * 11.00\% + \frac{1\ 539M}{4\ 728M+1\ 539M} * 3.40\% * (1-60\%) = 8.80\%$ when using non-rounded up values for r_D and r_E. The following sections highlight the procedures and key assumptions related to arriving at the figures for E and D.

10.1 Equity and Debt

As only the book value of Twitter debt was available, that was used in the calculation. Total debt in 09/2017 was around 1.539 Billion USD and total equity at the same time was worth 4.728 Billion USD. This gives a debt to equity ratio of 0.33.

PART 3: THE ENTERPRISE VALUE OF TWITTER

The enterprise value of Twitter is calculated as the NPV of Twitter with equation 2.15 (lecture notes p.15):

$$NPV = \sum_{t=0}^{T} \frac{CF_t}{(1+r)^t} + \frac{\frac{CF_{T+1}}{r-g}}{(1+r)^T}.$$

For this, we need the estimated future cash flows of Twitter and the discount rate (WACC). We have already assumed that we can forecast cash flow with enough reliability until and including year 2020, i.e. year T. Thus, to calculate the enterprise value of Twitter, we still need the constant growth rate of cash flows after year T (g). For this purpose, we assume that Twitter's constant growth rate is a slightly lower than that of the overall economy's, and thus used a figure of 3.5% as our estimate for g.

11 TWITTER'S NET PRESENT VALUE (NPV)

Below we present a reminder of the relevant figures obtained in parts 1 & 2 (free cash flow and the discount rate) relevant for calculating the NPV of Twitter, as well as the values of t, T and g.

- r_{WACC} = 8.80%, thus 1 + r = 1.088
- g = 3.5%
- T = 3 (i.e. year 2021)

Table 15: The values of t and free cash flows

Year	**2017**	**2018**	**2019**	**2020**	**2021**
t	0	1	2	3	4
Free cash flow	41	138	103	64	(13)

Looking at the $\sum_{t=0}^{T} \frac{CF_t}{(1+r)^t}$ part of the NPV formula we get (in M USD):

$$\frac{41}{(1.088)^0} + \frac{138}{(1.088)^1} + \frac{103}{(1.088)^2} + \frac{64}{(1.088)^3} = 304$$

Looking at $\frac{\frac{CF_{T+1}}{r-g}}{(1+r)^T}$ the part we get (in M USD): $\frac{\frac{(13)}{8.8\% - 3.5\%}}{(1.088)^3} = -189$

Adding these two together gives us **the enterprise value of Twitter** as: 304 M USD – 189 M USD = **115 M USD.**

PART 4: SENSITIVITY ANALYSIS AND AN ALTERNATIVE SCENARIO

Because any NPV model built is based on a large number of assumptions, for example assumptions regarding the development of revenue growth and costs, and the discount rate used, it is important to be aware of how sensitive the model is to variations in these assumptions. For example our model, even though giving negative EBIT figures, gives positive cash flows for most years because of large depreciations being added back after calculating EBIT. We have developed our baseline case in the sections 1-3 earlier, but now introduce also another scenario in which Twitter is able to reduce its costs substantially enough to have positive EBITs and its advertising revenue remains stagnant. We then perform sensitivity analysis on both the baseline case and the alternative case.

12 An alternative scenario

In the alternative scenario, the following items have been changed: advertising revenue (thus also total revenue and therefore also TAC), all SG&A costs (sales, general & administrative, and research & development). This means that depreciation remains the same as before, as well as data licensing revenue, cost of revenue less TAC, capital expenditures, and change in net working capital. The EBIT now being positive also affects the taxation of Twitter. Below, the changes made are shown in tables 16-21. All of the changes have been made based on simple assumptions about Twitter's ability in maintaining its current advertising revenue and its ability to decrease personnel costs (and SG&A costs in general) from a substantial but necessary cost restructuring program. The idea of the alternative model is mainly to just provide a comparison of what happens if Twitter becomes more successful. It must be noted that this is a very optimistic scenario, as as substantial cost cutting would probably lead into some kind of revenue decline due to e.g. reduced marketing and R&D.

12.1 The changes for the alternative case

Table 16: Twitter's estimated advertising revenues in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Growth rate	0 %	0 %	0 %	0 %	0 %
Advertising	2 250	2 250	2 250	2 250	2 250

Table 17: Twitter's estimated total revenues in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Data licensing	354	425	489	537	564
Advertising	2 250	2 250	2 250	2 250	2 250
Total revenue	**2 604**	**2 675**	**2 739**	**2 787**	**2 814**

Table 18: Twitter's estimated TAC in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Total revenue	2 604	2 675	2 739	2 787	2 814
TAC / revenue	5.5%	5.5%	5.5%	5.5%	5.5%
TAC	**143**	**147**	**151**	**153**	**155**

Table 19: Twitter's estimated sales expense in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Total revenue	2 604	2 675	2 739	2 787	2 814
Sales expense / revenue	37%	32%	27%	22%	17%
Sales expense	**964**	**856**	**739**	**613**	**478**

Table 20: Twitter's estimated G&A expense in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Growth rate	-	-10%	-10%	-10%	-10%
G&A expense	**300**	**270**	**243**	**219**	**197**

Table 21: Twitter's estimated R&D expense in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Growth rate	-	-5%	-5%	-5%	-5%
R&D expense	**698**	**663**	**630**	**598**	**567**

12.2 The alternative case's EBIT

Table 22: Estimating Twitter's EBITs in alternative case (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
Advertising revenue	2 250	2 250	2 250	2 250	2 250
Data licensing revenue	354	425	489	537	564
- Cost of revenue – TAC	368	347	325	301	301
- TAC	143	147	151	153	155
Gross Profit	2 092	2 181	2 263	2 333	2 359
- Sales expenses	964	856	739	613	478
- G&A expenses	300	270	243	219	197
- R&D expenses	698	663	630	598	567
- Depreciation	422	443	465	489	489
EBIT	**(291)**	**(51)**	**186**	**414**	**626**

12.3 The alternative case's free cash flows

Table 23 now demonstrates the free cash flows Twitter would have in this scenario. Note that taxation is now also affecting Twitter with 40% corporate tax rate when EBIT is positive (years 2019, 2020, 2021).

Table 23: Twitter's free cash flows in alternative scenario (M USD)

Year	**2017**	**2018**	**2019**	**2020**	**2021**
EBIT	(291)	(51)	186	414	626
- Taxes	0	0	74	166	250
Unlevered net income	(291)	(51)	111	248	375
+ Depreciation	422	443	465	489	489
- Capital expenditure	0	0	0	0	0
- Change in NWC	0	(31)	(29)	(28)	(28)
Free cash flow	**131**	**423**	**606**	**765**	**892**

12.4 The alternative case's enterprise value for Twitter

In this model, the free cash flows change, but the r_{WACC}, g, t and T are not changed but are still:

- r_{WACC} = 8.80%, (so 1 + r = 1.088)
- g = 3.5%
- T = 3 (i.e. year 2021)

Table 24: The values of t and free cash flows

Year	**2017**	**2018**	**2019**	**2020**	**2021**
t	0	1	2	3	4
Free cash flow	131	423	606	765	892

Thus, looking again at the $\sum_{t=0}^{T} \frac{CF_t}{(1+r)^t}$ part of the NPV formula we get (in M USD):

$$\frac{131}{(1.088)^0} + \frac{423}{(1.088)^1} + \frac{606}{(1.088)^2} + \frac{765}{(1.088)^3} = 1\ 626$$

Looking at the $\frac{\frac{CF_{T+1}}{r-g}}{(1+r)^T}$ part again we get (in M USD): $\frac{\frac{892}{8.8\%-3.5\%}}{(1.088)^3} = 13\ 076$

Adding these two together gives us **the enterprise value of Twitter** in the alternative case as: 1 626 M USD + 13 076 M USD = **14 702 M USD.**

13 Sensitivity analysis

As we now have two separate cases (the baseline and the alternative) for Twitter’s cash flows, we can also change the discount rate of the cash flows and the assumption about constant growth rate after year 2020 for both cases to perform sensitivity analysis. Table 25 below demonstrates the results of such sensitivity analysis for the baseline case and table 26 for the alternative case. The formula used in calculations is not explained, as it is the same as before for calculating enterprise value. The different enterprise values are shown in the cells with text in bold and italics and grey background.

Table 25: Sensitivity analysis with the baseline case (NPV in M USD)

	WACC = 6%	WACC = 8.8%	WACC = 10%
Constant growth rate = 2 %	***45***	***157***	***178***
Constant growth rate = 3.5%	***(117)***	***115***	***150***

It appears that changing the discount rate and the constant growth rate (i.e. the r_{WACC} and g) affects the enterprise value for Twitter even if free cash flows were kept the same. The most notable difference is that with a discount rate of 6% and constant growth rate of 3.5%, the enterprise value of Twitter would be negative. This is mainly because the model assumes that after the year 2020 Twitter would have negative cash flows.

Table 26: Sensitivity analysis with the alternative case (NPV in M USD)

	WACC = 6%	WACC = 8.8%	WACC = 10%
Constant growth rate = 2 %	***20 442***	***11 815***	***9 971***
Constant growth rate = 3.5%	***31 681***	***14 702***	***11 905***

It is clear that because this model assumes Twitter to have a free cash flow of about 900 M USD in year 2021, the enterprise value is extremely different, going from some hundreds of millions of USD to tens of billions of USD. This demonstrates that if Twitter, against our initial perhaps more realistic assumptions, manages to fix its cost structure and increase its revenues, the NPV is different than the values of our baseline model. We would like to stress that his model is very ambitious and optimistic but serves a purpose of showing massive possible changes in Twitter's free cash flow can have to enterprise value.

14 CONCLUSION

The enterprise value of Twitter in our baseline model is positive, being at **115 M USD**. Our sensitivity analysis reveals that the enterprise value in the baseline model could be negative if the discount rate used is e.g. 6% instead of the 8.8% used. The most substantial change to the enterprise value would come from Twitter's revenues growing instead of declining and from Twitter undergoing major cost restructuring. This is a possible but a very optimistic alternative. Overall, it seems that Twitter's net present value is positive.

REFERENCES

Eisenmann, T., Parker, G., & Van Alstyne, M. W. (2006). Strategies for two-sided markets. *Harvard business review*, 84(10), 92.

Forbes (2017). Twitter's Q2 Revenue Likely To Decline, Though MAUs Might Improve. Available online: https://www.forbes.com/sites/greatspeculations/2017/07/26/twitters-q2-revenue-likely-to-decline-though-maus-might-improve/#3644941a38a7 [Accessed 9 October 2017]

Isaac, M. (2016). Twitter to Cut Jobs as It Aims for a Turnaround. The New York Times. Available online: https://www.nytimes.com/2016/10/28/technology/twitter-job-cuts-q3-earnings.html [Accessed 8 October 2017]

Lecture notes available on MyCourses.

Neate, R. (2017). Twitter revenues decline for first time as advertising falls away. The Guardian. Available online: https://www.theguardian.com/technology/2017/apr/26/twitter-revenues-fall-first-quarter-results-advertising [Accessed 9 October 2017]

Twitter (2017). Annual Report 2017. Available online: https://investor.twitterinc.com/common/download/download.cfm?companyid=AMDA-2F526X&fileid=935049&filekey=05E6E71E-D609-4A17-A8BD-B621324A950D&filename=TWTR_2016_Annual_Report.pdf [Accessed 9 October 2017]

Twitter (2016). Annual Report 2016. Available online: http://www.viewproxy.com/twitter/2016/2/index.html [Accessed 9 October 2017]

Twitter (2015). Annual Report 2014. Available online: https://investor.twitterinc.com/common/download/download.cfm?companyid=AMDA-2F526X&fileid=821792&filekey=AB7B5D27-2CEB-468B-9C9B-469676E3186A&filename=876564_Twitter_Annual_Report.pdf [Accessed 9 October 2017]

Twitter (2014). Annual Report 2013. Available online: https://investor.twitterinc.com/common/download/download.cfm?companyid=AMDA-2F526X&fileid=742501&filekey=594B33C4-825C-42AD-9DD7-AE59A56FD3CD&filename= [Accessed 9 October 2017]

Volz, D. & Mukherjee, S. (2017). Twitter cuts jobs with eye on 2017 profit; Vine discontinued. Reuters. Available online: http://www.reuters.com/article/us-twitter-results/twitter-cuts-jobs-with-eye-on-2017-profit-vine-discontinued-idUSKCN12R1GW [Accessed 29 September 2017]