BUY
VRTX

Company Overview & Investment Thesis

- We believe Vertex Pharmaceuticals is undervalued as a result of a share price drop following February speculation over VRTX's latest drug release in late 2018 (see figure 1)
- Vertex is consolidating a growing market with 46% market share through its 3 market-leading drugs (Symdeko, Kalydeco and Orkambi).
- We believe that the company is still on track to achieve considerable revenue growth over the long term due to the widened recent regulatory approval for its Symdeko drug, a forecast expanded upon in the revenue section (see figure 2)
- Vertex has increased its potential customer base by 19% from 2018 and a forecast further 111% growth is expected, significantly increasing its attractiveness as an acquisition target and further improving sales growth – both factors positively correlated with a higher stock price (see figures 3 and 5)
- The biggest risk to Vertex's long-term stock price would be if it fails to get Triple Combination Regimen Approval in late 2019. They are likely, however, to get this approval and this should lead to a further 54% increase to their patient market
- Vertex's ability to finance its world-leading in-house research team is not contingent on debt and is based on strong cash flow. At its current state, there is low risk of liquidity (see risk section) – one of the advantages of VRTX's overall healthy balance sheet (see appendix and figure 7)

Security	Vertex Pharmaceuticals
Ticker symbol	VRTX
Market	Biopharmaceuticals
Credit Rating	A1 (Egan-Jones)
Analysts	*Mark Kleyner*
Sector	Biopharmaceuticals
Sub-industry	Cystic Fibrosis Treatment
Sector-heads	*Johnny Sargeant*
Recommendation	Buy
High Target price	234 USD
Avg. Target price	213.82 USD
Upside	18.45%
Stop loss	156.5 USD

Fig.1

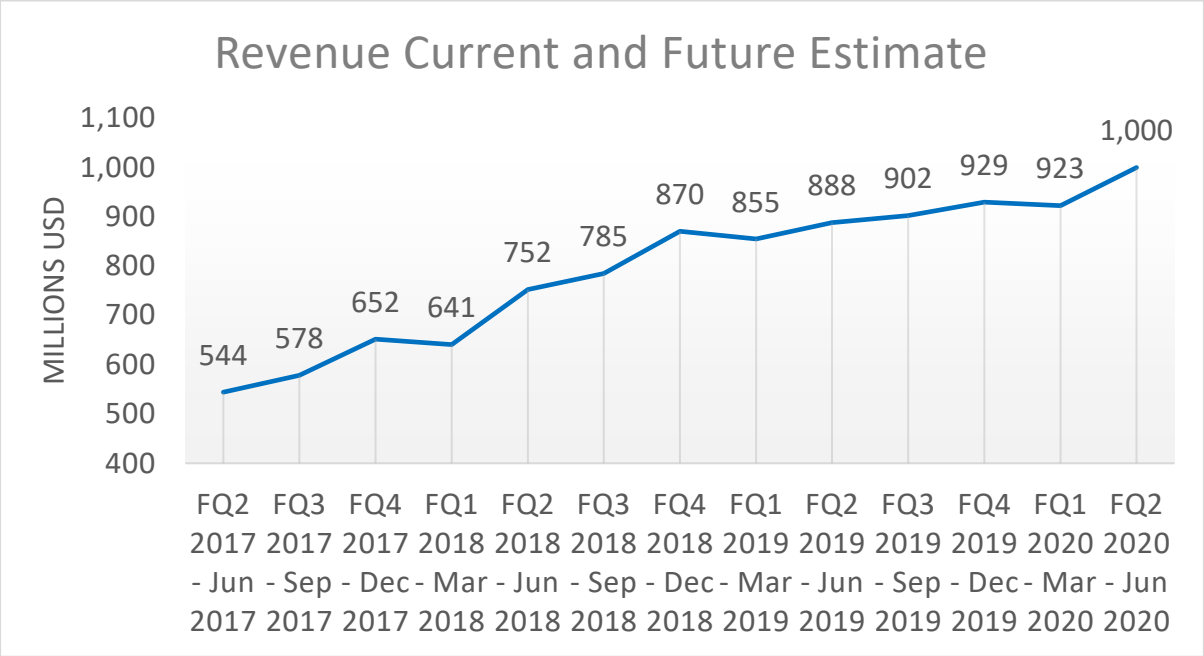
Vertex Pharmaceuticals Share Price Performance

Source: Yahoo Finance (https://goo.gl/xf45hN)

The normalisation of the price after an initial increase reflects the market's speculative behaviour. Considering the positive predictions for Vertex's Sales Growth, it's increasing revenue from Cystic Fibrosis Markets (see figure 6), the average target price is 213.82 USD.

Fig.2

Vertex Pharmaceuticals Current Revenue and Future Revenue Estimate

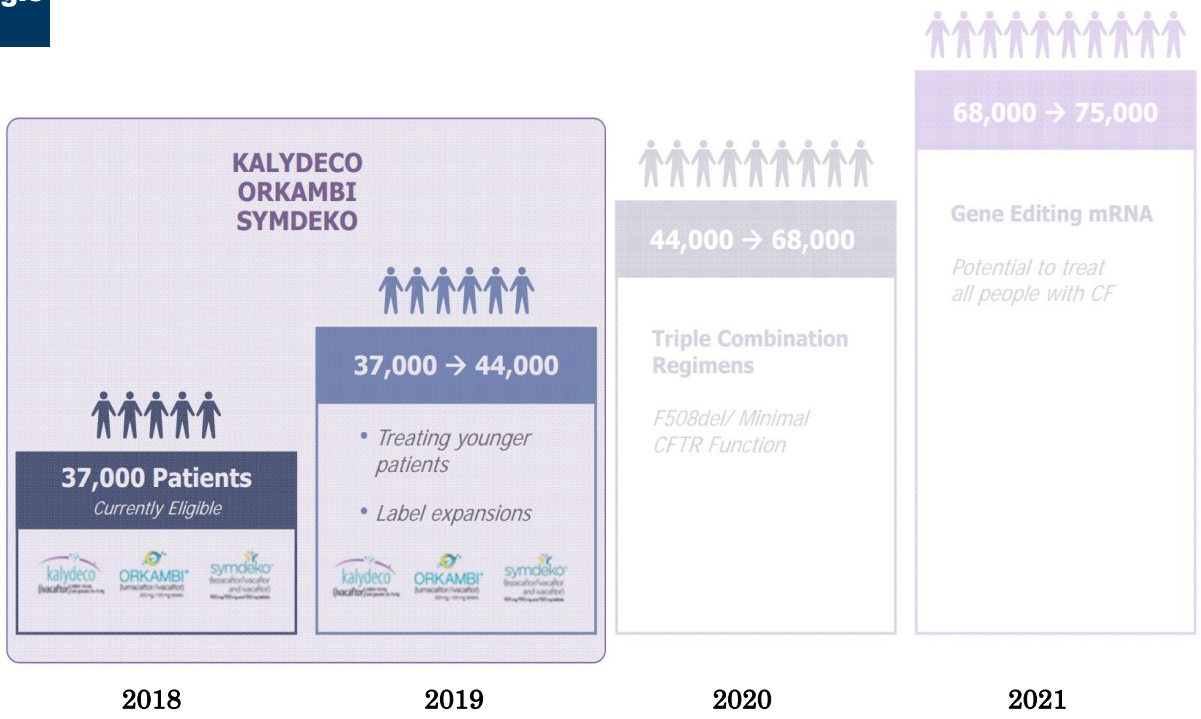


Source: Author's Work.

As seen above, Vertex has positive predictions of quarterly growth with a considerable revenue surge expected even without accounting for Gene Editing Treatments passing regulation.

Vertex Pharmaceutical Patient Market Increase

Fig.3



Source: VRTX (https://investors.vrtx.com/static-files/7938e809-4185-42df-8efe-744ec4a08d3b)

Fig.4

Vertex Pharmaceuticals Key Figures

Key Figures	
Price	180.52 (11/03/2019)
Market Cap	46.151bn USD
P/E	22.32x
EV/EBITDA	58.04x
ROE	64.44%
ROA	8.48%
Beta	1.16
Profit Margin	68.81%
D/E	0.4x
WACC	18.0%

Source: Author's Work

As seen above, VRTX has a healthy balance sheet. While it is volatile, it has a very low Debt-to-Equity and a high WACC, which suggests the cash flow's impact is dissipated. By relying on their internal cash flow to fund research and development, Vertex is thus making full use of their currently healthy balance sheet.

Investment Thesis

1. Vertex is a world-leading biopharmaceutical company investing in scientific innovation to create transformative medicines for people with serious diseases. They specialise in the development and commercialisation of medication, drug treatments and gene-editing solutions to combat cystic fibrosis and other diseases. Vertex already is present across the US and within the EU with a growing presence in developing markets (see Revenues by Geographic Location)

2. Vertex is a highly innovative company with a world-leading in-house research team, which has continually produced more successful medicines than their immediate competitors. This has had a direct impact towards their returns which have been outperforming the market and their competition since 2014 (see figures 5 and 8 in the appendix).

3. Vertex is consolidating a growing market with 46% market share through its 3 market-leading drugs (Symdeko, Kalydeco and Orkambi) - the only drugs dealing with the disease at a genetic level, having the best medical success results in covering 50% of 1900 identified Cystic Fibrosis Mutations (CF).

4. Vertex is financially independent with a low debt-to-equity of 0.4 and has strong growth forecasts with 16.5% annualised growth and an EBITDA margin of 24.2%. If, for instance, $100 had been invested at the end of 2013, by 2018, the investor would have $210 with strong historic performance indicated through cumulative returns (see figure 5).

5. Vertex is on the verge of developing their triple combo drug which will cover 90% of identified CF mutations, further improving their consolidation of the ever-growing market (see figure 3). Vertex will choose the best regimen to submit for regulatory approval with an NDA planned for no later than mid-2019[1]

6. Vertex has very strong leadership. It's President and CEO Dr. Jeff Leiden has had an enormously successful academic career, at the Universities of Chicago and Harvard, being named in Chicago Business 40 Under 40 in 1994. He then served as a member of the National Heart, Lung, and Blood Institute Board of Scientific Counselors from 1994 to 1999. During his academic career, he was also involved in starting several biotechnology companies including Vical and Cardiogene. He then showed himself to be an excellent leader in running Abbot's global pharmaceutical, leading the development of breakthrough medicines including HUMIRA® (adalimumab) for rheumatoid arthritis and other autoimmune diseases and KALETRA® (lopinavir/ritonavir) for HIV infection. Having held director positions at Abbott Laboratories, Tap, Shire Pharmaceuticals Plc, Millenium Pharmaceuticals and Clarus Ventures, under his leadership Vertex Pharmaceuticals have has delivered the first and only precision medicines to treat the underlying cause of cystic fibrosis (CF).

When to exit the position

In mid-2019, Vertex is applying for approval for its triple drug cocktail. If these announced plans are realised, after revenue streams are increased, once the anticipated rise in stock price will take

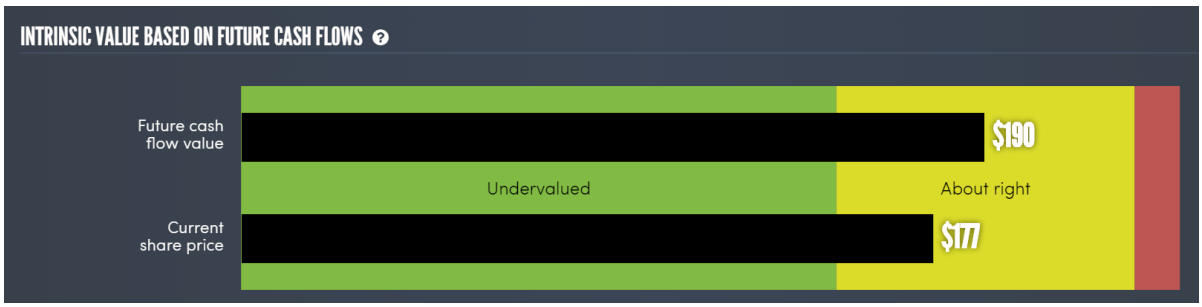
[1] Source: J. P. Morgan Healthcare Conference (https://investors.vrtx.com/static-files/7938e809-4185-42df-8efe-744ec4a08d3b).

place, then another comparable valuation will need to be carried out to determine the sell-point and whether the current exit strategy would remain the best one.

At what price will the stock become fair/overvalued?

Based on its current share price, which is undervalued based off its strong cash flow performance (see below and figure 7 in the appendix), the stock price will be fair even after it reaches $190. That said, once the new medication is approved, this will likely lead to a notable increase in the share price as this would increase future cash flow value.

Vertex Pharmaceutical Intrinsic Value Based on Future Cash Flows



Source: SimplyWallStreet (https://simplywall.st/stocks/us/pharmaceuticals-biotech/nasdaq-vrtx/vertex-pharmaceuticals)

Realistically, therefore, the sell strategy for this stock, in the long run, should be to sell once a realistic competitor emerges which would have medicines on par with Vertex's (Currently, top 3 cystic fibrosis medicines are all produced by Vertex).

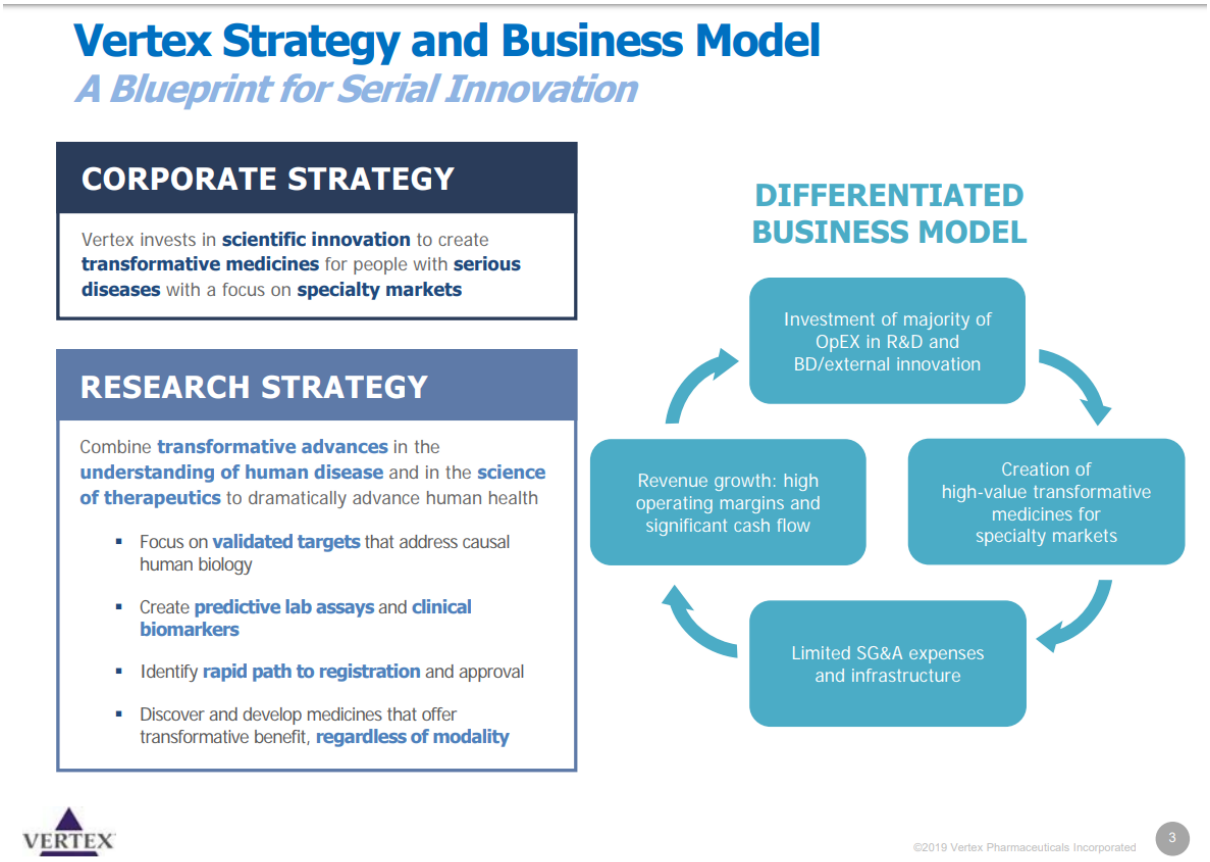
Company Profile

Operations

What does the company do?

Vertex Pharmaceuticals is a biopharmaceutical company based in Boston, Massachusetts which invests in scientific innovation to create transformative medicines for people with serious diseases. They specialise in the development and commercialisation of medication, drug treatments and (as of recently), gene-editing solutions to combat cystic fibrosis and other diseases.

What is it's business model?



Source: J. P. Morgan Healthcare Conference (https://investors.vrtx.com/static-files/7938e809-4185-42df-8efe-744ec4a08d3b).

Customers/Suppliers

Customers: The target-client market is the 75,000 currently experiencing Cystic Fibrosis diseases (see 'Direct Patient Market'). There are also a few intermediary customers who buy in bulk from Vertex, who account for over 10% of total gross revenues. These are shown below.

Significant Customers

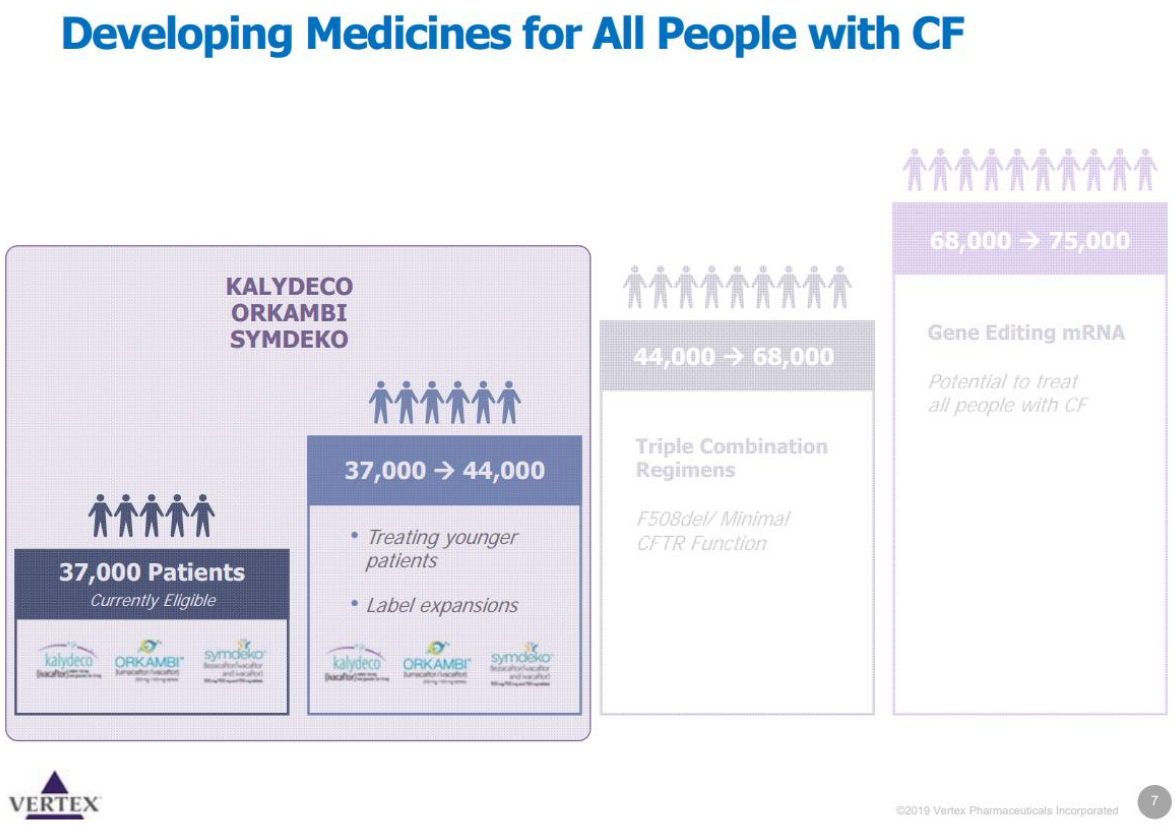
Gross revenues and accounts receivable from each of the Company's customers who individually accounted for 10% or more of total gross revenues and/or 10% or more of total gross accounts receivable consisted of the following:

	Percent of Total Gross Revenues			Percent of Gross Accounts Receivable	
	Year Ended December 31,			As of December 31,	
	2018 (as reported under ASC 606)	2017 (as reported under ASC 605)	2016 (as reported under ASC 605)	2018	2017
Walgreen Co.	20%	17%	19%	16%	20%
Accredo/Curascript	14%	14%	15%	10%	12%
McKesson Corporation	14%	<10%	<10%	16%	<10%
CVS/Caremark	n/a	<10%	19%	n/a	n/a

Suppliers: VRTX operates an expansive global supply chain which the following suppliers:

- Rigaku Corporation (Japan) - materials
- Fair Trade Schiffahrt, Handel + Logistik Gmbh (Germany) - materials
- Ecu Line Italia (Italy) - materials
- Vertex Pharmaceuticals Li (VRTX's Irish Subsidiary) - materials
- Vertex Pharmaceuticals UK (VRTX's UK Subsidiary) - materials
- Kinaxis (USA) - software solutions and digital supply chain management

Vertex's Direct Patient Market



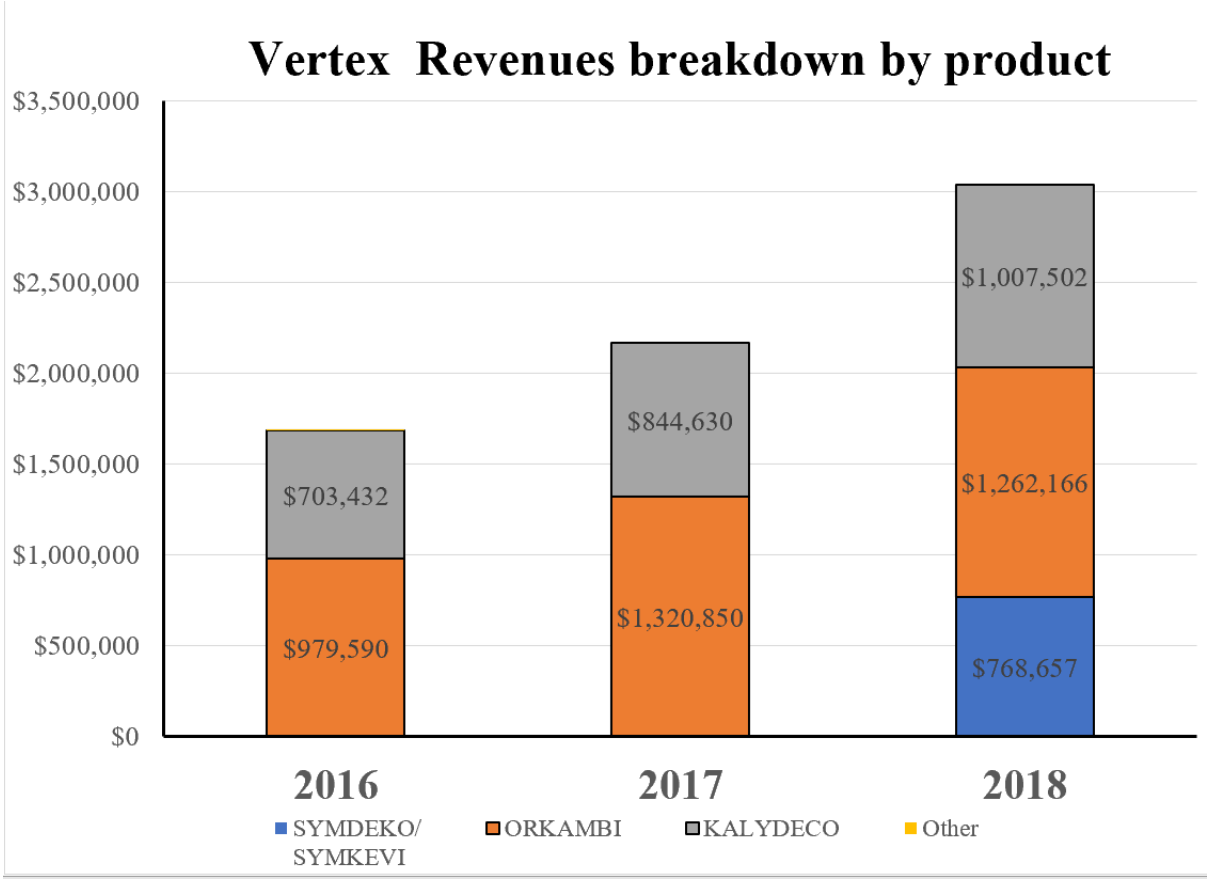
Source: J. P. Morgan Healthcare Conference (https://investors.vrtx.com/static-files/7938e809-4185-42df-8efe-744ec4a08d3b).

Revenues by product (2016-18)

	2018 (as reported under ASC 606)	2017 (as reported under ASC 605)	2016 (as reported under ASC 605)
		(in thousands)	
SYMDEKO/SYMKEVI	$ 768,657	$ —	$ —
ORKAMBI	1,262,166	1,320,850	979,590
KALYDECO	1,007,502	844,630	703,432
Other	—	—	610
Total product revenues, net	$ 3,038,325	$ 2,165,480	$ 1,683,632

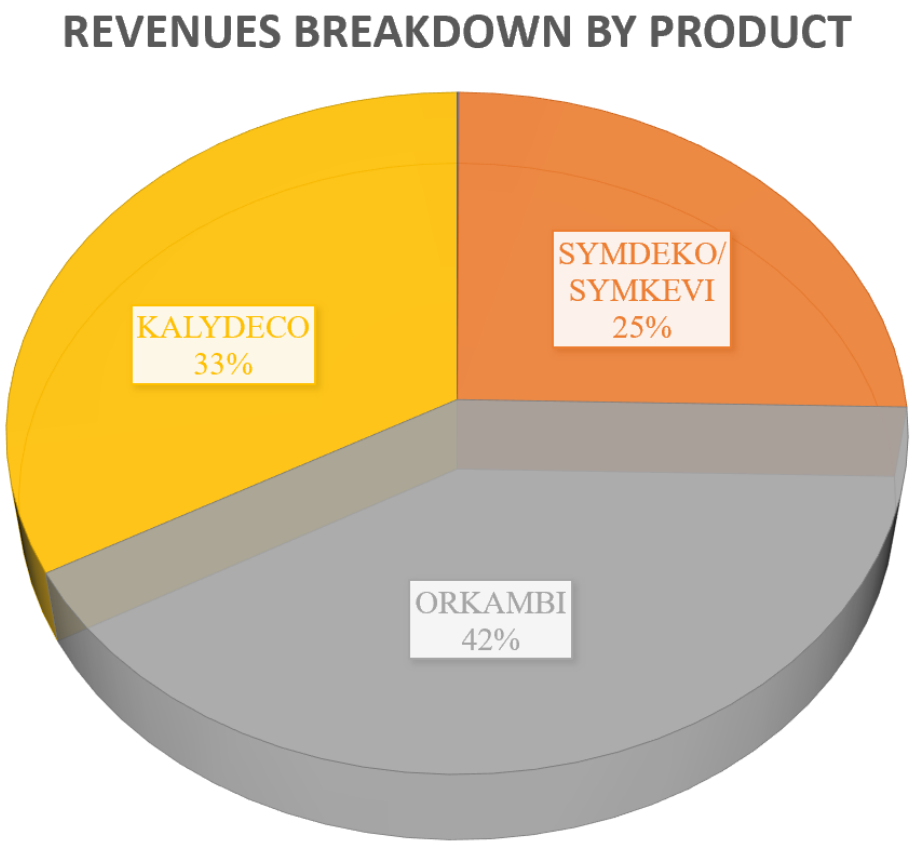
Source: 2018 VRTX Annual Report SEC Filing

Vertex Pharmaceuticals Revenues Breakdown by Product in Cystic Fibrosis Market 2016-18



Source: Author's Work

Vertex Pharmaceuticals Revenues Breakdown by Product in Cystic Fibrosis Market 2018



Source: Author's Work

Revenues by Geographic Location (2016-2018)

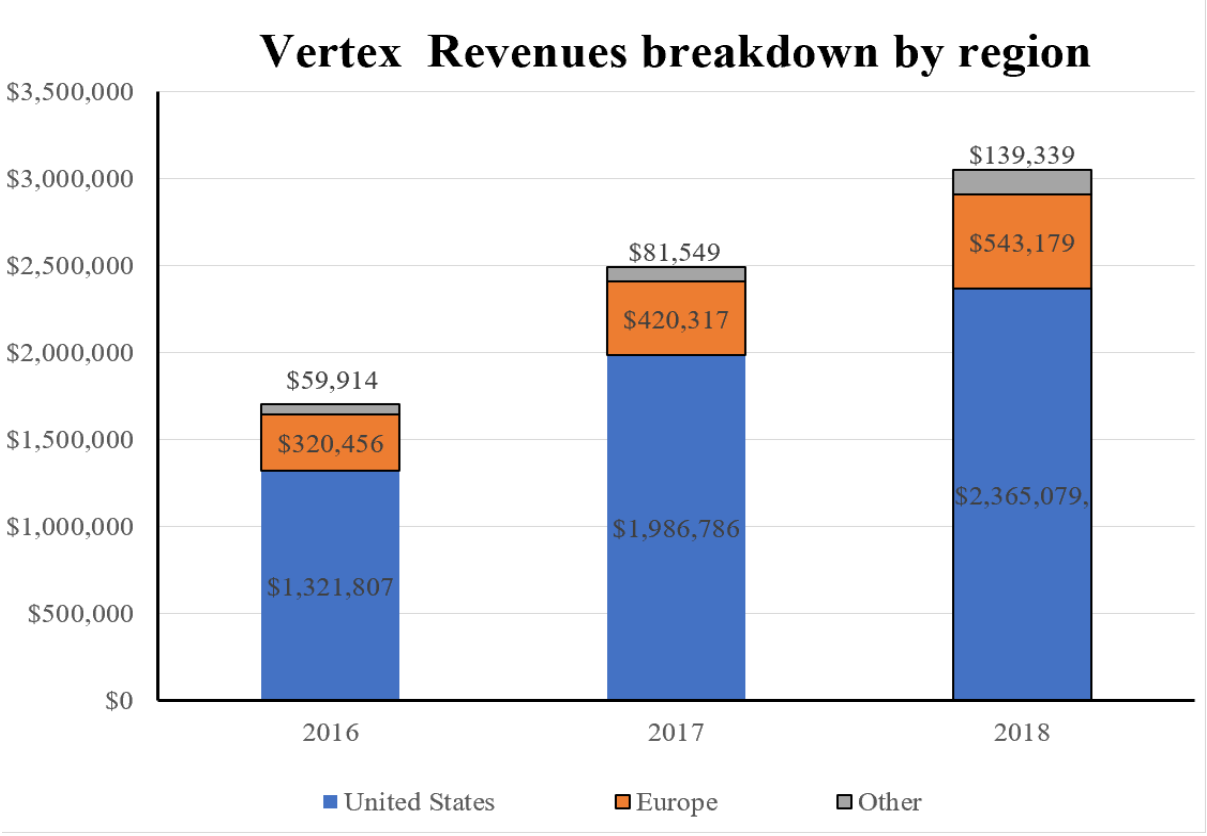
Net product revenues are attributed to countries based on the location of the customer. Collaborative and royalty revenues are attributed to countries based on the location of the Company's subsidiary associated with the collaborative arrangement related to such revenues. Total revenues from external customers and collaborators by geographic region consisted of the following:

	2018 (as reported under ASC 606)	2017 (as reported under ASC 605)	2016 (as reported under ASC 605)
		(in thousands)	
United States	$ 2,365,079	$ 1,986,786	$ 1,321,807
Outside of the United States			
Europe	543,179	420,317	320,456
Other	139,339	81,549	59,914
Total revenues outside of the United States	682,518	501,866	380,370
Total revenues	$ 3,047,597	$ 2,488,652	$ 1,702,177

In 2018, 2017 and 2016, revenues attributable to Germany and the United Kingdom contributed the largest amounts to the Company's European revenues.

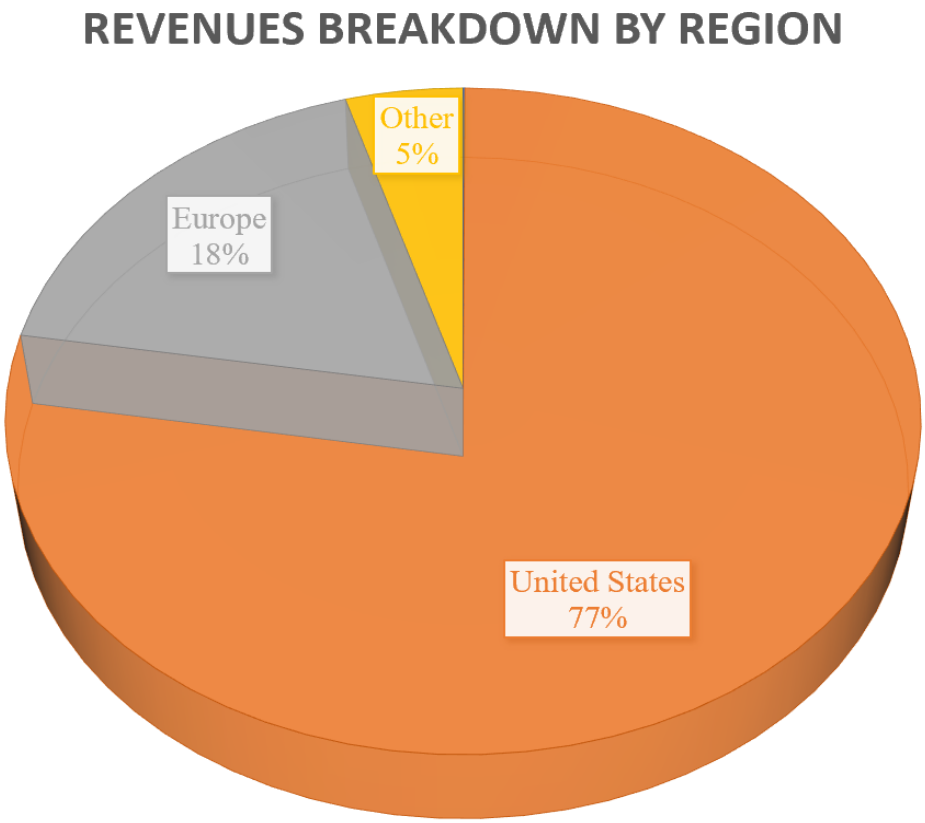
Source: 2018 VRTX Annual Report SEC Filing

Vertex Pharmaceuticals 2016-18 Revenues Breakdown



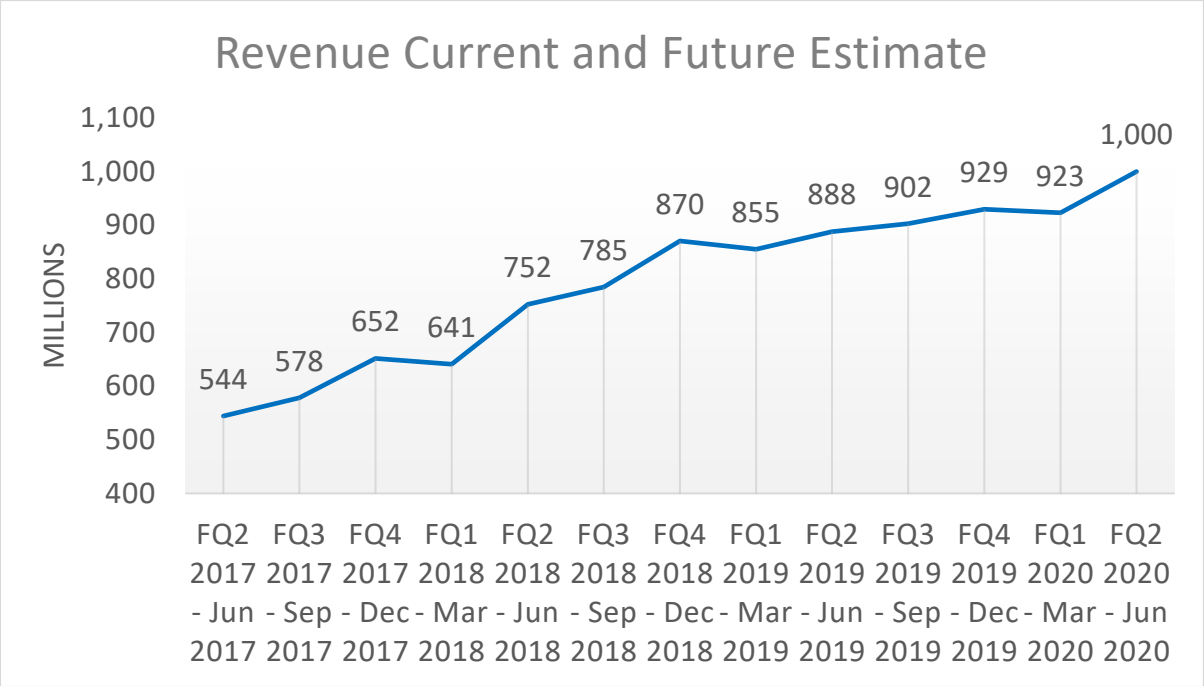
Source: Author's Work

Vertex's Revenues by Region



Source: Author's Work

Revenue Current and Future Estimate Summary



Source: Author's Work. Also, see figure 6 (Appendix)

Operating Costs and Expenses

Operating Costs and Expenses

	2018	2017	2016	2018/2017 Comparison Increase/(Decrease) $	2018/2017 Comparison Increase/(Decrease) %	2017/2016 Comparison Increase/(Decrease) $	2017/2016 Comparison Increase/(Decrease) %
	(in thousands)			(in thousands, except percentages)			
Cost of sales	$ 409,539	$ 275,119	$ 210,460	$ 134,420	49%	$ 64,659	31%
Research and development expenses	1,416,476	1,324,625	1,047,690	91,851	7%	276,935	26%
Sales, general and administrative expenses	557,616	496,079	432,829	61,537	12%	63,250	15%
Restructuring (income) expenses	(184)	14,246	1,262	(14,430)	**	12,984	**
Intangible asset impairment charges	29,000	255,340	—	(226,340)	**	255,340	**
Total costs and expenses	$ 2,412,447	$ 2,365,409	$ 1,692,241	$ 47,038	2%	$ 673,168	40%

** Not meaningful

Source: 2018 VRTX Annual Report SEC Filing

Research and Development Expenses

Research and Development Expenses

	2018	2017	2016	2018/2017 Comparison Increase/(Decrease) $	2018/2017 Comparison Increase/(Decrease) %	2017/2016 Comparison Increase/(Decrease) $	2017/2016 Comparison Increase/(Decrease) %
	(in thousands)			(in thousands, except percentages)			
Research expenses	$ 438,360	$ 311,206	$ 314,602	$ 127,154	41 %	$ (3,396)	(1)%
Development expenses	978,116	1,013,419	733,088	(35,303)	(3)%	280,331	38 %
Total research and development expenses	$ 1,416,476	$ 1,324,625	$ 1,047,690	$ 91,851	7 %	$ 276,935	26 %

Further breakdown of Research and Development Expenses 1

	2018	2017	2016	2018/2017 Comparison Increase/(Decrease) $	2018/2017 Comparison Increase/(Decrease) %	2017/2016 Comparison Increase/(Decrease) $	2017/2016 Comparison Increase/(Decrease) %
	(in thousands)			(in thousands, except percentages)			
Research Expenses:							
Salary and benefits	$ 87,773	$ 81,229	$ 80,845	$ 6,544	8 %	$ 384	<1%
Stock-based compensation expense	62,925	60,122	51,034	2,803	5 %	9,088	18 %
Laboratory supplies and other direct expenses	50,578	45,822	43,151	4,756	10 %	2,671	6 %
Outsourced services	38,777	39,497	33,682	(720)	(2)%	5,815	17 %
Collaboration and asset acquisition expenses	111,600	8,425	33,000	103,175	**	(24,575)	**
Infrastructure costs	86,707	76,111	72,890	10,596	14 %	3,221	4 %
Total research expenses	$ 438,360	$ 311,206	$ 314,602	$ 127,154	41 %	$ (3,396)	(1)%

** Not meaningful

Further breakdown of Research and Development Expenses 1

				2018/2017 Comparison		2017/2016 Comparison	
				Increase/(Decrease)		Increase/(Decrease)	
	2018	2017	2016	$	%	$	%
	(in thousands)			(in thousands, except percentages)			
Development Expenses:							
Salary and benefits	$ 220,128	$ 208,769	$ 177,399	$ 11,359	5 %	$ 31,370	18%
Stock-based compensation expense	140,187	121,778	102,417	18,409	15 %	19,361	19%
Laboratory supplies and other direct expenses	84,900	45,594	42,861	39,306	86 %	2,733	6%
Outsourced services	344,339	337,901	282,137	6,438	2 %	55,764	20%
Collaboration and asset acquisition expenses	250	160,250	—	(160,000)	**	160,250	**
Drug supply costs	42,099	13,660	12,510	28,439	208 %	1,150	9%
Infrastructure costs	146,213	125,467	115,764	20,746	17 %	9,703	8%
Total development expenses	$ 978,116	$ 1,013,419	$ 733,088	$ (35,303)	(3)%	$ 280,331	38%

** Not meaningful

Sales Expenses

				2018/2017 Comparison		2017/2016 Comparison	
				Increase/(Decrease)		Increase/(Decrease)	
	2018	2017	2016	$	%	$	%
	(in thousands)			(in thousands, except percentages)			
Sales, general and administrative expenses	$ 557,616	$ 496,079	$ 432,829	$ 61,537	12%	$ 63,250	15%

Sales, general and administrative expenses increased by 12% in 2018 as compared to 2017, and by 15% in 2017 as compared to 2016. These increases were primarily due to increased global support for VRTX products. Analysts expect VRTX sales, general and administrative expenses to continue to increase in 2019.

Restructuring Costs

In 2018, 2017 and 2016, VRTX recorded restructuring (income) expenses of $(0.2) million, $14.2 million and $1.3 million, respectively. Vertex's restructuring expenses in 2017 were primarily related to the decision to consolidate their research activities into VRTX's Boston, Milton Park and San Diego locations and to close their research site in Canada.

Interest Expenses

Vertex Pharmaceuticals' interest expense, net relates primarily to interest expenses associated with certain of their real estate leases and outstanding debt, if any, partially offset by interest income from the investment of cash equivalents and marketable securities. In 2018, 2017 and 2016, interest expense, net was $34.1 million, $57.6 million and $81.4 million, respectively. The decrease in interest expense, net in 2018 as compared to 2017 was primarily due to an increase in their interest income resulting from an increase in their cash equivalents and marketable securities. The decrease in interest expense, net in 2017 as compared to 2016 was primarily due to the repayment of the $300.0 million outstanding under VRTX's dedicated revolving credit facility in February 2017. In 2019, expectations suggest that they will incur approximately $52 million in interest expenses related to their real estate leases, including a decrease in 2019 as compared to 2018 of approximately $13 million based on updated accounting guidance related to aspects of lease accounting that became effective January 1, 2019. In addition to the updated accounting guidance, VRTX's future net interest expense will also be dependent on whether, and to what extent, they reborrow amounts under their dedicated credit facility and the amount of and prevailing market interest rates on their outstanding cash equivalents and marketable securities.

Debt and Financing

Predominantly Vertex Pharmaceuticals relies on its strong internal cash flow to fund innovation, growth and development with a debt-to-equity (total liabilities/equity) = 0.4 and a WACC of 18%.

As seen below, the company's medication is licenced, and, thus, the company does business, in the United States and within the EU.

Product/Drug Candidate	Status of United States Patent (Projected Expiration)	Status of European Union Patent (Projected Expiration)
KALYDECO	Granted (2027)	Granted (2025) [1]
ORKAMBI	Granted (2030)	Granted (2026) [2]
SYMDEKO/SYMKEVI	Granted (2027)	Granted (2028) [3]
VX-659/tezacaftor/ivacaftor	Pending (2037)	Pending (2037)
VX-445/tezacaftor/ivacaftor	Pending (2037)	Pending (2037)

[1] Certain European countries have granted supplementary protection certificates for KALYDECO, which expire in 2027.
[2] Certain European countries have granted supplementary protection certificates for ORKAMBI, which expire in 2030.
[3] We intend to apply in certain European countries for supplementary protection certificates for SYMKEVI, which we expect to expire in 2033.

Source: VRTX Annual Performance Report 2018 filed with SEC (https://investors.vrtx.com/node/25896/html#sB8870785B3A355DABF6D310BE3FFD33E)

Strategic Analysis

Cystic Fibrosis Treatment Market

The global market for cystic fibrosis is dominated by Vertex Pharmaceuticals Incorporated. With two FDA approved CFTR modulator drugs Kalydeco & Orkambi, Vertex Pharmaceuticals secured a top spot with the market share of 46% in the global cystic fibrosis market. Kalydeco and Orkambi are the drugs that affect the disease at a genetic level whereas all the other drugs from different companies deal with the disease symptoms and associated problems. Currently, there is no competition for the Kalydeco and Orkambi. Moreover, Vertex is on the verge of developing their next and better drug "triple combo" which is expected to cover 90% of the total identified CFTR mutations. This development is the strong reason for Vertex pharmaceutical to be on top of the table in the near future as well.

Market Growth

While the Cystic Fibrosis Market is largely segmented into Oral and non-oral medication, one-time or regular medications and other factors, aggregate data is not always available.

According to Cystic Fibrosis Foundation, a dedicated patient registry in the US, 1000 new cystic fibrosis cases are diagnosed each year in the USA.

While no aggregate data exists on the increasing number of cases year-to-year, market research shows that more than 35,500 people were suffering from cystic fibrosis in 2014 and this has risen significantly since then.
Source: Marketwatch (https://www.marketwatch.com/press-release/cystic-fibrosis-market-the-biggest-trends-to-watch-out-for-2018-2023-2018-11-30)

The global CF therapeutics market size was estimated at USD 3,560.5 million in 2016 and is expected to grow at a CAGR of 16.7% from 2017 to 2025, reaching USD 13.9 bn by 2025.
Source: Grandview (https://www.grandviewresearch.com/press-release/global-cystic-fibrosis-cf-therapeutics-market)

Industry Concentration and Trend

The global cystic fibrosis therapeutics market is moderately concentrated. Though there are few leading vendors, new vendors look at capturing the market share. With many new players entering the market the competition is expected to intensify with players investing heavily in R&D activities. As a result, the key players are increasing their number of partnerships and acquisitions to integrate various technologies and increase their foothold in the market.

The wider trend, therefore, shows that Cystic Fibrosis vendors are currently making acquisition strategies to increase their presence in the global market, expand their product portfolios, and achieve economies of scale in production.

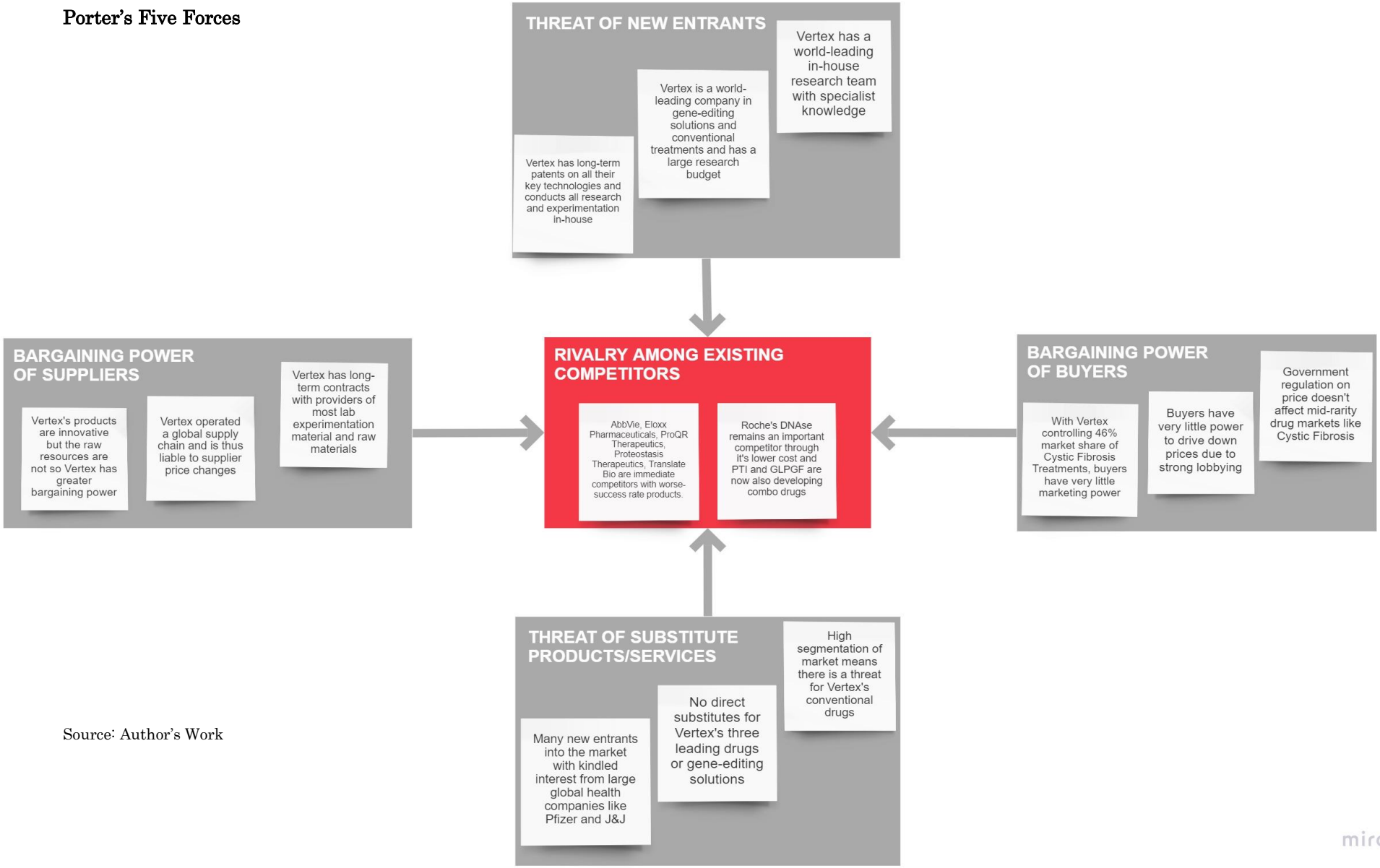
Competition Analysis

Competition in the biopharmaceutical industry is a whole and in Cystic Fibrosis especially, is based on, among other factors, innovative research, the effective and rapid development of drug candidates, the ability to market and obtain reimbursement for products and the ability to establish effective patent protection. Vertex Pharmaceuticals face competition based on the safety and efficacy of their product and drug candidates, the timing and scope of regulatory approvals, the availability and cost of supply, marketing and sales capabilities, reimbursement coverage, price, patent protection and other factors. Vertex's competitors may develop or commercialize more effective, safer or more affordable products than Vertex are able to develop or commercialize or

obtain more effective patent protection. As a result, competitors may commercialize products more rapidly or effectively than Vertex, which would adversely affect Vertex's competitive position, the likelihood that Vertex drug candidates, if approved, would achieve and maintain market acceptance and Vertex's future ability to generate meaningful revenues from their products. Future competitive products may render Vertex's products, or future products, obsolete or non-competitive.

Several companies are seeking to identify and develop drug candidates for the treatment of CF, including public companies such as AbbVie, Eloxx Pharmaceuticals, ProQR Therapeutics, Proteostasis Therapeutics, and Translate Bio, and several private companies. Although Vertex is the first company to successfully develop medicines that treat the underlying cause of CF, current VRTX products are collectively approved to treat only a portion of patients with CF and future treatment regimens, including Vertex's triple combination regimens, if approved, could deliver enhanced benefits to patients who are currently being treated with Vertex's medicines. Vertex's competitors have research and development programs directed at identifying and developing CFTR potentiators, CFTR correctors and drug candidates with other mechanisms of action or that utilize new therapeutic approaches that seek to address the underlying cause of CF. Vertex's competitors are exploring the development of drug candidates primarily as part of combination regimens of small molecules, and some competitors are exploring the development of new therapeutic approaches, including nucleic acid-based therapies, which could provide a one-time treatment option for patients with CF. Vertex's comparative success in rapidly developing and commercializing their products may increase the resources that competitors allocate to the development of these potential treatments for CF. If one or more competing therapies are successfully developed as a treatment for patients with CF, Vertex's revenues from their current products and/or additional CF products, if then approved, could face significant competitive pressure.

Porter's Five Forces



Source: Author's Work

Competitive Advantage

Vertex introduced the 3 market-leading drugs (Symdeko, Kalydeco and Orkambi) - the only drugs dealing with the disease at a genetic level, having the best medical success results in covering 50% of 1900 identified Cystic Fibrosis Mutations (CF). In mid-2019, Vertex is also applying for approval for its triple drug cocktail. If these announced plans are realised, after revenue streams are increased, once the anticipated increase in stock price increases, then another comparable valuation will need to be carried out to determine the sell-point and whether the current exit strategy would remain the best one.

As a major provider of medication in a niche market, Vertex's world-leading research team has allowed it to capitalise on the market's growth, as reflected in its increasing earnings and revenue 2016-2019. In the biopharmaceutical market, where the largest customers of pharmaceutical companies are medical insurance providers and their intermediary suppliers, the efficiency of Vertex medication, has been directly linked with a 59% decrease in Mortality, 71% decrease in transplantation, 33% decrease in hospitalisation and 28% decrease in pulmonary exacerbation[2].

Why would it fit the Investment Fund's Portfolio?

This stock will fit in excellently into the Alternatives' portfolio due to its very high growth prospects for the next 3-5 years. Financial performance in biopharmaceuticals is closely correlated with regulatory approval. With regulatory approval expected in late 2019 and revolutionary gene-editing solutions at the mid-pipeline level, Vertex's patient market is expected to expand by 111% by 2021 and may more than double if the gene-editing treatments prove successful, with positive connotations for stock prices.

VRTX stock will add more diversification into the nuanced biopharmaceutical sector – an area that is largely being overlooked despite the strong performance of Cystic Fibrosis Treatment market with CAGR estimates of 13-17% for the next 8 years. Diversification gains will come through VRTX's innovative gene-editing solutions.

Further considering how the US economy is slowing (shown below), a future recession or global financial crisis is likely, and it is thus even more important to increase the portfolio's holdings of 'recession-safe' stocks such pharmaceutical stocks.

[2] Source: J. P. Morgan Healthcare Conference (https://investors.vrtx.com/static-files/7938e809-4185-42df-8efe-744ec4a08d3b).

USA GDP Growth

Source: Statista (https://www.statista.com/statistics/263614/gross-domestic-product-gdp-growth-rate-in-the-united-states/)

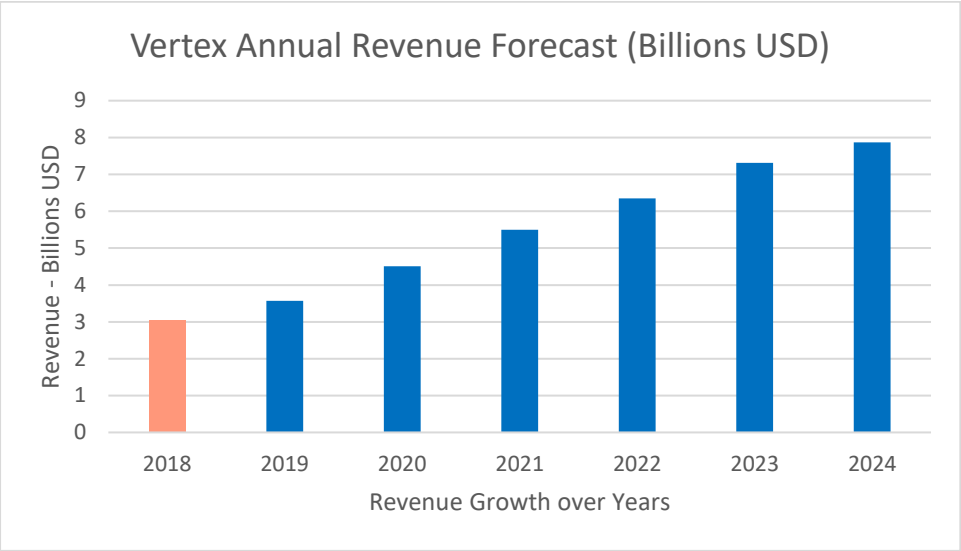
World Economic Outlook

Source: IMF (https://www.imf.org/en/Publications/WEO/Issues/2019/01/11/weo-update-january-2019)

USA GDP has moderate growth predictions in the coming years, even as Emerging Markets and Developing Economies have 4.5-4.9% growth (2018-2020). New target markets may open in these developing economies, vastly increasing revenue gain potential

Valuation Overview

Vertex Pharmaceuticals Revenue Forecasts



Source: Author's Work.

As shown above, Vertex's annual Revenue Forecast suggests a significant increase in revenue from 2018-2024, in line with increased regulatory approval and rising sales, as suggested in the Investment Thesis. Furthermore, past revenue results show a positive surprise across the last 8 measurements, which further supports the notion of efficient governance by Vertex's Management.

Key Financial Predictions

	Last 4Q	Next 4Q	FY 19	FY 20	FY 21
P/E	64.19	43.86	43.16	29.05	20.65
P/S	15.8	13.55	13.56	10.72	8.8
P/B	10.89		8.46	6.56	4.91
P/CF	37.9		43.61	29.73	20.44
EV/Revenue	14.93	12.74	12.75	10.08	8.27
EV/EBITDA	64.29	26.13	30.54	20.38	14.65
EV/EBIT	71.62	32.22	32.46	21.33	14.05
EV/OPP	71.62	36.36	35.66	21.88	15.43

Source: Author's Work

Key Financial Predictions from the valuation have all indicators suggesting a good forward-looking dynamic for the next 3 years, reinforcing the buy recommendation. Furthermore, as seen from P/E predictions, with a PEG Ratio (5-year expectation) of 0.81, price earnings normalisation is expected as the firm continues to strongly grow meeting the partially speculatively uplifted stock price (see figure 1). These coupled with the strong revenue growth prospects further support how Vertex has good growth prospects.

Moreover, a falling debt to asset score (see appendix) suggests that Vertex's consistent growth has largely been driven by its internal cash flow, rather than by taking on debt, supporting the investment thesis

Terminal Value = $74,984.69 (see appendix for full calculation).

Present Value of terminal Value = $27,675.99 (see appendix for full calculation).

High WACC of 18% (see appendix) suggests the cash flow's impact is dissipated. Future years, therefore, have a smaller influence on the company's value, suggesting profit volatility will not be as significant.

Risk Analysis

Credit/Finance risk

Vertex Pharmaceuticals invest their cash in a variety of financial instruments, principally securities issued by the U.S. government and its agencies, investment-grade corporate bonds and commercial paper, and money market funds. These investments are denominated in U.S. Dollars. All their interest-bearing securities are subject to interest rate risk and could decline in value if interest rates fluctuate. Substantially all their investment portfolio consists of marketable securities with active secondary or resale markets to help ensure portfolio liquidity, and they have implemented guidelines limiting the term-to-maturity of Vertex's investment instruments.

Due to the conservative nature of these instruments, material exposure to interest rate risk is almost non-existent, and as such, if interest rates were to increase or decrease by 1%, the fair value of VRTX's investment portfolio would increase or decrease by an immaterial amount

In 2016, VRTX entered into a credit agreement. Loans under the credit agreement bear interest, at their option, at either a base rate or a Eurodollar rate, in each case plus an applicable margin. The applicable margin on base rate loans ranges from 0.75% to 1.50% and the applicable margin on Eurodollar loans ranges from 1.75% to 2.50%, in each case, based on VRTX's consolidated leverage ratio (as defined in the credit agreement).

Changes in interest rates related to their credit agreement are likewise unlikely to have a material effect on VRTX's financial statements. As of December 31, 2018, Vertex had no principal or interest outstanding.

Long-Term Future Debt Risk

Despite the trend towards funding it's research predominantly through strong internal cash flow, Vertex may need to raise additional capital in the future through debt. Any potential public offering, private placement or debt financing may or may not be like the transactions that Vertex entered in the past. Any debt financing may be on terms that, among other things, include conversion features that could result in dilution to their then-existing security holders and restrict Vertex's ability to pay interest and dividends—although Vertex does not currently pay, nor intends to pay dividends for the foreseeable future. Additionally, Vertex's pledge of specified assets as collateral to secure their obligations under their dedicated credit agreement may limit Vertex's ability to obtain additional debt financing. Any equity financings would result in dilution to their then-existing security holders. If adequate funds are not available on acceptable terms, or at all, Vertex may be required to curtail significantly or discontinue one or more of their research, drug discovery or development programs, including clinical trials, incur significant cash exit costs, or attempt to obtain funds through arrangements with collaborators or others that may require them to relinquish rights to certain of Vertex's technologies, drugs or drug candidates. Based on these many factors, as well as wider economic conditions, additional financing may not be available on acceptable terms, if at all.

Market Risk

The stock is volatile (see figure 5 in the appendix) with a beta of 1.16 (as per Yahoo analysis), characteristic of the high volatility of biopharmaceutical sector companies. According to aggregate data, the company is not rated as overvalued at its current price ($180.52 – as of 12/03/2019), however on a P/E basis, on P/E basis Vertex is on par with its competitors.

With a high average volume of 1.37M (on a 10-day basis), i.e. $ 247.31m, Vertex's stock is quite liquid and is traded at a reasonable volume. Liquidity, therefore, should not be the issue.

VRTX's market cap is medium at $46.1bn, which, along with other factors make it a desirable acquisition target. If hypothetical plans put forward by J&J or Pfizer go ahead, this could see stock price increase significantly.

Regulatory-Operational Risk

Vertex's products are subject to continuing regulatory oversight, including the review of additional safety information. Drugs are more widely used by patients once approval has been obtained and therefore side effects and other problems may be observed after approval that were not seen or anticipated, or were not as prevalent or severe, during pre-approval clinical trials or nonclinical studies. The subsequent discovery of previously unknown problems with a product could negatively affect commercial sales of the product, result in restrictions on the product or lead to the withdrawal of the product from the market. Each of Vertex's commercial products and Vertex's triple combination treatment regimens contain ivacaftor or VX-561, a deuterated version of ivacaftor. As a result, if any of Vertex's products or drug candidates were to experience safety issues, Vertex's other commercial products as well as one or more of Vertex's drug candidates, may be adversely affected. The reporting of adverse safety events involving Vertex's products or public speculation about such events could cause their stock price to decline or experience periods of volatility.

In addition, Vertex and their third-party manufacturers must comply with cGMP and other applicable regulations governing the manufacturing and distribution of Vertex's products. Regulatory authorities periodically inspect Vertex's drug manufacturing facilities, and those of Vertex's third-party manufacturers, to evaluate compliance with cGMP requirements.

If Vertex or Vertex's collaborators, or third-parties acting on Vertex's behalf, fail to comply with applicable continuing regulatory requirements, Vertex or Vertex's collaborators may be subject to fines, suspension or withdrawal of regulatory approvals for specific products, product recalls and seizures, operating restrictions and/or criminal prosecutions, any of which could have a material adverse effect on Vertex's business, reputation, financial condition and results of operations.

Manufacturing/Production-Operational Risk

Vertex Pharmaceuticals rely on a worldwide network of third-party manufacturers to manufacture Vertex's drugs for commercial use and Vertex's drug candidates for clinical trials. As a result of Vertex's reliance on these third-party manufacturers and suppliers, Vertex could be subject to significant supply disruptions outside of Vertex's control. Vertex's supply chain for sourcing raw materials and manufacturing drug product ready for distribution is a multi-step international endeavour. Third-party contract manufacturers, including some in China, perform different parts of Vertex's manufacturing process. Contract manufacturers may supply Vertex with raw materials, convert these raw materials into drug substance and/or convert the drug substance into the final dosage form. Establishing and managing this global supply chain requires a significant financial commitment and the creation and maintenance of numerous third-party contractual relationships.

Although Vertex attempt to manage the business relationships with companies in Vertex's supply chain, Vertex does not have control over their operations. Supply disruptions may result from several factors, including shortages in product raw materials, labour or technical difficulties, regulatory inspections or restrictions, shipping or customs delays or any other performance failure by any third-party manufacturer on which Vertex rely. Any supply disruptions could disrupt sales of Vertex's products and/or the timing of Vertex's clinical trials.

Vertex Pharmaceuticals require a supply for Vertex's medicines for commercial sale and supply of Vertex's drug candidates for use in Vertex's clinical trials. While Vertex has developed some internal capabilities, most of the manufacturing steps needed to produce Vertex's drug candidates and drug products are performed through a third-party manufacturing network. To ensure the stability of Vertex's supply chains Vertex aim to develop additional sources of manufacture for all steps of Vertex's manufacturing processes at the time of, or shortly after, marketing approval. Therefore, at any point in time, Vertex may have a limited number of single source manufacturers for certain steps in Vertex's manufacturing processes, particularly for recently launched products.

If Vertex or Vertex's third-party manufacturers become unable or unwilling to continue manufacturing product on Vertex's behalf and Vertex are not able to promptly identify another manufacturer, Vertex could experience a disruption in the commercial supply of Vertex's then-marketed medicines, which would have a significant effect on patients, Vertex's business and Vertex's product revenues. Similarly, a disruption in the clinical supply of drug products could delay the completion of clinical trials and affect timelines for regulatory filings. There can be no assurance that Vertex will be able to establish and maintain secondary manufacturers for all of Vertex's drug candidates and drug products on a timely basis or at all.

As such, Vertex's dependence on third-party manufacturers to manufacture their products for the materials required for clinical trials means that disruption of these relationships could result in supply disruptions within VRTX's wider supply chain.

Competitor-driven Future Revenue Risk

Several companies are seeking to identify and develop drug candidates for the treatment of CF, including public companies such as AbbVie, Eloxx Pharmaceuticals, ProQR Therapeutics, Proteostasis Therapeutics, and Translate Bio, and several private companies. Although Vertex is the first company to successfully develop medicines that treat the underlying cause of CF, current VRTX products are collectively approved to treat only a portion of patients with CF and future treatment regimens, including Vertex' triple combination regimens, if approved, could deliver enhanced benefits to patients who are currently being treated with Vertex's medicines. Vertex's competitors have research and development programs directed at identifying and developing CFTR potentiators, CFTR correctors and drug candidates with other mechanisms of action or that utilize new therapeutic approaches that seek to address the underlying cause of CF. Vertex's competitors are exploring the development of drug candidates primarily as part of combination regimens of small molecules, and some competitors are exploring the development of new therapeutic approaches, including nucleic acid-based therapies, which could provide a one-time treatment option for patients with CF. Vertex's comparative success in rapidly developing and commercializing their products may increase the resources that competitors allocate to the development of these potential treatments for CF. If one or more competing therapies are successfully developed as a treatment for patients with CF, Vertex's revenues from their current products and/or additional CF products, if then approved, could face significant competitive pressure.

In addition, Vertex's business faces competition from major pharmaceutical companies, such as Abbvie, Bristol-Myers Squibb, Gilead, Johnson & Johnson, Merck, Novartis, Pfizer, Sanofi and Roche, which possess substantially greater financial resources than VRTX possess, and numerous smaller public and private companies, academic institutions, government agencies, public and private research organizations and charitable venture philanthropy organizations that conduct research, seek patent protection and/or establish collaborative arrangements for research, development, manufacturing and commercialization. As an example of how competition has affected Vertex's business in the past, in 2013 and 2014 VRTX experienced a rapid decline in the number of patients being treated with INCIVEK, a product previously marketed for the treatment of hepatitis C virus infection, as a result of competition from a treatment regimen identified by a small biotechnology company and developed and commercialized by Gilead.

Vertex's products and any drugs that they develop in the future may not be able to compete effectively with marketed drugs or new drugs that may be developed by competitors. The risk of competition is particularly important to Vertex company because substantially all their revenues, as well as their most advanced drug candidates, are related to the treatment of patients with CF. There are many other companies developing drugs for the same indications that Vertex is pursuing. In order to compete successfully in these areas, Vertex must continue to demonstrate improved safety, efficacy and/or tolerability, ease of manufacturing, and gain and maintain market acceptance over competing drugs. Otherwise, Vertex may lose market share.

Liquidity/Cash Flow Risk

The company has enough working capital to do its business. Future cash flow for Vertex Pharmaceuticals is substantially dependent on their Cystic Fibrosis Product Sales. With this forecast to rise considering the sector's 13.5% compound annual growth rate[3], this is likely to increase soon.

Vertex intends to rely on their existing cash, cash equivalents and marketable securities together with cash flows from product sales as their primary source of liquidity. They are receiving cash flows from sales of KALYDECO and ORKAMBI in the United States and ex-U.S. markets and from SYMDEKO in the United States. VRTX will begin receiving cash flows from sales of SYMKEVI in the European Union in 2019. Future net product revenues from ex-U.S. markets will be dependent on, among other things, the timing of and their ability to complete reimbursement discussions in European countries. Vertex may borrow up to $500.0 million pursuant to a revolving credit facility that they entered into in 2016. They may repay and reborrow amounts under the revolving credit agreement without penalty. Subject to certain conditions, they may even request that the borrowing capacity under this credit agreement be increased by an additional $300.0 million if necessary for future expansion.

Currency Risk

As a result of VRTX's foreign operations, Vertex face exposure to movements in foreign currency exchange rates, primarily the Euro and British Pound against the U.S. Dollar. The current exposures arise primarily from cash, accounts receivable, intercompany receivables and payables, payables and accruals and inventories. Both positive and negative effects to VRTX's net revenues from international product sales from movements in exchange rates are partially mitigated by the

[3] Source: Marketwatch https://www.marketwatch.com/press-release/cystic-fibrosis-market-the-biggest-trends-to-watch-out-for-2018-2023-2018-11-30

natural, opposite effect that exchange rates have on VRTX's international operating costs and expenses.

Vertex Pharmaceuticals operates a foreign currency management program with the objective of reducing the effect of exchange rate fluctuations on VRTX's operating results and forecasted revenues and expenses denominated in foreign currencies. Vertex currently has cash flow hedges for the Euro, British Pound, Canadian Dollar and Australian Dollar related to a portion of VRTX's forecasted product revenues that qualify for hedge accounting treatment under U.S. GAAP. Vertex does not seek hedge accounting treatment for VRTX's foreign currency forward contracts related to monetary assets and liabilities that impact VRTX's operating results. As of December 31, 2018, Vertex held foreign exchange forward contracts that were designated as cash flow hedges with notional amounts totalling $505.2 million and had a net fair value of $20.1 million recorded on VRTX's consolidated balance sheet.

Although not predictive in nature, Vertex's internal analysis suggests a hypothetical 10% threshold reflects a reasonably possible near-term change in exchange rates. If the December 31, 2018 exchange rates were to change by a hypothetical 10%, the fair value recorded on VRTX's consolidated balance sheet related to VRTX's foreign exchange forward contracts that were designated as cash flow hedges as of December 31, 2018 would change by approximately $50.5 million.

However, since these contracts hedge a specific portion of VRTX's forecasted product revenues denominated in certain foreign currencies, any change in the fair value of these contracts is recorded in "Accumulated other comprehensive income (loss)" on VRTX's consolidated balance sheet and is reclassified to earnings in the same periods during which the underlying product revenues affect earnings. Therefore, any change in the fair value of these contracts that would result from a hypothetical 10% change in exchange rates would be entirely offset by the change in value associated with the underlying hedged product revenues resulting in no impact on VRTX's future anticipated earnings and cash flows with respect to the hedged portion of VRTX's forecasted product revenues.

Geopolitical risk:

Referring to the revenues regional breakdown (see company profile), 77% of Revenues are domestic to the US with 18% in the EU and 5% from elsewhere. Vertex's revenues are therefore unlikely to directly suffer from the worsening US-China Trade War relationship. Nevertheless, if the Trump Administration moves forward with a trading war with the EU, this could have a significant influence on the 18% VRTX revenues in Europe.

VRTX's British and Irish holdings are likewise likely to undergo supply chain changes considering Brexit negotiations.

The company's supply chain is also partially at risk of disruption through certain suppliers such as Rigaku Corporation (Japan) who may be affected by the escalation of Geopolitical conflict in the Pacific.

Given recent global economic pressures and geopolitical uncertainty, government authorities, particularly in Europe, are increasingly attempting to limit or regulate the price of drug products. This may have an adverse effect on the success of Vertex's SYMDEKO drug sales in Europe.

Furthermore, Vertex Pharmaceuticals and their competitors are likewise exposed to risks from unexpected election results in the US 2020 election, where certain candidates have expressed a desire for greater regulatory scrutiny of the wider Pharmaceutical sector.

Governmental risk:

Vertex's sales of products depend in part upon the availability of reimbursement from third-party payors. Third-party payors include government health programs such as Medicare and Medicaid in the United States and the national health care systems in many international markets, managed care providers, private health insurers and other organizations. The trend in the health care industry is cost containment and efforts of third-party payors to contain or reduce health care costs may adversely affect Vertex's ability to establish or maintain appropriate prices for Vertex's products or any drugs that Vertex may develop and commercialize. In most ex-U.S. markets, the pricing and reimbursement of therapeutic and other pharmaceutical products is subject to governmental control and such government authorities are increasingly attempting to limit or regulate the price of drug products. In the United States, there have been, and Vertex expect that there will continue to be, several federal and state proposals to implement governmental controls that are similar to those that currently exist in Europe. For example, the ACA required manufacturers of Medicare Part D brand name drugs to provide discounts on those drugs to Medicare Part D beneficiaries during the coverage gap; increased the rebates paid by pharmaceutical companies to state Medicaid programs on drugs covered by Medicaid; and imposed an annual fee, which increases annually, on sales by branded pharmaceutical manufacturers.

Third-party payors throughout the world also have been attempting to control drug spending through various other actions. In reimbursement negotiations, many payers are demanding price discounts and limiting both the types and variety of drugs that they will cover if they are not able to secure them. As part of these negotiations, international government payers also are requiring companies to establish product "cost-effectiveness" as a condition of reimbursement. These cost-effectiveness reviews frequently are subjective, may not account for many of the benefits provided by innovative medicines, and have led to conclusions that certain medicines, including Vertex's products in certain jurisdictions, are not worth their price. As a result, certain countries have declined to reimburse some of Vertex's products. Although not mandated in the United States, various organizations have started advocating for cost-effectiveness analyses in the United States as well. Notably, if U.S. payors were to adopt such assessments and make corresponding (negative) coverage determinations, Vertex could expect to see a decrease in Vertex's future net product revenues, which could harm Vertex's business.

There is also an increase in laws, regulations, and activity related to drug pricing and drug pricing transparency. In the United States, various states, including Nevada, Maryland, Louisiana, New York, California, and Oregon, have passed legislation requiring companies to disclose significant amounts of information, including information relating to drug prices, drug price increases, and spending on research, development, and marketing. Although it is not clear what states ultimately will do with the information collected, some laws were designed to obtain additional product discounts, and Vertex likely will continue to see more state action, which could require further disclosures or other actions.

Complying with these laws requires significant personnel and operational resources and deters focus on Vertex's business. Additionally, any additional required discounts would adversely affect the pricing of, and revenues from, Vertex's products. Finally, while Vertex seeks to comply with

all statutory and regulatory requirements, Vertex face increased enforcement activity by the U.S. federal government, state governments, and private payors against pharmaceutical and biotechnology companies for pricing and reimbursement-related issues.

In addition, in the United States and some foreign jurisdictions, there have been a number of legislative and regulatory proposals and initiatives to change the health care system in ways that could affect Vertex's ability to sell products. For example, in the United States, there have been ongoing federal legislative and administrative efforts as well as legal challenges seeking to repeal, substantially modify or invalidate some or all the provisions of the ACA. Tax legislation enacted at the end of 2017 eliminated the tax penalty for individuals who do not maintain sufficient health insurance coverage beginning in 2019. The Bipartisan Budget Act of 2018 contained various provisions that affect coverage and reimbursement of drugs, including an increase in the discount that manufacturers of Medicare Part D brand name drugs must provide to Medicare Part D beneficiaries during the coverage gap from 50% to 70% starting in 2019. As a result, there is uncertainty regarding future changes in the laws and regulations applicable to the health care system and the effect any such changes may have on Vertex's business. Some of these proposed and implemented reforms have resulted, or could result, in reduced reimbursement rates and/or more limited access for Vertex's current or future products, which would adversely affect Vertex's business, operations and financial results.

The increasing availability and use of innovative speciality pharmaceuticals, combined with their relatively higher cost as compared to other types of pharmaceutical products, is beginning to generate significant third-party payor interest in developing cost-containment strategies targeted to this sector. Government regulations in both U.S. and ex-U.S. markets.

Regulatory Risk:

Vertex Pharmaceuticals are subject to health care fraud and abuse laws, such as the federal False Claims Act and the anti-kickback provisions of the federal Social Security Act, laws prohibiting off-label product promotion and other similar laws and regulations both in the United States and in non-U.S. markets. While Vertex has a corporate compliance program designed to "actively identify, prevent and mitigate risk through the implementation of compliance policies and systems and the promotion of a culture of compliance", if they are found not to be in full compliance with these laws and regulations, Vertex's business could be materially harmed.

The sales and marketing practices of the CF industry have been the subject of increased scrutiny from governmental entities in the United States and other countries in which Vertex market their products, and this trend will likely continue. The risk of Vertex being found in violation of these laws is increased by the fact that many of these laws have not been fully interpreted by the regulatory authorities or the courts, and their provisions are subject to a variety of interpretations.

If past or present operations are found to be in violation of any such laws or any other governmental regulations that may apply to Vertex, Vertex may be subject to penalties, including civil and criminal penalties, damages, fines, exclusion from federal health care programs and/or the curtailment or restructuring of Vertex's operations. Any action against Vertex for violation of these laws, even if Vertex successfully defends against them, also could cause Vertex to incur significant legal expenses and divert the management's attention from the main operations of their business. There is also enhanced scrutiny of company-sponsored patient assistance programs, including insurance premium and co-pay assistance programs and donations to third-party charities that provide such assistance. If Vertex or their vendors or donation recipients are deemed to fail to

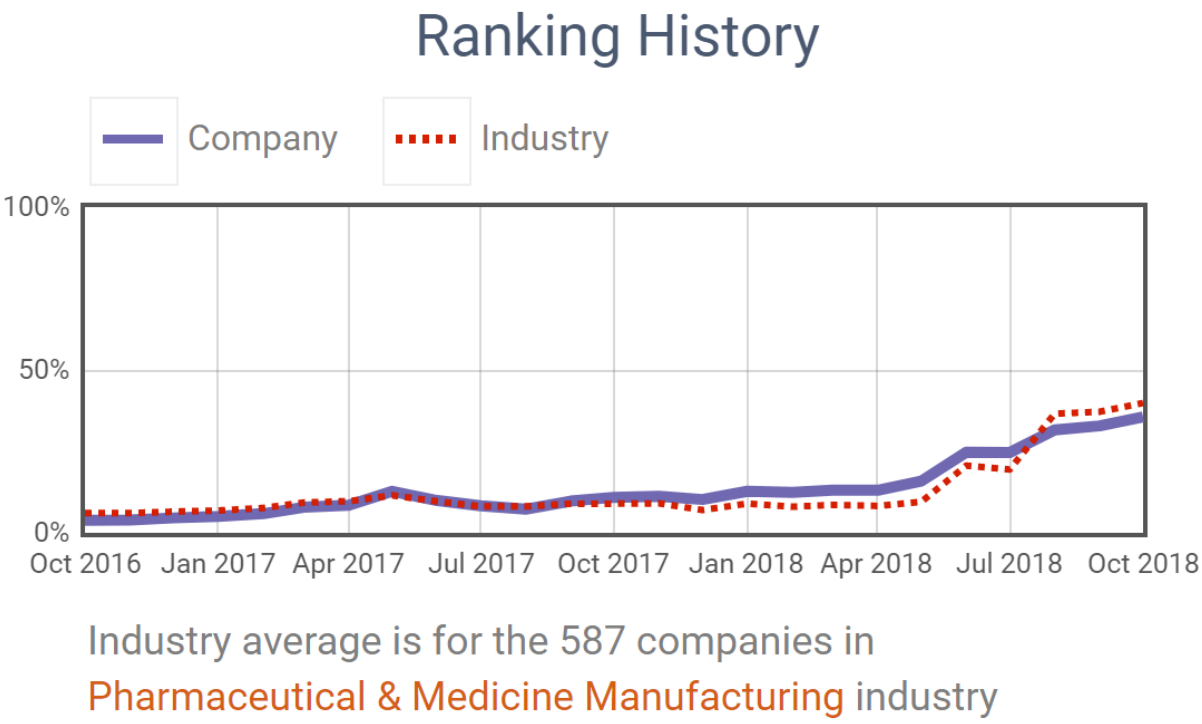
comply with relevant laws, regulations or government guidance in the operation of these programs, Vertex could be subject to significant fines and penalties.

Overall ESG (Environmental, Social, Governance) Performance risk

Vertex Pharmaceutical are rated as below average according to ESG scores at present based off CSRHub's ratings (shown below). This should not be interpreted at face value since Vertex Pharmaceuticals is measured against companies in the wider Pharmaceutical & Medical Manufacturing Industry and not against Biopharmaceuticals. Vertex Pharmaceuticals, like the majority of Biopharmaceutical firms, carries out animal testing of drug and medication products, in line with US and EU regulations. This, in turn, reduces it's CSR/ESG rating at present.

At present, there are no records suggesting environment damages from manufacturing or human rights issues in its supply chain.

Vertex ESG Ranking History



Source: CSRHub (https://www.csrhub.com/CSR_and_sustainability_information/Vertex-Pharmaceuticals-Incorporated)

Vertex has maintained the same compensation program that they implemented in 2016, which closely ties pay with performance and has contributed to their short- and long-term successes. Vertex's CEO's salary has been unchanged at $1.3 million since 2014 and is aligned with the median CEO pay of peer companies.

Name	2017 Base Salary	2018 Base Salary	Peer Ranking (Percentile)	% Change 2017 v 2018
Jeffrey M. Leiden	$ 1,300,000	$ 1,300,000	65th	0%
David Altshuler	$ 575,000	$ 625,000	40th	9%
Thomas Graney	$ 550,000	$ 550,000	25th	0%
Michael Parini	$ 675,000	$ 725,000	45th	7%
Amit Sachdev	$ 540,750	$ 540,750	70th	0%
Ian F. Smith	$ 850,000	$ 850,000	55th	0%

Source: VERTEX PHARMACEUTICALS INCORPORATED - 2018 Proxy Statement (https://investors.vrtx.com/static-files/627fdcef-b8ee-4ea5-ac4c-596916107155)

As seen above, the salaries of Vertex Executive Staff are measured directly against their immediate peers. Since 2017, Vertex's Board of Directors increased the base salary of two of Vertex's executive officers by 7% to 9% based on a review of base salaries of peers and in recognition of their roles and contributions to the company. This suggests management is not paid excessively.

Furthermore, as noted in the Notice of Annual Meeting of Shareholders and 2016 Proxy Statement, Vertex is improving its sustainability.

According to the Board of Directors, the company is committed to conserving natural resources and minimizing or eliminating any adverse health, safety and environmental impacts that may be associated with Vertex's facilities and operations and to promoting waste minimization, recycling and energy efficiency in their business activities. One indication of Vertex's commitment to sustainability is that they recently achieved LEED Gold certifications for high performance in sustainable site development, water savings, energy efficiency, materials selection and indoor environmental quality. This suggests that the company, currently facing an average ESG risk, is improving its wider ESG performance.

Furthermore, Vertex's CEO and President Dr. Jeffrey Leiden has established a signature program at Vertex to enhance science, technology, engineering, art and math (STEAM) education among students in local communities in the US, including an on-site Learning Lab, mentorship programs, internships and college scholarships. Consequently, in 2017, Vertex announced a sustained corporate giving commitment of $500 million over the next 10 years, of which $50 million is focused on STEAM education. This suggests that the company is run by a socially conscious CEO who is dedicated to promoting better Social Impact, further decreasing the likelihood of ESG risk and increasing the attractiveness of investment into VRTX.

Social Media risk:

Social media is being used by third parties to communicate about Vertex's products and drug candidates and the diseases their therapies are designed to treat. Surveys show that members of the CF community are more active on social media as compared to other patient populations due to the demographics of this patient population. Social media practices in the pharmaceutical and biotechnology industries are evolving, which creates uncertainty and risk of noncompliance with regulations applicable to their business. For example, patients may use social media platforms to comment on the effectiveness of, or adverse experiences with, a drug or a drug candidate, which could result in reporting obligations. In addition, their employees may engage on social media in ways that may not comply with their social media policy or with legal or regulatory requirements, which may give rise to liability, lead to the loss of trade secrets and other intellectual property, or result in public disclosure of protected personal information. There is a risk of inappropriate disclosure of sensitive information or negative or inaccurate posts or comments about Vertex on any social networking website. If any of these events were to occur or Vertex otherwise fails to comply with applicable regulations, Vertex could incur liability, face restrictive regulatory actions or incur other harm to their business, including damage to their reputation.

Vertex's Investments risk:

Currently, VRTX makes strategic investments in publicly traded companies, as recorded on their quarterly basis 'other income'. Due to the high volatility of stocks in the biotechnology industry, it is expected that the value of these strategic investments will fluctuate and that the increases or

decreases in the fair value of these strategic investments will continue to have material impacts on VRTX's net income (expense) and their profitability under GAAP on a quarterly and/or annual basis.

Future Operational Risk:

A pain point may be that regulations issues may arise in getting approval for future medicine. A further pain point could be the buy-out of engineers by rival firms, though this is unlikely at present. A further wider risk is if the interest rate in the US goes up, this will increase the risk-free rate, further increasing the (already high) WACC.

Appendix

Consolidated Income Statement

Consolidated Income Statement (without exceptional items)	12/2015	12/2016	12/2017	12/2018
Item	Total $000.000's	Total $000.000's	Total $000.000's	Total $000.000's
Revenue	$ 1,032.30	$ 1,702.20	$ 2,488.70	$ 3,047.60
Revenue growth YoY %	43.8 %	64.9 %	46.2 %	22.5 %
Cost of Sales (**COGS**) (-)	$ 1,120.40	$ 1,258.20	$ 1,599.80	$ 1,826.00
Cost of Sales (COGS) / Revenue %	108.5 %	73.9 %	64.3 %	59.9 %
Gross Profit	$ (88.10)	$ 444.00	$ 888.90	$ 1,221.60
Gross margin (%)	-8.5 %	26.1 %	35.7 %	40.1 %
Other Income (+)				
Operating Expenses (-)	$ 376.60	$ 432.80	$ 496.10	$ 557.60
Depreciation & Amort.	$ 62.30	$ 61.40	$ 61.40	$ 72.40
Operating Profit (EBITDA)	$ (402.40)	$ 72.60	$ 454.20	$ 736.40
Finance Income (+)				
Net Interest Exp.	$ (84.20)	$ (81.40)	$ (57.60)	$ (34.10)
Currency Exchange Gains (Loss)	$ (6.80)	$ 4.00	$ (5.50)	$ (1.10)
Other Non-Operating Inc. (Exp.)	$ 0.10	$ 0.10	$ 7.90	$ (1.20)
Restructuring Charges	$ (2.20)	$ (1.30)	$ (14.20)	$ 0.20
Finance Costs (-)	$ 93.30	$ 78.80	$ 85.20	$ 33.80
Gain (Loss) On Sale Of Assets			$ (76.60)	$ (1.10)
In Process R & D Exp.			$ (255.30)	$ (29.00)
Other Unusual Items			$ (7.10)	
Profit Before Tax (EBT)	$ (558.00)	$ (67.60)	$ (17.20)	$ 600.10
Tax on Profit (-)	$ 30.40	$ 16.70	$ (107.30)	$ (1,486.90)
Profit attributable to equity holders (**E**)	$ (588.40)	$ (84.30)	$ 90.10	$ 2,087.00
Minority Int. in Earnings	$ 31.80	$ (28.00)	$ 171.80	$ 9.80
Net Income	$ (556.60)	$ (112.30)	$ 261.90	$ 2,096.80

Statement of Financial Position/Balance Sheet 1

Statement of Financial Position (also known as Balance Sheet)	12/2015	12/2016	12/2017	12/2018
Item	Total $000.000's	Total $000.000's	Total $000.000's	Total $000.000's
Non-current Assets				
Intangible Assets	$ 334.70	$ 334.70	$ 79.40	$ 50.40
Property, plant and equipment (PP&E)	$ 1,033.80	$ 1,086.20	$ 1,221.60	$ 1,263.40
Accumulated Depreciation	$ (336.10)	$ (387.80)	$ (432.10)	$ (451.40)
Pension prepayments	$ -	$ -	$ -	$ -
Loans Receivable Long-Term	$ 30.00	$ -	$ -	$ -
Investment in subsidiary undertakings	$ -	$ -	$ -	$ -
Deferred tax Assets	$ -	$ -	$ 0.80	$ 1,499.70
Long-term Investments	$ -	$ 20.30	$ -	$ 13.60
Other Long-Term Assets	$ 29.00	$ 11.90	$ 27.40	$ 27.10
TOTAL Non-current Assets	**$ 1,091.40**	**$ 1,065.30**	**$ 897.10**	**$ 2,402.80**
Current Assets				
Inventories	$ 57.20	$ 77.60	$ 111.80	$ 124.40
Prepaid Exp.	$ 22.10	$ 36.10	$ 62.50	$ 74.00
Trade and other receivables	$ 188.50	$ 220.40	$ 383.90	$ 452.50
Other Current Assets	$ 12.80			
Derivative financial instruments	$ 5.20	$ 15.10		$ 19.00
Assets classficied as held for sale (?)	$ 327.70	$ 250.60	$ 423.30	$ 518.10
Restricted Cash	$ 78.90	$ 47.80	$ 2.10	$ 4.90
Cash and cash equivalents	$ 714.80	$ 1,183.90	$ 1,665.40	$ 2,650.10
TOTAL Current Assets	**$ 1,407.20**	**$ 1,831.50**	**$ 2,649.00**	**$ 3,843.00**
TOTAL Current and Non-Current Assets	**$ 2,498.60**	**$ 2,896.80**	**$ 3,546.10**	**$ 6,245.80**
Non-current Liabilities				
Loans and other borrowings	$ 223.90	$ -	$ -	$ -
Inserted by Mark - Capital Leases	$ 515.50	$ 521.30	$ 583.90	$ 581.60
Trade and other payables				
Inserted by Mark - Unearned Revenue, Non-Current	$ 9.70	$ 6.60	$ -	$ -
Deferred tax liabilites	$ 110.40	$ 134.10	$ 6.30	
Other Non-Current Liabilities	$ 39.20	$ 104.00	$ 106.20	$ 108.90
Retirement benefit obligations				
TOTAL Non-Current Liabilities	**$ 898.70**	**$ 766.00**	**$ 696.40**	**$ 690.50**

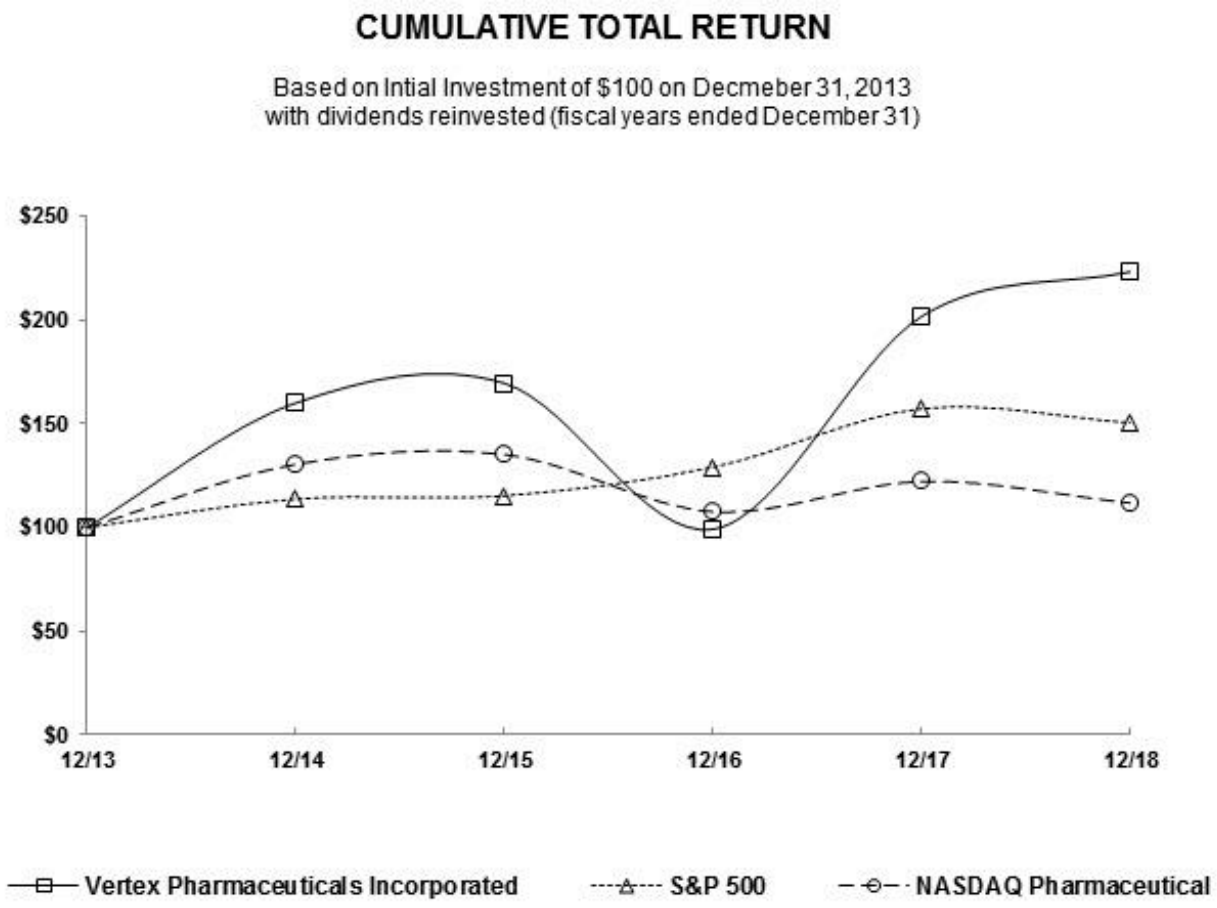
Statement of Financial Position/Balance Sheet 2

Statement of Financial Position (also known as Balance Sheet)	12/2015	12/2016	12/2017	12/2018
Item	Total $000.000's	Total $000.000's	Total $000.000's	Total $000.000's
Current Liabilities				
Loans and other borrowings	$ -	$ -	$ -	$ -
Accounts Payable	$ 74.90	$ 61.50	$ 74.00	$ 111.00
Derivative financial instruments				
Accrued Exp.	$ 274.90	$ 315.20	$ 444.00	$ 604.50
Short-term Borrowings	$ -	$ 300.00	$ -	$ -
Curr. Port. of LT Debt	$ 71.30	$ -	$ -	$ -
Curr. Port. of Cap. Leases	$ 15.50	$ 19.40	$ 22.50	$ 9.80
Unearned Revenue, Current	$ 16.30	$ 6.00	$ 1.70	$ 24.90
Provisions				
Current tax liabilities	$ 31.00	$ -	$ -	$ -
Other Current Liabilities	$ 22.30	$ 90.40	$ 265.10	$ 370.10
TOTAL Current Liabilities	**$ 506.20**	**$ 792.50**	**$ 807.30**	**$ 1,120.30**
Capital and reserves attributable to equity holders				
Inserted by Mark - Common Stock	$ 2.40	$ 2.50	$ 2.50	$ 2.50
Inserted by Mark - Additional Paid in Capital	$ 6,197.50	$ 6,506.80	$ 7,157.40	$ 7,421.50
Inserted by Mark - Comprehensive Inc. and Other	$ 1.80	$ 21.20	$ (11.60)	$ 0.70
Retained earnings	$ (5,261.80)	$ (5,373.80)	$ (5,119.70)	$ (2,989.50)
Minority Interest	$ 153.70	$ 181.60	$ 13.70	$ -
TOTAL equity	**$ 1,093.60**	**$ 1,338.30**	**$ 2,042.30**	**$ 4,435.20**
TOTAL equity and liabilities	**$ 2,498.50**	**$ 2,896.80**	**$ 3,545.00**	**$ 5,245.00**

Cash Flow Statement

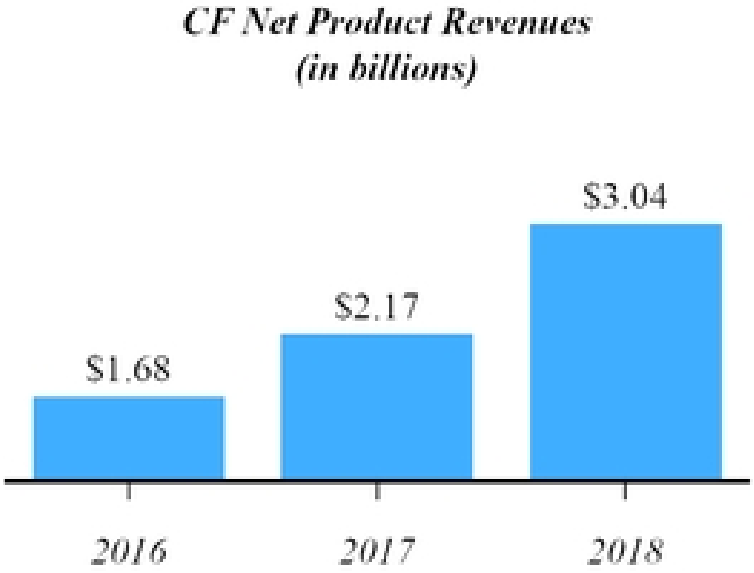
Cash Flow Statement (without exceptional items)	12/2015	12/2016	12/2017	12/2018
Item	Total $000.000's	Total $000.000's	Total $000.000's	Total $000.000's
Operating activities				
Profit before tax	$ (556.60)	$ (112.30)	$ 261.90	$ 2,096.80
Adjustments for:				
Interest receivable				
Interest payable				
Depreciation of property, plant and equipment (**PP&E**) & Amortisation	$ 62.30	$ 61.40	$ 61.40	$ 72.40
Impairment of property, plant and equipment	$ 2.50	-	$ 415.30	$ 29.00
Loss(+)/Gain(-) on sale of PP&E	$ -	$ -	$ 76.60	$ 1.10
Operating cash flows before movements in working capital	**$ (491.80)**	**$ (50.90)**	**$ 815.20**	**$ 2,199.30**
Stock-Based Compensation	$ 231.00	$ 240.60	$ 293.20	$ 325.00
Other Operating Activities	$ (19.00)	$ 51.10	$ (277.90)	$ (1,489.60)
Decrease(+)/Increase(-) in inventories	$ (23.10)	$ (19.40)	$ (47.50)	$ (32.00)
Decrease(+)/Increase(-) in receivables	$ (110.10)	$ (39.10)	$ (71.80)	$ (108.20)
Decrease(-)/Increase(+) in payables	$ (1.70)	$ (11.70)	$ 8.80	$ 36.60
Difference between employer pension contributions and amounts recognised in the income statement				
Change in Unearned Rev.	$ (19.20)	$ -	$ -	$ -
Change in Other Net Operating Assets	$ 68.20	$ 65.20	$ 123.30	$ 341.60
Cash generated from operations	**$ (365.70)**	**$ 235.80**	**$ 843.30**	**$ 1,272.70**
Tax on profit paid	$ 30.40	$ 16.70	$ (107.30)	$ (1,486.90)
Net cash from operating activities	**$ (335.30)**	**$ 252.50**	**$ 736.00**	**$ (214.20)**
Investing activities				
Acquisition of subisdiary (net of cash acquired)	$ -	$ -	$ -	$ -
Acquisition of intangible assets	$ (80.00)	$ -	$ (160.00)	$ -
Purchase of property, plant and equipment	$ (45.30)	$ (56.60)	$ (99.40)	$ (95.50)
Proceeds from sale of property, plant and equipment	$ -	$ -	$ -	$ -
Invest. in Marketable & Equity Securt.	$ 434.40	$ 127.90	$ (163.40)	$ (83.80)
Interest received	$ -	$ -	$ -	$ -
Other Investing Activities	$ (40.20)	$ (20.10)	$ (60.50)	$ (22.80)
Net cash used in investing activities	**$ 268.90**	**$ 51.20**	**$ (483.30)**	**$ (202.10)**
Long Term Debt Repaid	$ (20.50)	$ (75.00)	$ (25.00)	$ (50.40)
Bank arrangement fees paid				
Finance lease payments				
Purchase of company shares by employee benefit trusts				
Proceeds of disposal of company shares by employee benefit trusts				
Issuance of Common Stock	$ 185.60	$ 68.20	$ 344.80	$ 289.30
Repurchase of own shares	$ -	$ -	$ -	$ (350.00)
Dividends paid	$ -	$ -	$ -	$ -
Dividends received	$ -	$ -	$ -	$ -
Other Financing Activities	$ -	$ 71.90	$ 12.50	$ 7.10
Foreign Exchange Rate Adj				
Net cash used in financing activities	$ 189.00	$ 133.30	$ 68.40	$ (71.20)
Net increase in cash and cash equivalents	**$ 122.60**	**$ 437.00**	**$ 321.10**	**$ (487.50)**
Cash and cash equivalents at beginning of year		**£ 122.6**	**£ 559.6**	**£ 880.7**
Cash and cash equivalents at end of year	**£ 122.6**	**£ 559.6**	**£ 880.7**	**£ 393.2**

Figure 5: Cumulative Total Returns of Vertex Pharmaceuticals



Source: Vertex SEC Filing (https://investors.vrtx.com/node/25896/html#sB8870785B3A355DABF6D310BE3FFD33E)

Figure 6: Product Revenues within the Cystic Fibrosis Market



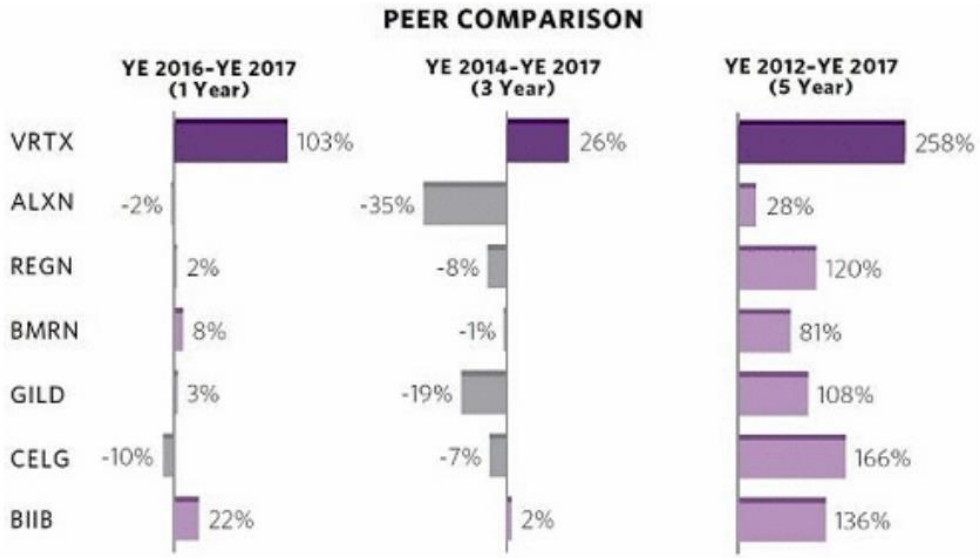
Source: Vertex SEC Filing (https://investors.vrtx.com/node/25896/html#sB8870785B3A355DABF6D310BE3FFD33E)

In 2019, CF net product revenues are projected to increase due to full-year revenues from SYMDEKO/SYMKEVI (released late 2018) and further CF net product revenue growth will be dependent on if, and when, Vertex is able to able to obtain approval to market a triple combination regimen for patients with CF.

Figure 7: Vertex's Cash, Cash Equivalents and Marketable Securities

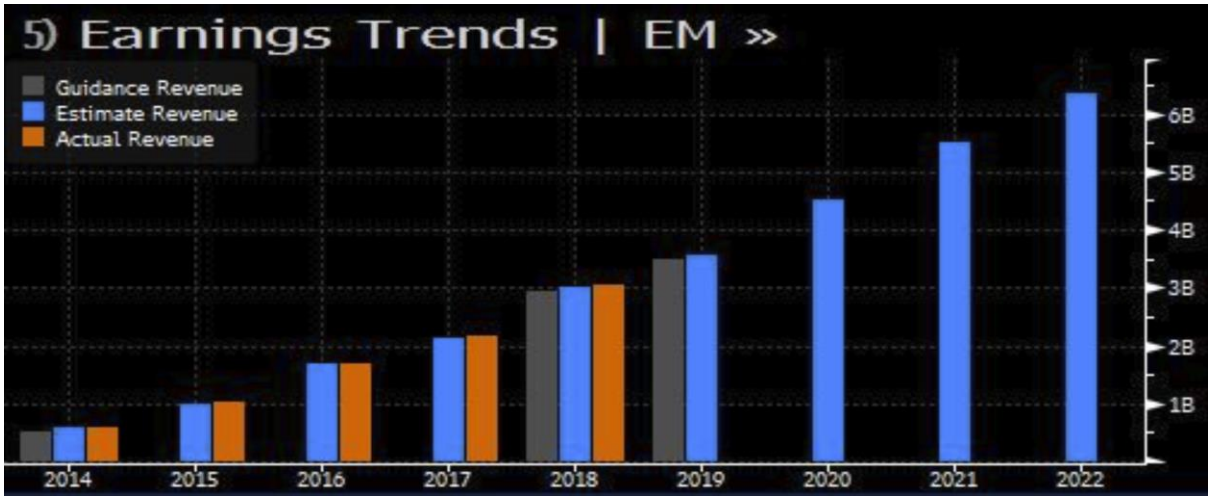
Source: Vertex SEC Filing (https://investors.vrtx.com/node/25896/html#sB8870785B3A355DABF6D310BE3FFD33E)

Figure 8: Peer Comparison of Shareholder Returns Compared to companies with a similar business model



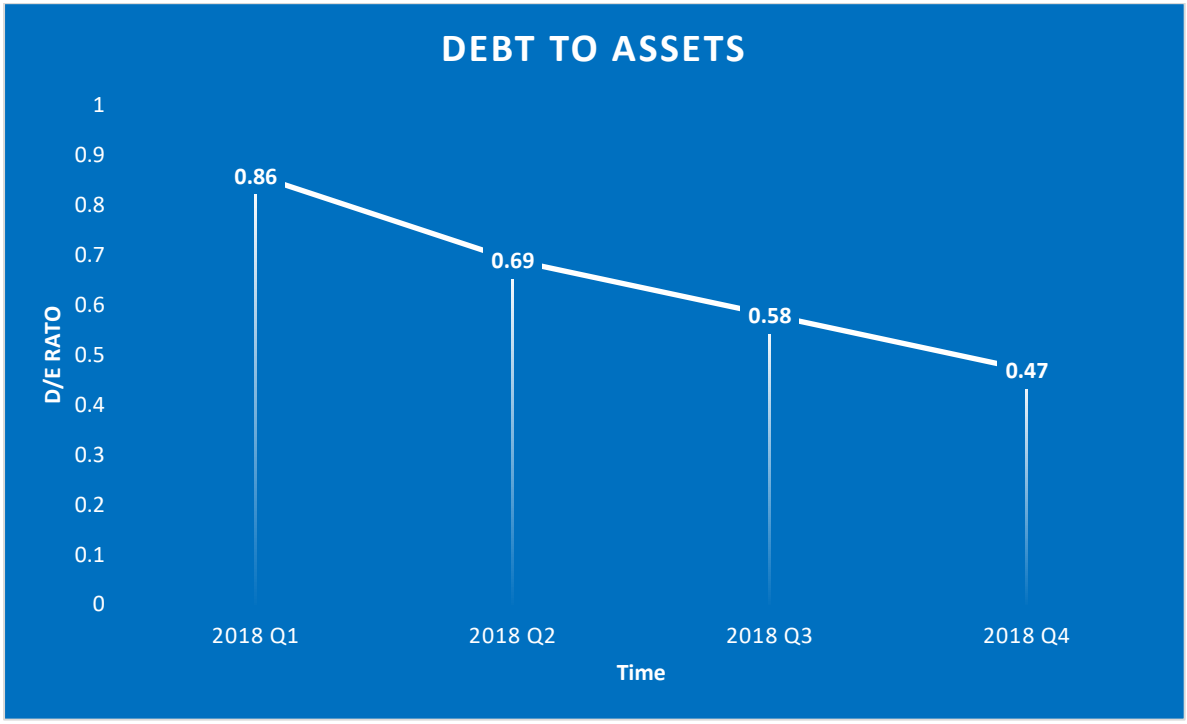
Source: Vertex Annual Report (https://investors.vrtx.com/static-files/627fdcef-b8ee-4ea5-ac4c-596916107155)

Figure 9: Earnings Trends of Actual Revenue outperforming Expected Revenue



Source: Bloomberg Database

Figure 10: Vertex Debt-to-Asset Ratio across 2018



Source: Author's Work

Discounted Cash Flow and WACC Calculation

$$WACC = \frac{E}{D+E}(r_e) + \frac{D}{D+E}(r_d)(1-t)$$

Where:
E = market value of equity
D = market value of debt
r_e = cost of equity
r_d = cost of debt
t = corporate tax rate

	2018	2019	etc	
Market Value of Equity:	4,435.20			
Market Value of Debt:	2,576.88	5,102.25	6,391.60	8,263.02
Cost of Equity:	25.00%	0	0	0
Cost of Debt:	0.65%			
Corporate Tax Rate:	2.99%			
WACC:	16.05%			

Cost of Equity CAPM Formula = Risk-Free Rate of Return + Beta * (Market Rate of Return - Risk-Free Rate of Return).
If no dividends...

Risk-Free Rate of Return (US Treasury):	2.55%
Beta(Reuters):	1.65
Market Rate of Return:	16.20%
Cost of Equity CAPM:	25.07%

Note: High WACC suggests the cash flow's impact is dissipated. Future years therefore have a smaller influence on company's value

	2018	2019	2020	2021	2022
TEV	41,167.93	45,599.24	45,110.65	44,368.39	51,901.00

Source: Author's Work

	Discounted Cash Flow Forecast Period				
	2019	2020	2021	2022	2023
(Levered OR Unlevered) FCF	1,223.00	1,967.87	2,761.06	3,439.07	3,978.37
Discounted:	1,036.85	1,414.42	1,682.48	1,776.67	1,742.46
Present value:	7,652.89				
Terminal value (discounted to present):	1,036.85	1,967.87	2,761.06	3,439.07	3,978.37
Present value incl. TV	$ 8,689.7				

	Weighted average cost of capital					
Proportion of equity:	71%					
Cost of equity:	25%	0%	0%	0%	0%	(Dividends are 0 at present)
Proportion of debt:	29%					
Cost of debt:	1%					
Tax rate:	21%	21%	21%	21%	21%	
Resulting WACC:	18%	0%	0%	0%	0%	

Source: Author's Work

Alternative Terminal Value Calculation:

	Calculation	Result
Terminal Value	= FCF2028 × (1 + g) ÷ (Discount Rate – g) = $5,657.49 × (1 + 2.73%) ÷ (10.48% – 2.73%)	$74,984.69
Present Value of Terminal Value	= Terminal Value ÷ $(1 + r)^{10}$ = $74,984.69 ÷ $(1 + 10.48\%)^{10}$	$27,675.99

Source: Author's Work and SimplyWallStreet

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