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THE RELATIONSHIP BETWEEN LIQUIDITY AND PROFITABILITY IN THE

PHARMACEUTICAL INDUSTRY

A COMPARISON BETWEEN INDIA AND THE UNITED STATES

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Abstract

This Work Project gives new insights into the liquidity and profitability relationship in the pharmaceutical industry, by adding epidemiological and economic variables to the debate. Between 2013 and 2017, the results show two significant relationships, positive in India, and negative in the United States (US). US producers are recommended to diversify and improve cost efficient processes, to decrease government dependency and increase customer reach. In Indian companies since working capital efficiency is a profitability driver, managers are recommended to sustain low production and skilled labour costs, and decrease cash conversion cycle and operating risk, while investing in marketing.

Keywords: Liquidity; Profitability; Cash Conversion Cycle, India, United States.

1. Introduction

With lower production costs and increased acceptability, developing countries are a growing threat to the United States dominance in the pharmaceutical industry. In 2016, the United States (US) represented 30 to 40 percent of the global market (Ellis, 2016), with more than 15 top market capitalization companies in the industry. The Indian pharma market is recognizable worldwide, and leader in the generic drugs market (IBEF, 2018). Exports, which the main destination is the US, grew 2.92% from 2017 to 2018 (The Economic Times, 2018) and by 2020, India - which is part of BRICS[1] and Tier II[2] - is expected to be at the top three pharmaceutical markets by incremental development, and sixth by absolute size (IBEF, 2018).

From 2007 to 2012, the compound annual growth rate (CAGR) was 5% (volume) for the total market and 8% for pharmerging markets. From 2012 to 2017, the overall market CAGR was 2%, while for pharmerging and developed nations it was, respectively, 4%, and 1%.

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[1] BRICS stand for Brazil, Russia, India, China, and South Africa.
[2] Tiers are grouped as follows: Tier I- China; Tier II- Russia, India & Brazil; Tier III- Argentina, Egypt, Indonesia, Mexico, Pakistan, Poland, Romania, South Africa, Thailand, Turkey, Ukraine, Venezuela, Vietnam. Pharmerging markets: simultaneously GDP < 30,000 USD and > 1Bn USD or LCUSD in absolute 5yr growth (2014-2019) (IQVIA, 2017).

Although pharmerging nations' CAGR has decelerated, it is still higher than the CAGR in developed nations and the total market. From 2017 to 2022, the CAGR forecast is 3% on pharmerging markets, and null variation on developed markets (IQVIA, 2018).

Pharmaceuticals' main issue is sustaining financial performance and operating margins (Deloitte, 2018). Thus, liquidity and profitability play a role in the industry's future development, by ensuring long-term growth. An adequate liquidity position prevents volatility in market oscillations, insolvency, and bankruptcy situations (Panigrahi, Raul & Chaitrali Gijare, 2017). Profitability ensures future operation (Mathuva, 2010).

This research's purpose is to understand how epidemiological and economic factors and products commercialized influence the liquidity and profitability relationship in the pharmaceutical industry in India and the US. Following the Introduction, Section 2 provides an overview of the pharmaceutical industry in the United States and India while highlighting the possible impact on key concepts. Section 3 reviews the empirical literature. Section 4 outlines the research questions, methodology, sample, and data. Section 5 presents, discusses the results and provides recommendations. Section 6 concludes and offers suggestions for future research.

2. Key Concepts and Contextual Background

The pharmaceutical industry incorporates all the processes involved in the manufacture, extraction, processing, purification, and packaging of chemicals used to medicate humans or animals. There are three types of pharmaceuticals marketed, branded ones, generics, and biosimilar.[3] *Branded* pharmaceuticals include all the company's pharmaceutical products that have held (or currently hold) official patents. *Generics*, on the contrary, have never held an exclusive official patent over a pharmaceutical. By having the same active ingredients, they work similarly and meet the same standards that branded pharmaceuticals have too. *Biosimilars*

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[3] See Annex 1 for a detailed description of each type of pharmaceuticals marketed.

are identical "copies" of another product produced by another company which approves them once the patent expires, and have never held exclusive patents to products.

Profitability is a performance indicator that reflects the company's capacity to generate revenues in excess to the expenses during a specific period. Some of the measures to access it are Return on Assets (ROA), Return on Equity (ROE), and Gross Sales Margins. ROA evidences how efficient the company is in using its assets to generate profits.

$$ROA = \frac{Earnings\ Before\ Interest\ and\ Taxes}{Total\ Assets} \qquad [2]$$

ROA may be split[4] into Operational Risk (OR), Gross Sales Margin (GSM) and Asset Turnover (AT)[5], as follows:

$$ROA = \frac{Earnings\ Before\ Interest\ and\ Taxes}{Gross\ Margin} \times \frac{Gross\ Margin}{Sales} \times \frac{Sales}{Total\ Assets} \qquad [3]$$

ROA highly depends on the industry[6], consequently, comparing companies within an industry highlights differences and similarities in the operating context and managers' strategic and operational decisions. During the spring season, usually due to pollination, individuals with allergies need to take special medication, and in autumn some population segments are advised to be vaccinated against the flu. These events spike sales without necessarily increasing total assets (TA) and reinforcing ROA's seasonality dependency. Furthermore, during a recession, due to lower purchasing power, the choice may be to swap branded products for generics, increasing, therefore, the generics' ROA while decreasing branded pharmaceuticals' ROA.

Liquidity acknowledges the extent to which a company is able to meet its current debt while taking advantage of its current assets, namely inventories, trade debts, and cash. Higher liquidity means better ability to face adversarial environmental conditions while maintaining a

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[4] Based on the DuPont method developed in the 1920s by DuPont de Nemours Corporation.
[5] See Annex 2 for definition of ROA, and its components.
[6] For example, a banks tend to hold higher levels of assets, which may be cash, investments, and loans. If a pharmaceutical company obtains similar EBITDA (while holding less totals assets) it will generate higher return on assets than the bank.

low financial risk of bankruptcy. Liquidity ratios, cash conversion cycle, and cash flow statement analysis are some of the liquidity measures.

Ratios allow to compare companies of different size, and with financial statements expressed in different currencies. Liquidity ratios, such as the Current ratio (CR), the Quick ratio (QR), the Working capital turnover ratio (WC Turn), and the Inventory to net working capital ratio (Inv/WC)[7] provide an understanding of the company's ability to meet liabilities' deadlines, and are particularly crucial to short-term creditors (Mathuva, 2010). Nonetheless, these ratios have inherent disadvantages. As Finnerty (1993) explains, operating assets, since involved in the operating cycle of the firm, should not be included in the analysis. Moreover, liquidity ratios are static in nature, with computations mainly based on balance sheet accounts, and, therefore, their predictive ability is limited (Kamath, 1989).

Cash Conversion Cycle (CCC)[8] measures the time in days taken to convert resources into cash receipts obtained from sales and is a dynamic working capital measure, focused on income statement accounts (Bolek, 2013). The CCC components are the Days Inventory Outstanding (DIO), Days Sales Outstanding (DSO), and Days Payable Outstanding (DPO).

$$CCC = DIO + DSO - DPO \quad [1]$$

The CCC recognizes how much credit length should be available for customers, how much and how long inventory should be hold, and how to manage the supplier's payment period. According to Moss and Stine (1993), Uyar (2009), and Bhutto, Abbas, Rehman and Shah (2011), CCC is negatively correlated to firm size (proxied by total assets), i.e., larger firms tend to have smaller CCC. A lower CCC is often desirable as it indicates less dependency on external financing, resulting in lower interest paid, and higher profitability. Management is able to increase liquidity by shortening either the average collection period, or the inventory levels,

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[7] See Annex 3, for definition of liquidity ratios, and the most commonly used ones.
[8] See Annex 4 for definition of CCC, and its components.

reducing costs, and decreasing losses, damages, and obsolete products. Also by extending average payment period liquidity increases. On the other hand, a high DIO, contributing to higher CCC, is beneficial if supply has to match a sudden expansion in demand. The lack/significance and the sign of the impact that CCC has on profitability depends on the products or services commercialized, the industry, the companies' size, and how organized the firm is. Both working capital analyses are limited, and companies should balance them.

These key variables depend on country-specific factors, such as weather, economic and health care environment, regulations, epidemiological factors, as well as company-specific factors, such as vision, mission, the product offered, strategy, and functional policies. Tables 1 and 2 compare, respectively, the strengths and weaknesses, and the opportunities and threats in the pharmaceutical industry in India and the United States.

Table 1: Strengths and weaknesses in the pharmaceutical industry

	Strenghts	Weaknesses
India	> Largest generics provider in the world (supplying 40% of the generics demand in the US). > Highly fragmented supplier market (low market concentration) > Non-original brands pharmaceuticals constitute the largest portion of total sales (75%). > Lower R&D, labour, and production costs. > Lower price of commercialized products.	> Poor sanitary conditions. > Intense price competition and strict price regulations may be deteorating to the companies' finances. > Lack of proper infrastructure, investment in sales force, marketing and commercial operations. > Most of the pharmaceutical companies deal with liquidity issues due to inefficient working capital management.
United States	> Largest pharmaceutical market in the world. > Companies with strong reputations and brand-equity that maintain solid finances. > Originators constitute the largest portion of total sales (72.96%).	> Unproportionate increase in healthcare costs increase in comparison to insurance coverage. > Strong price and quality relations not deemed as enough to benefit patients. >High market concentration due to the entry barriers raised by the early entrants that leveraged on market share and government regulations.

Table 2: Opportunities and threats in the pharmaceutical industry

	Opportunities	Threats
India	> With losses of exclusivity expected, an increase in accessibility and acceptibity of the generics market may be due. > Higher GDP per capita growth, induces and increase in disposable income and, therefore, in health care spending. > With the improvement of sanitary conditions, some of the most widely spread diseases may be significantly reduced. > In an optimist scenario CAGR is expected to be 17% until 2020. > In the base scenario, CAGR is expected to be 14.5% (market reach of 55 billion USD) (close 2nd next to the US, in volume). > In a pessimist scenario CAGR is expected to be 10% until 2020, which is still above the expected for Asia & Australasia (5%). > The growth factors are acceptability (46%), accessibility (33%), and epidemiological factors (1%) .	> If demand is not elastic enough, when prices decrease, revenue may decrease, leading to the decrease in profitability (measured by profitability ratios). > If Indian companies have to sacrifice sustainable finances to match with supply with the increase in demand. > If the US decides to heavily compete in the generics pharmaceutical market. > If companies are not able to build sufficient financially sound operating models.
United States	> Population aging and increase in life expectancy. > Strong customer demand. > If large companies invest in generics' sales, revenue increase may be even more significant.	> Larges losses of exclusivity are expected (105 Billion USD). > Price level is expected to rise 2-5% in the next few years. > Growth in developed countries is expected to slow. CAGR expected to be 4.4% until 2020. > Environmental volatility due to the government dependancy.

Taking into account the future expected losses of exclusivity, US companies, being in a more mature pharma market, require flexibility in the types of products offered (IQVIA, 2018). As so, more efficient manufacturing processes, that diminish the cost of goods sold, must be set without sacrificing the companies' profitability. With a wider range of products at a lower price, US pharma companies would increase their market share, prevent further market entrances, and the take on by foreign companies. Diversely, Indian companies offering low prices and being inefficient at working capital management are facing liquidity issues. Since entry barriers are not as significant in India as in the US, there is a threat for existing companies of losing their already small market shares. Consequently, Indian pharma companies need to heavily invest in sales force, infrastructure, marketing, and commercial operations to expand customer reach and establish better supplier relationships to increase bargaining power. The liquidity and profitability concern in both countries raises the question about their relationship.

3. Literature Review

According to Nicholas (1991), liquidity management is only a company's concern in crisis or close to bankruptcy situations. Sagner (2001) states that working capital is a safeguard for short-term providers while maintaining the return on equity (ROE). Bhunia and Khan (2011) also agree on the lack of impact that the liquidity position has on profitability. In contrast, Price,

Haddock, and Brock (2003) illustrate the possibility of having a strong long-term financial position while not being able to repay the debt obligations. Mathuva (2010)[9] indicates a significant negative relationship between CCC and profitability (proxied by net operating profit), a negative relationship between profitability and average collection period, and a positive relationship between some CCC components (inventory conversion period and average payment period), and profitability. Shin and Soenen (1998), Delof (2003), Lazaridis and Tryfonidis (2006), and Raheman and Nasr (2007) found a negative correlation between CCC, its components, and the value created for shareholders in various countries, namely the US, Greece, Belgium, and Pakistan[10]. To maximize value the former authors' encourage managers to decrease the number of days inventory, receivables, and payables, and the CCC. Eljelly (2004)[11] found a negative relationship between CR (most impactful liquidity measure on profitability), cash gap, and profitability (net operating income). The cash gap significance depends on which is the intensive factor (labour is less, and capital is more impactful). The pharmaceutical industry is capital intensive, meaning that CCC has a significant impact on profitability. In the US, Gill, Bigger, and Marthur (2010), based on data from 2005 to 2007, show a negative relationship between profitability (gross operating profit) and number of days accounts receivables, meaning that a large collection period for accounts receivable may induce lower profitability and a positive relationship between profitability and CCC. No statistical evidence was found regarding the relationship between profitability and number of days accounts payables, and the number of days inventory.

In the pharmaceutical industry, Khan and Safiuddin (2016) found a positive correlation between liquidity and profitability[12] emphasising, however, that liquidity does not necessarily

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[9] Mathuva (2010) used a sample of 30 firms listed in the Nairobi Stock Exchange.

[10] Shin and Soenen (1998) used a sample of 58,985 firms in the American market, Lazaridis and Tryfonidis (2006), a sample of 131 companies listed in Athens Stock Exchange, Delof (2003), 1009 large Belgian Firms, and Raheman and Nasr (2007), 94 Pakistan firms listed in Karachi Stock Exchange.

[11] Eljelly (2004) used 29 joint stock companies in the industrial, agriculture and services sector in Saudi Arabia.

[12] In two of the largest Indian companies: Cipla and Dr. Reddy's Lab.

imply higher profit. Ofoegbu, Duru, and Onodugo (2016)[13] research focus on the importance of efficient liquidity management on profitability and stresses a strong positive correlation between CR and profitability. Panigrahi, Raul, and Gijare (2017)[14] demonstrate how a low (or negative) working capital to increase profitability and return on capital, may compromise the liquidity position of the firm, and ability to comply with current liabilities, a major concern to short-term creditors. Viswanathan, Palanisamy, and Mahesh (2016) [15] research displays a negative relationship between CCC (and components) and profitability. Although liquidity positions were satisfactory, solvency positions were not. To increase profitability, companies should decrease the conversion period for working capital components, and control the cost of sales and other operating expenses. Vijayalakshmi and Srividya (2015)[16] found the impact of the independent variables (WC Turnover, Working capital/Net worth, Net working capital/Current liabilities) on net profit to be inconstant. The minimum R-square is 47.9%. Finally, Prasad and Lakshmi (2018)[17] found cash to be between 7% and 23% of total assets, and firm size to be positively related to liquidity, which may be a result of sales, lower operational costs and reduced investments in comparison to medium or small companies.

The profitability and liquidity relationship remains dubious, which may be due to the different maturity stages of the pharmaceutical markets. Moreover, the working capital strategies Indian companies should follow as to unleash its growth potential are yet to be settled. This Work Project aims at giving new insights into the relationship between liquidity (proxied by liquidity ratios, and CCC) and the operating profitability measured by the ROA ratio.

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[13] With a sample of three pharmaceutical companies quoted in Nigerians Stock Exchange.
[14] With a sample of five major companies in India,
[15] Using 10 large companies in India.
[16] Analysed 10 Indian companies listed on the BSE and National Stock Exchange of India.
[17] Based on a sample of 15 Indian pharmaceutical companies (accounting for 29.31% of total market capitalization of companies listed in BSE Health Care.

4.1 Research Questions and Model of Research

As debated in section 3, the relationship between liquidity and profitability is not consensual. A high liquidity level encourages external financing independence, leading, in the long-run, to better performance, and sustainable growth. The contrasting analysis of United States pharmaceuticals and the pharmerging markets provides a better response as to why potential CAGR is higher on developing nations, and what are the recommended strategies to increase results in the global market.

RQ 1. H0: *Liquidity has a significant relationship with ROA.*

By taking advantage of the ratios' properties, it is possible to compare companies such as Johnson & Johnson (US) and Torrent Pharmaceuticals (India). The liquidity ratios used are the CR, QR, Inv/WC, and WC Turn. ROA analysis is broken into OR, GSM, and AT.

RQ 2. H0: *CCC and components have a significant relationship with ROA.*

In section 3, no consensus has been reached with regarding the sign of the relationship between Cash Conversion Cycle and Profitability relationship, particularly in the pharmaceutical industry. For CCC, the proxies used are DIO, DSO, and DPO.

RQ 3. H0: *Company size has a significant relationship with liquidity.*

The largest companies in India and the US are selected, as they better illustrate market tendencies while dictating the response strategies to environmental conditions. Gill, Bigger and Mathur (2010) prove no significant relationship between firm size and gross operating profit ratio. In contrast, Raheman and Nasr (2007) show a positive relationship between company size and profitability. The aim is, therefore, to clarify how company size (measured by total sales of the year[18]) relates to liquidity and profitability.

RQ 4. H0: *Company size has a significant relationship with ROA.*

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[18] Most appropriate measure of company size taking into consideration that Return on Assets is the proxy chosen to measure profitability. Total assets and the employee's number are other possible proxies of company's size.

The univariate analysis (section 4.3) joins descriptive statistics to recognise the two countries' companies' characteristics. The bivariate analysis (section 5) (with a chosen 90% confidence level), entailing linear regressions, is adopted to validate the hypothesis set in 4.1.

$$Y_t = a + bX_t \quad [4]$$

Y_t is the dependent variable, and X_t is the independent variable The regression coefficient b, exhibits "what", "why", and "how much" is the impact of the explanatory variable, and a, the intercept, reveals the weight of exogenous variables. The variables used and the expected regression signs are exposed in Table 3.

Table 3. Variables and expected signs of the relationships

DEPENDENT VARIABLE	INDEPENDENT VARIABLES							
	CR	QR	Inv/WC	WC Turn	DIO	DSO	DPO	CCC
ROA	+	+	-	-	-	-	?	-
Section	5.1				5.2			

DEPENDENT VARIABLE	INDEPENDENT VARIABLE Annual Sales
CR	+
QR	+
Inv/WC	+
WC Turn	?
ROA	+
Section	5.3

4.2. Sample and Data

Before the decision about countries to select for the analysis, an initial sample, comprising 54 large companies from Europe, the United States, and Asia, was taken. The 10 Chinese companies were excluded due to lack of English reporting. Data was retrieved from consolidated annual reports and SEC filings available on the companies' website. The periods under analysis ranges from 2013 until 2017. The year-end for India differs from the US, the former begins on the 1st of April and ends on the 31st of March of the following year. The 31st December of 2017 in Europe and US is compared to the 31st March of 2018 in India, the 31st December of 2016 in Europe and US is compared to the 31st March of 2017 in Asia, onwards. With the 44 companies remaining (European, United States, and Japan), and the year-end

assumption, the minimum and the maximum revenue for 2017 is, respectively, 511 and 76,450 million USD. Total revenue for 2017 (and March 2018) was approximately 752,380 million USD, and the average is 17,100 USD[19]. This research is based on a sample compounded by the largest pharmaceutical companies in India and US. The US was chosen since it is the most significant pharma market in the world, and India, due its remarkable presence in the generics market (which are increasing in acceptability) as well as growth potential.

The final sample combines 27 companies, 16 from the US and 11 from India. US companies follow the US Generally Accepted Accounting Principles (GAAP), and Indian companies follow the domestic IAS (Indian accounting standards) and Indian GAAP. Although both are similar to International Financial Reporting Standards (IFRS) issued by the International Accounting Standards Board (IASB), the main differences lie on the revenue recognition expense recognition, derivatives, liabilities, assets, business combinations, consolidation. In 2017, the final sample companies' were able to generate 343,390 million USD in revenues, 18.55% higher than in 2013, and representing 45.64% of the total revenues of the initial sample[20]. For 2017, the average total revenue for the final sample is, approximately, 12,718 million USD, 25.6% less than the initial sample. From 2013 to 2017, the minimum revenue increased by 43.83% and the minimum revenue (76,450 million USD (Johnson & Johnson) rose by 7.20%. Minority interest[21] is integrated into total equity value[22]. The composition of the initial, final sample and exclusion reasons is provided in Appendix 1.

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[19] Using the currency rates in 31st March of the respective year for Asian companies.
[20] Using the conversion rates in 31st March of the respective year for Indian companies (See Annex 6 for conversion rates used).
[21] Minority interest (non-controlling interest): "Portion of equity (net assets) in a subsidiary not attributable, directly or indirectly, to a parent." (Deloitte, 2018)
[22] data was not available with regards to inventory purchases, this variable was estimated using:
$$Purchases_n = Inventory_n - Inventory_{n-1} + Cost\ of\ Goods\ Sold_n$$

4.3. Univariate Analysis

To characterize Indian and the US pharma companies, the maximum, minimum, the average, standard deviation and variation coefficient, for each variable is analysed.

Average sales are considerably lower in India, around 9.37% of the US's average sales, being the increasing significance of online pharmaceutical sales in the US one explaining factor. In India, from 2013 to 2017, Cost of Goods Sold/ Annual Sales fell by 15.85% to 26.66% (2017), while in the US it decreased by 1.95% to 23.29% in 2017. In India, this can be attributed to lower production and skilled labour costs and increased manufacturing processes efficiency.

Figure 1. Average ROA on the Pharmaceutical Industry (2013-2017)
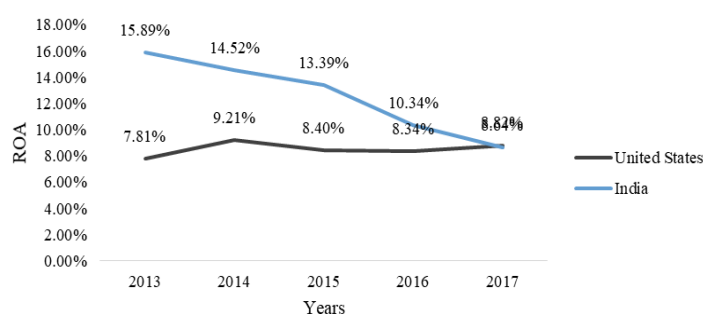
The drop in India's pharma companies' ROA (7.25 percentage points), between 2013 and 2017, resulted from the decline in OR (in 2017 26.14% less) and AT (in 2017 21.07% less). The GSM in India increased by 6.06%. In contrast, the US's ROA has remained relatively stable, increasing by 1.01 percentage points (in comparison to 2013) and hitting its maximum of 9.21% in 2014. The growth factor was the decrease in operational risk (by 42.70%), associated with the increase in the OR ratio. The average AT decreased by 2.76%, indicating lower efficiency in the use of assets to generate sales. The gross sales margin in the US slightly decreased by 0.69% when comparing to 2017. Only in 2017 was the US capable of matching India's operating profitability, India's average ROA was 8.64%, and the US was 8.82%.

Figure 2. Average Liquidity Ratios in the Pharmaceutical Industry (2013-2017)
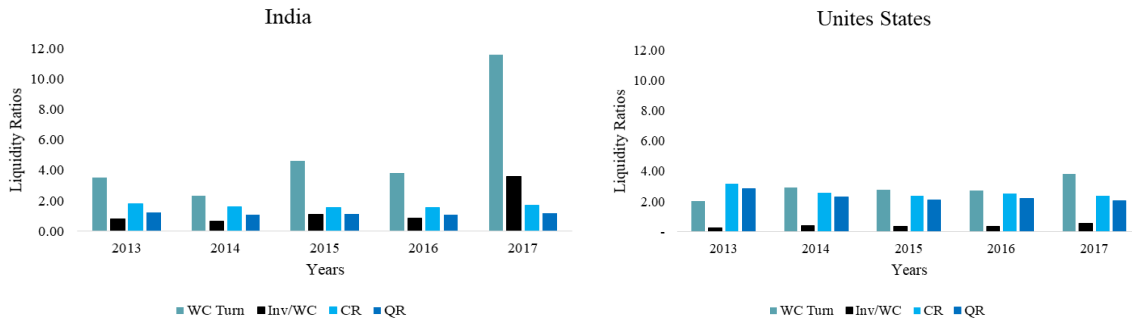
WC Turn is the liquidity ratio with the most significant difference between countries (3.06 percentage points, 84.59% lower in the US). From 2013 to 2017, Indian companies' Inv/ WC increased by 357.26%, being in 2017, 6.5 times more than the US' ratio. Thus, India's liquidity not only is lower than US's liquidity but has also declined in the period of analysis. In 2013 the QR, being 113.48% higher in the US had the highest difference between the two countries. Since 2013, India's QR fell by 4.96%, reflecting a lower capability of meeting current financial obligations with available funds. According to Prasad and Lakshmi (2018), in India, cash usually is 7% and 23% of total assets. The results, however, indicate a Cash/Total Assets ratio of 5.36% in India, and 14.40% in the US, reinforcing a higher liquidity level in the US.[23]

Figure 3. Average CCC in the Pharmaceutical Industry (2013-2017)
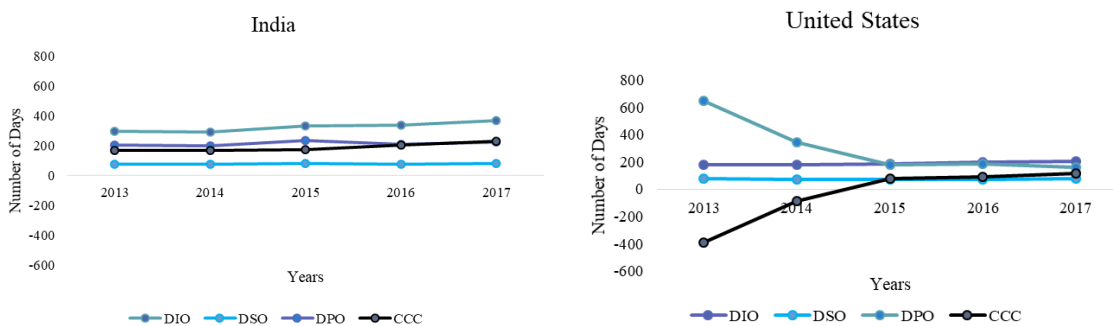
In 2017, the average DIO is the CCC component that differs the most between countries. In 2017, DIO in the US and India was, respectively, 204 and 370 days. Therefore, India has a

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[23] Although with similar results, the ratios' volatility differ, Inv/WC with a Coefficient of Variation of 254.89% in India (2017) and 126.38% in the US (2017), and QR with a Coefficient of Variation of 35.74% in India (2017) and 53.51% in the US (2017).

lower ability to turn inventory into sales. The average DSO is fairly similar, 75 days in the US and 83 days in India. The average DPO is 224 days in India and 160 days in the US. Although with an increasing trend the United States' average CCC has always been below the Indian one. In India, the decrease in liquidity and ROA indicates a positive relationship between these variables. In the US, the match between the ROA increase and liquidity decrease illustrates that if significant, the relationship has a negative sign. Since similar ROA may be achieved through different combinations of OR, GSM, and AT, companies may balance these depending on the subjected conditions. The following sections answer the questions purposed in section 4.1.

5.1. Relationship between Liquidity and Return on Assets

In the US, CR has a significant negative correlation of -0.265 with OR (p-value=1.7595%) and a significant positive relationship with GSM (p-value=0.0029%, correlation=0.449). AT does not have a significant relationship with CR (p-value=30.40%). The final result is a significant negative relationship between CR and ROA (p-value= 10.18%, R-square=3.40%)[24]. A one unit increase in the current ratio is expected to decrease ROA by 1.5692%, *ceteris paribus*. The Indian companies express no significant relationship between CR and OR, nor with GSM. However, there is a significant relationship between CR and AT (p-value=3.1436%, b =0.107). CR and ROA have a significant positive relationship (p-value=8.0507%) in India, aligning with Khan and Safiuddin (2016).

In the US, there is a significant negative relationship between QR and OR (p-value=1.3067%, b =-0.079), matching the relationship between CR and OR. There is also a significant positive relationship between GSM and QR (p-value=0.0002%, correlation=0.503). Similarly to CR, QR and AT do not have a significant relationship. A significant correlation of -0.194 is present between QR and ROA (p-value=8.5202%, b =-0.017). The Indian companies showed no relationship between the quick ratio, and return on assets, nor its components.

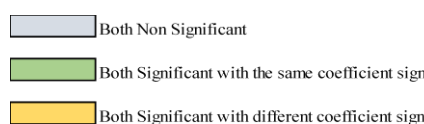---

[24] Considered as being a significant relationship due to the proximity to the 10% not included in the confidence interval.

In the United States, WC turn has a significant positive correlation of 0.204 with OR (*p*-value=6.9523%, R-square=4.16%). The regression coefficient is 0.032. There is also a significant negative relationship with GSM (*p*-value=0.0006%, *b* =-0.030). Neither AT nor ROA have a significant relationship with this liquidity ratio. In India, the WC Turn does not have a significant relationship with ROA, nor its components.

In the US, Inv/WC only has a significant correlation of -0.583 with GSM (*p*-value=0.000001%). Each unit change in the Inv/WC is expected to generate a decrease in GSM by 0.188 units, *ceteris paribus*. No significant relationships are established between this liquidity ratio and ROA, the remaining components. In India, no significant relationship is found between the Inv/WC and the profitability ratios (ROA and components).

Table 4. Liquidity Ratios and Profitability's relationship in India and United States

Both Non Significant

Both Significant with the same coefficient sign

Both Significant with different coefficient sign

United States		OR	GSM	AT	ROA
CR	p-value	1.7595%	0.0029%	30.4038%	10.1789%
	Coefficient	-7.4013%	4.9757%	-1.0730%	-1.5692%
	Coefficient Sign	-	+	-	-
	Significant	✔	✔	✖	✔
	Equal sign		=		
	Equal significance				=
QR	p-value	1.3067%	0.0002%	52.2245%	8.5202%
	Coefficient	-7.8896%	5.6887%	-0.6837%	-1.6844%
	Coefficient Sign	-	+	-	-
	Significant	✔	✔	✖	✔
	Equal sign		=	=	
	Equal significance		=	=	=
Inv/WC	p-value	33.6486%	0.0000%	50.6917%	99.5977%
	Coefficient	8.8800%	-18.8348%	-2.0265%	0.0142%
	Coefficient Sign	+	-	-	+
	Significant	✖	✔	✖	✖
	Equal sign			=	
	Equal significance	=		=	=
WC Turn	p-value	6.9523%	0.0006%	55.0190%	29.6697%
	Coefficient	3.1933%	-2.9798%	0.3502%	0.5634%
	Coefficient Sign	+	-	+	+
	Significant	✔	✔	✖	✖
	Equal sign			=	
	Equal significance		=	=	=

India		OR	GSM	AT	ROA
CR	p-value	47.3547%	17.5700%	3.1436%	8.0507%
	Coefficient	-2.2491%	-2.5332%	10.6799%	2.5048%
	Coefficient Sign	-	-	+	+
	Significant	✖	✖	✔	✔
	Equal sign		=		
	Equal significance				=
QR	p-value	80.6241%	90.5449%	91.8169%	24.9686%
	Coefficient	0.9510%	0.2763%	-0.6427%	2.0507%
	Coefficient Sign	+	+	-	+
	Significant	✖	✖	✖	✖
	Equal sign		=	=	
	Equal significance		=	=	=
Inv/WC	p-value	43.2941%	52.1984%	76.2479%	63.0908%
	Coefficient	-0.3221%	0.1579%	-0.2007%	-0.0914%
	Coefficient Sign	-	+	-	-
	Significant	✖	✖	✖	✖
	Equal sign			=	
	Equal significance	=		=	=
WC Turn	p-value	16.3769%	49.4040%	87.9447%	66.2635%
	Coefficient	-0.1824%	0.0541%	0.0323%	-0.0266%
	Coefficient Sign	-	+	+	-
	Significant	✖	✖	✖	✖
	Equal sign			=	
	Equal significance			=	=

In both countries, there is a significant relationship between CR and ROA. In the US when CR increases, ROA decreases, meaning that the increase in Total Assets generated surpasses the increase in earnings (due to the expenses' increase). In contrast, in India, when CR increases, ROA increases, meaning that these companies can increase liquidity while

increasing revenues more than expenses and TA. In the United States, when liquidity increases GSM is expected to increase. In India, no consensus was found regarding the relationship between liquidity ratios and profitability ratios. In India and the US, the Inv/WC and WC Turn ratios had the highest Variation Coefficients among the sampled companies, explaining the lack of significant relationships with profitability variables[25].

5.2. Relationship between Cash Conversion Cycle and Return on Assets

In the US there is a significant positive relationship between DIO and GSM (p-value=0.5179%). When DIO increases by one day, the GSM is expected to increase by 0.0328%, *ceteris paribus*. DIO is also negatively related to AT (p-value=0.0001%, b =-0.045%). There is no significant relationship between DIO and OR, and DIO and ROA. Indian companies have a positive relationship between DIO and GSM (p-value=0.0004%, b =-0.0434%). However, DIO has no significant relationship with the other ROA components.

In the US, when DSO by one day, OR is expected to increase by 0.302%, *ceteris paribus* (p-value=1.3710%, correlation=0.275). Although there is no significant relationship with GSM nor AT, there is a significant positive relationship with ROA (p-value=0.30%, b =0.1097%). Indian pharma companies show no significant relationship with ROA, nor its components.

The US pharmaceutical companies' DPO does not have a significant relationship with AT. DPO and OR have a negative correlation of -0.188 (p-value=9.5406%). The impact of a day change on the OR is fairly low (b =-0.0072%). DPO and GSM are positively correlated by 0.329 (p-value=0.28%, b =0.005%). Finally, there is a significant negative relationship with ROA (p-value=6.92%). The negative coefficient (-0.0024%) could be related to the fact that as the average accounts payable increase, relationships with suppliers and creditors may be damaged and future credit terms compromised. In India, DPO has only a significant correlation

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[25] Inv/WC not found to be significantly related to OR, AT, nor ROA, WC Turn was not found to be significantly related to AT and ROA.

with GSM (0.403) (*p*-value=0.23%). Despite having the same positive sign as the US, the magnitude of the impact on GSM is 0.027%, 0.022 percentage points, and 447% higher.

In the US, there is a significant negative relationship between CCC and GSM (*p*-value=1.0965%). The correlation is -0.283, and it matches the -0.0043% decrease in GSM if DPO increases by a day. No significant relationship is present with AT, and OR. Despite having a significant relationship with ROA (*p*-value=7.8064%), the correlation, the regression coefficient, and R-square are fairly low, respectively 0.198, 0.0023%, and 3.93%. In India, CCC is only significantly related to OR (*p*-value=2.242%, *b* =-0.034%), meaning that a higher CCC level translates into an increase in risk (OR decrease).

Table 5. Cash Conversion Cycle and Profitability's relationship in India and the United States

United States

		OR	GSM	AT	ROA
DIO	p-value	14.0588%	0.5179%	0.0001%	32.4673%
	Coefficient	-0.0444%	0.0328%	-0.0453%	-0.0091%
	Coefficient Sign	-	+	-	-
	Significant	✗	✓	✓	✗
	Equal sign	=	=		=
	Equal significance	=	=		=
DSO	p-value	1.3710%	96.3734%	51.0585%	0.3001%
	Coefficient	0.3017%	-0.0022%	-0.0271%	0.1097%
	Coefficient Sign	+	-	-	+
	Significant	✓	✗	✗	✓
	Equal sign		=		=
	Equal significance		=	=	
DPO	p-value	9.5406%	0.2849%	80.1402%	6.9241%
	Coefficient	-0.0072%	0.0050%	-0.0004%	-0.0024%
	Coefficient Sign	-	+	-	-
	Significant	✓	✓	✗	✓
	Equal sign		=	=	
	Equal significance		=	=	
CCC	p-value	12.6716%	1.0965%	67.5560%	7.8064%
	Coefficient	0.0066%	-0.0043%	-0.0006%	0.0023%
	Coefficient Sign	+	-	-	+
	Significant	✗	✓	✗	✓
	Equal sign				
	Equal significance			=	

India

		OR	GSM	AT	ROA
DIO	p-value	15.5819%	0.0004%	47.2693%	42.1437%
	Coefficient	-0.0243%	0.0434%	0.0200%	0.0064%
	Coefficient Sign	-	+	+	+
	Significant	✗	✓	✗	✗
	Equal sign	=	=		
	Equal significance	=	=		=
DSO	p-value	14.3737%	98.4875%	19.8304%	54.1010%
	Coefficient	-0.1177%	-0.0009%	0.1675%	0.0229%
	Coefficient Sign	-	-	+	+
	Significant	✗	✗	✗	✗
	Equal sign		=		
	Equal significance			=	
DPO	p-value	45.1530%	0.2270%	51.1260%	14.3474%
	Coefficient	0.0117%	0.0274%	-0.0165%	0.0104%
	Coefficient Sign	+	+	-	+
	Significant	✗	✓	✗	✗
	Equal sign		=	=	
	Equal significance		=	=	
CCC	p-value	2.2423%	41.0380%	12.9354%	55.4291%
	Coefficient	-0.0337%	0.0075%	0.0366%	-0.0041%
	Coefficient Sign	-	+	+	-
	Significant	✓	✗	✗	✗
	Equal sign				
	Equal significance			=	

Similarly to 5.1, in the US, liquidity, now measured by CCC, is negatively related to ROA, that is, when CCC increases ROA is expected to increase. The presence of low inventory levels reduces costs, losses, and damages. In order to increase profitability, US companies should increase the clients' credit period and decrease the number of days payable. In India, CCC does not have a significant relationship with ROA. In both countries there is the positive relationship between DPO and GSM. A higher DPO, associated to higher supplier credit and better ability to negotiate prices, leads to lower cost of goods sold. This is particularly important

during economic recessions, such as the US recession in 2008, and to emerging markets, such as the Indian pharmerging market.

5.3. Company size and Liquidity and Profitability Relationship

The US companies have a significant negative relationship between annual sales and CR (p-value=0.0009%). Annual sales have also a significant negative relationship with QR (p-value=0.0015%, b =-0.0028%). WC Turn, on the other hand, has a significant positive relationship with annual sales (p-value=0.686%, b =0.0033%). The correlation of this regression is 0.300, so, in absolute value it is lower than the correlation of the other two liquidity ratios, which is expected since annual sales increase by more than working capital. With Inv/WC there is not significant relationship. In India there is no evidence of a significant relationships between annual size and the liquidity ratios. Inv/WC is the most volatile liquidity measure in the considered period. Furthermore, the analysis considered the largest pharmaceuticals companies in the India and the US. These play a role in the lack of significant relationship between company size and Inv/WC. In the US, using the other liquidity measures it is accessed that as company size increases liquidity is expected to decrease. In both countries the results do not align with Prasad and Lakshimi (2018) findings, but prove the possibility set out by Price, Haddock, and Brock (2003).

In the US, annual sales are significantly positively correlated to OR (p-value=3.406%, b =0.0004%). In contrast, annual sales has a significant negative GSM (p-value=1.8082%). Since gross margin does not increase in the same proportion as the annual sales, the negative of this coefficient (-0.00018%) is expected. In the US pharmaceutical industry, company size is not significantly related with AT nor ROA. In India, there is a significant positive relationship between company size and GSM (p-value= 0.1069%, b =0.0033%). In contrast to the US, GSM increase as a result of the lower cost of goods sold/ annual sales, which has decreased 15.85% in comparison to 2013. These results match Gill, Bigger and Marthur (2010) research.

Table 6. Liquidity ratios and Profitability Proxies' relationship with Company Size

United States		CR	QR	WC Turn	Inv/WC
	p-value	0.0009%	0.0015%	0.6862%	17.1966%
	Coefficient	-0.0030%	-0.0028%	0.0033%	0.0003%
Annual Sales	Coefficient Sign	-	-	+	+
	Significant	✔	✔	✔	✗
	Equal sign				
	Equal significance				=

India		CR	QR	WC Turn	Inv/WC
	p-value	26.6037%	11.4488%	55.1825%	51.7824%
	Coefficient	0.0085%	0.0097%	-0.1081%	-0.0377%
Annual Sales	Coefficient Sign	+	+	-	-
	Significant	✗	✗	✗	✗
	Equal sign				
	Equal significance				=

United States		OR	GSM	AT	ROA
	p-value	3.4062%	1.8082%	80.9774%	10.8962%
	Coefficient	0.0004%	-0.0002%	0.0000%	0.0001%
Annual Sales	Coefficient Sign	+	-	+	+
	Significant	✔	✔	✗	✗
	Equal sign				=
	Equal significance		=	=	=

India		OR	GSM	AT	ROA
	p-value	57.1049%	0.1069%	99.4044%	61.4665%
	Coefficient	-0.0010%	0.0033%	0.0000%	0.0004%
Annual Sales	Coefficient Sign	-	+	-	+
	Significant	✗	✔	✗	✗
	Equal sign				=
	Equal significance		=	=	=

5.4. Recommendations

With losses of exclusivity expected and increased acceptability of generics, United States pharmaceutical companies should diversify the portfolio of products offered, namely by extending to the generic drugs market while investing in cost-efficient manufacturing processes to lower prices. However, to decrease the cost of goods sold/ annual sales ratio and increase GSM, the price fall should not surpass the unit cost decrease. As healthcare cost decreases, customer demand increases and the gap with supply diminishes. This would allow less dependency on government regulations and lead to an operational risk decrease (OR increase). Price on branded pharmaceuticals could be maintained or even increased since there would always be demand for the type, particularly in rich countries, and the effect on the non-branded pharmaceuticals would be enough to sustain the stable finances companies have built. This would mitigate the expected CAGR slowdown in the developed countries pharmaceutical's market. Taking into consideration the strong reputations and bargaining power over suppliers, the effect of liquidity on profitability is no longer as significant.

Most of the Indian pharmaceutical companies deal with liquidity issues due to inefficient working capital management. The financial instability associated with market and economic volatility marks the importance of maintaining a low CCC to decrease risk (increase OR ratio). By joining the better accessibility with the investment in Salesforce and marketing,

to increase acceptability, customer demand is expected to increase. With higher market share, and stronger finances Indian companies can increase supplier bargaining power and the average payment period. Even with lower prices, by sustaining a low production and skilled labour cost they are able to rise average inventory to supply in a sudden expand demand situation, without spiking the low cost of goods sold/ annual sales ratio, nor sacrificing finances. Moreover, the barriers of entry are expected to raise due to the sales force, marketing, and cost efficiency investments new companies would need to support. Therefore, the increase in DPO and DIO induces the increase in GSM. Although the effect of DIO on GSM is similar positive in both countries, it is stronger in India. Finally, an improved working capital management, with higher liquidity, provides less volatility in adverse environments and leads to an increase in the ROA.

6. Conclusion

This research aimed to understand the liquidity and profitability relationship, and how epidemiological and economic factors influence it. The countries analysed were India and the United States, and the period of analysis ranges from 2013 to 2017. In both countries, there is a significant relationship between liquidity and profitability. In the US, when liquidity (liquidity ratios and CCC) increased return on assets decreased; this is possibly due to the matured market mainly composed of companies with strong brand-equity and bargaining power companies. In India, higher ROA is achieved through higher liquidity levels. Although in India Cash Conversion Cycle does not have a direct influence on ROA, maintaining it at a low level is vital to decrease operational risk. The early maturity stage and the unclear distinction between local players and multinational companies may justify the non-consensus around the possible relationships with company size.

In India, the positive relationship between liquidity and ROA reveals the importance of increasing working capital efficiency. Managers should evoke new market opportunities, such as patents, public health, and vaccines, while establishing collaborations with stakeholders, seek

a balance between liquidity position and profitability rates, and improve companies' organization. For market leadership, investment in salesforce, commercial operations, as well as marketing, is recommended there. In the US, exclusivity losses are expected, managers should leverage on the companies' market positioning to diversify the portfolio of products offered, namely by extending to the generics market. With the costs efficient processes investment, they could be able to lower prices, without sacrificing product margins, particularly with elastic demand. Ultimately, this would increase customer reach and boost revenues.

There were some limitations encountered in the research. Firstly, it considers distinct fiscal years (1st January till 31st December and 1st April till 31st March) meaning that external variables, such as environmental conditions, government policies (specific to that particular period) and seasonality, may slightly bias the analysis. Moreover, the fact that financial reporting standards in use differ in the two countries may exert an impact on the final results.

This research only extends to the US and India pharmaceuticals markets. However, with the accelerated growth in the pharmerging markets it would be interesting to explore the Tier I has and is expected to progress in the following years while addressing the liquidity role. The forecast future branded and generics' revenues based on the previous years' evolution as well as the impact of the different financial reporting regulations are also topic left as suggestions for future research.

References

Almeida, Rui. 2016. "The Relationship between Liquidity and Profitability in the Food & Beverage Industry, Evidence from Europe and United States". Master thesis' work project. Nova School of Business and Economics.

Amarjit, Gill, Nahum, Bigger, and Neil Mathur. 2010 "The Relationship between Working Capital Management and Profitability: Evidence from the United States" B*usiness of Economics Journal*, 10.

Bhutto, Niaz A., Abbas, Ghulam, Rehman, Mujeeb, and Shah, Syed M. M. 2011. "Relationship of Cash Conversion Cycle with Firm Size, Working Capital Approaches and Firm's Profitability: A Case of Pakistani Industries" *Pakistan Journal of Engineering and Applied Sciences*, 1 (2): 45-64.

Bhunia, Amalendu, and Khan, Islam Uddin. 2011. "Liquidity Management Efficiency of Indian Steel Companies (A Case Study)". *Far East Journal of Psychology and Business*, 3 (3).

Bolek, Monika. 2013. "Dynamic and Static Liquidity Measures In Working Capital Strategies". *European Scientific Journal*, 9 (4).

Charneca, Diogo. 2013. "Operating Profitability in Branded Pharmaceutical Firms". Master thesis' work project. Nova School of Business and Economics.

Cole, Nicolas. 1991. *"*When The Numbers Do Not Add Up". *Director*, 44 (6): 61-68.

Deloitte. 2018. "2018 Global Life Sciences Outlook" *Innovating Life Sciences in the fourth industrial revolution: Embrace, Build, Grow.*

Deloitte. 2018. "A Roadmap to Accounting for Noncontrolling Interests", 1.

Deloof, Mark (2003). Does Working Capital Management Affect Profitability of Belgian Firms?" *Journal of Business Finance Accounting*, 30 (3-4): 573-588.

Duddu, Praveen. 2017. "US Pharmaceutical Market Projected to Grow at CAGR of 4.4% up to 2020". *Pharmaceutical Technology.* https://www.pharmaceutical-technology.com/research-reports/researchreportreport-us-pharmaceutical-market-projected-to-grow-at-a-cagr-of-44-up-to-2020-5720032/ (Accessed October 6, 2018).

Eljelly, Abuzar M. 2004. "Liquidity – Profitability Tradeoff: An Empirical Investigation in an Emerging Market". *International Journal of Commerce and Management*, 14 (2): 48-61.

Ellis, Lisa. 2017. "Snapshot of the American Pharmaceutical Industry." *The Nutrition Source*. https://www.hsph.harvard.edu/ecpe/snapshot-of-the-american-pharmaceutical-industry/ (Accessed September 30, 2018).

Finnerty, J. E. 1993. "Planning Cash Flow". *American Management Association.*

Hetal. T. 2017. "Liquidity Performance Analysis of Selected Pharmaceutical Companies: A Comparative Study" *Abhinav National Monthly Refereed Journal of Research in Commerce & Management*, 6 (9) 31-37.

Huebsch, Russell. 2016. "Actions a Business Might Take when Experiencing Cash Flow Problems" *Houston Chronicle.* https://smallbusiness.chron.com/actions-business-might-experiencing-cash-flow-problems-4919.html. (Accessed November 24, 2018)

Indian Brand Equity Foundation. 2018. "Indian Pharmaceutical Industry". https://www.ibef.org/industry/pharmaceutical-india.aspx (Accessed September 15, 2018).

Institute for Health Metrics and Evaluation. 2017. "United States". http://www.healthdata.org/united-states (Accessed November 10).

International Federation of Pharmaceutical Manufacturers & Associations. 2017. "The Pharmaceutical Industry and Global Health".

IQVIA. 2017. "Prescription Medicines Trends: An Overview and Perspective on Two Therapy Areas".

IQVIA. 2018. "2018 and Beyond: Outlook and Turning Points".

Kamath, R. 1989. "How Useful are Common Liquidity Measures?" *Journal of Cash Management*, 9 (1): 24-28.

Lazaridis, Ioannis, Tryfonidis, Dimitrios. 2006. "Relationship between Working Capital Management and Profitability of Listed Companies in the Athens Stock Exchange" *Journal of Financial Management and Analysis*, 19 (1): 19-25.

Mathuva, David M. 2010. "The Influence of Working Capital Management Components on Corporate Profitability/ a Survey on Kenyan Listed Firms" *Research Journal of Business Management*, 4 (1): 1-11.

McKinsey & Company. 2010. "India Pharma 2020 Propelling Access and Acceptance, Realising True Potential" *Pharmaceutical and Medical Products Practice.*

Moss, Jimmy D., and Stine, Bert. 1993 "Cash Conversion Cycle and Firm Size: A Study of Retail Firms", *Managerial Finance*, 19 (8): 25-34.

Mushtaq, Mohmad K., Safiuddin, Syed K. 2016. "Liquidity and Profitability Performance Analysis of Select Pharmaceutical Companies" *International Journal of Science and Technology and Management*, 5 (1): 167-177.

Nichols, Hannah. 2017. "The Top 10 Leading Causes of Death in the United States" *Medical News Today*. https://www.medicalnewstoday.com/articles/282929.php (Accessed October 6, 2018).

Ofoegbu, Grace N., Duru, Ann N., Onodugo, Vincent. 2016. "Liquidity Management and Profit Performance of Pharmaceutical Manufacturing Firms Listed in Nigeria Stock Exchange" *International Journal of Management Sciences and Business Research*, 5 (7): 1-13.

Panigrahi, Ashok K., Namita, Raul, and Gijare, Chaitrali. 2017. "Liquidity Analysis of Selected Pharmaceutical Companies: A Comparative Study". *Journal of Management & Entrepreneurship*, 12 (3): 26-53.

Pearl, Robbert. 2018. "4 Regulations That Would Terrify U.S. Drug Companies Ahead of the 2018 Midterms". *Forbes*. https://www.forbes.com/sites/robertpearl/2018/07/16/drug-companies/#712f97371e41 (Accessed November 20, 2018).

Prasad, R.Siva Rama, Lakshmi, B.Hima. 2018. "Working Capital Analysis of Indian Pharmaceutical Industry-A Study on Selected Companies" *International Journal of Sustainable Development Research,* 3 (1): 20-28.

Price, J. E.; Haddock, M. D.; and H.R. Brock. 2003. *College Accounting* (Tenth Edition), Irwin; McGraw-Hill.

Raghava, Prabha. 2018. "Pharma Exports Can Cross $20 Bn by 2020: Chief Of Pharmexcil". *The Economic Times*.https://economictimes.indiatimes.com/industry/healthcare/biotech/pharmaceuticals/pharma-exports-can-cross-20-bn-by-2020-chief-of-pharmexcil/articleshow/64055966.cms (Accessed September 30, 2018).

Raheman, Abdul, and Nasr. , Mohamed. 2007. "Working Capital Management and Profitability – Case of Pakistani Firms" *International Review of Business Research Papers*, 3 (1): 279-300

Reportlinker. 2018. "Pharmaceutical Drugs Global Market Opportunities And Strategies To 2021".. https://www.reportlinker.com/p05482362/Pharmaceutical-Drugs-Global-Market-Opportunities-And-Strategies-To.html (Accessed October 13, 2018).

Sagner, James S. 2001. "Working Capital: A Modern Approach" *Financial Executive.*

Shin, H. H., and Soenen, L. 1998. "Efficiency of Working Capital and Corporate Profitability". *Financial Practice & Education*, 8(2): 37–45.

Statista. 2016 "Top 10 Generic Pharmaceutical Companies Worldwide by Value as of 2016 (in Billion U.S. Dollars)". https://www.statista.com/statistics/596768/top-generic-pharmaceutical-companies-by-value-worldwide/ (Accessed September 7, 2018).

Statista. 2017. "Share of Pharmaceutical Revenue Worldwide in 2017, by Country". https://www.statista.com/statistics/784420/share-of-worldwide-pharma-revenue-by-country/ (Accessed September 14, 2018).

Statista. 2018 "BRIC Countries: Gross Domestic Product (GDP) Per Capita in Current Prices from 2012 to 2022 (In U.S. Dollars)". https://www.statista.com/statistics/741745/gross-domestic-product-gdp-per-capita-in-the-bric-countries/ (Accessed October 6, 2018).

Statista. 2018 "U.S. Pharmaceutical Industry - Statistics & Facts". https://www.statista.com/topics/1719/pharmaceutical-industry/ (Accessed September 7, 2018).

Statista. 2018. "Global Pharmaceutical Sales from 2015 to 2017, By Region (In Billion U.S. Dollars)". https://www.statista.com/statistics/272181/world-pharmaceutical-sales-by-region/ (Accessed October 6, 2018).

Uyar, Ali. 2009. "An Analysis of Graphic Disclosure in Annual Reports: The Case of Turkey", *Managerial Auditing Journal*, 24 (5): 423-444.

Vijayalakshmi, V., and Srividya, M. 2015. "A Study on Working Capital Management of Pharmaceutical Industry in India" *Journal of Management and Science,* 5 (3): 59-80.

Viswanathan, M., Palanisamy, A., and Mahesh, R. 2016. "A Comparative Study on Working Capital Management of Selected Pharmaceutical Companies in India" *International Journal of Management & Social Sciences*, 3 (3): 499-511.

XE Currency Converter. 2018. "XE Currency Converter". https://www.xe.com/currencyconverter/ (Accessed October 16, 2018).

World Bank. 2018. "World Bank Open Data". https://data.worldbank.org/ (Accessed October 5, 2018).

Appendix 1. Initial and Final Sample with exclusion criteria

Companies	Country	Exclusion Reasons
Johnson & Johnson	**United States**	
Pfizer	**United States**	
AbbVie	**United States**	
Merck & Co.	**United States**	
Amgen	United States	Biotechnology Company
Bristol-Myers Squibb	**United States**	
Abbott Laboratories	**United States**	
Gilead Sciences	United States	Biotechnology Company
Eli Lilly & Co	**United States**	
Celgene	United States	Biotechnology Company
Biogen	**United States**	
Stryker Corporation	**United States**	
Regeneron Pharmaceuticals Inc	**United States**	
Illumina	**United States**	
Vertex Pharmaceuticals	**United States**	
Zoetis	United States	Animals Pharmaceutical
Mylan	**United States**	
Alexion Pharmaceuticals	**United States**	
BioMarin	**United States**	
Incyte	**United States**	
Sun Pharmaceutical	**India**	
Lupin Ltd	**India**	
Dr. Reddy's Laboratories	**India**	
Cipla	**India**	
Aurobindo Pharma	**India**	
Zydus Cadila Healthcare	**India**	
Piramal Enterprises	**India**	
Glenmark Pharmaceuticals	**India**	
Torrent Pharmaceuticals	**India**	
Alkem Laboratories	India	2012 non available accounts
Biocon Ltd.	**India**	
Ipca Laboratories	**India**	
Shangai Pharmaceuticals	China	Non available English reports
Sinopharm Group	China	Non available English reports
Jiangsu Hengrui Medicine	China	Non available English reports
Shangai Fosun Pharmaceuticals	China	Non available English reports
Huadong Medicine	China	Non available English reports
Yunnan Baiyao Group	China	Non available English reports
Guangzou Pharmaceutical	China	Non available English reports
Harbin Pharmaceutical	China	Non available English reports
China Meheco	China	Non available English reports
Kangmei Pharmaceutical	China	Non available English reports
Roche	Switzerland	Non US/India
Novartis	Switzerland	Non US/India
Novo Nordisk	Denmark	Non US/India
Sanofi	France	Non US/India
Bayer	Germany	Non US/ India; Biotechnoly company
GlaxoSmithKline	United Kingdom	Non US/India
AstraZeneca	United Kingdom	Non US/India
Allergan	Ireland	Non US/India
Shire Pharmaceuticals	Ireland	Non US/India
Takeda Pharmaceutical	Japan	Non US/India
Astellas	Japan	Non US/India
Daiichi Sankyo	Japan	Non US/India

A Work Project presented as part of the requirements for the Award of a Master Degree in

Management from the NOVA – School of Business and Economics

THE RELATIONSHIP BETWEEN LIQUIDITY AND PROFITABILITY IN THE

PHARMACEUTICAL INDUSTRY

A COMPARISON BETWEEN INDIA AND THE UNITED STATES

SUPLEMENTARY ANNEXES

MARIA LUÍS BENTO DE ALMEIDA AGUIAR DE VASCONCELOS

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4TH JANUARY 2019

Supplementary Annexes:

This section incorporates all the supplementary annexes indicated throughout the main text that not mandatory to understand the thesis.

Annex 1: Types of pharmaceuticals marketed description

Branded pharmaceuticals include all the company's pharmaceutical products that have held (or currently hold) official patents. In other words, they hold exclusive right of producing or marketing it. Moreover, they tend to lever mainly on company's reputation, knowledge, and endorsements by professionals and hospitals. The four categories it incorporates are biologics, emerging therapies, small molecules, and vaccines.

Generics have never held exclusive official patent over a pharmaceutical. By having the same active ingredients, they work similarly and meet the same standards that branded pharmaceuticals have too. Meanwhile, due to the lack of inherent branding, they are less expensive than *Branded* pharmaceuticals.

Biosimilars are identical "copies" of another product produced by another company. Similarly to generics, they have never held exclusive patents to products. They can only be produced once the patent expires and are approved by the original producer company. Consequently, although having higher levels of profitability, they have a riskier profile than generics as well as lower development costs and pipeline failure than branded products.

Annex 2: Profitability Definitions

The measure of profitability chosen is the Return on Assets (ROA). ROA shows how efficient is the company in converting its assets into earnings, and it is commonly used to compare companies within the same industry. A higher ROA is the companies' objective. Through the DuPont decomposition method ROA is split into three components: Operational Risk, Gross Sales Margin, and Asset Turnover.

$$ROA = \frac{EBIT}{Total\ Assets} \Longleftrightarrow ROA = OR \times GSM \times AT$$

Operational Risk (OR) is a measure of leverage incurred during the company's operations, and accesses the fixed costs effect. The decrease in this ratio is associated to higher risk and lower ROA.

$$Operational\ Risk = \frac{EBIT}{EBITDA}$$

Gross Sales Margin (GSM) is a measure of how much of the sales generated is the company able to absorb. A higher GSM indicates that the company is profitable in its sales.

$$Gross\ Sales\ Margin = \frac{Sales - COGS}{Sales}$$

Asset Turnover (AT) is a measure of the efficiency of the company in converting assets into revenue. A higher ratio means that the company is able to generate a certain level of revenue without requiring a high level of assets.

$$Asset\ Turnover = \frac{Sales}{Total\ Assets}$$

Annex 3: Liquidity Ratios Definitions

Liquidity Ratios are financial measures to evaluate the company's ability to meet its current liabilities. They not allow for comparisons between companies of different sizes and currencies, they simplify accounting statements, and help managers understand the impact of the decisions made relatively to the previous period. The most commonly used liquidity ratios are the currency ratio, quick ratio, inventory to net working capital ratio, and working capital ratio.

The Current Ratio exposes to which extent the company is able to meet its current liabilities with its current assets. Current Ratios below 1 indicate that the company may incur problems in repaying its liabilities. High current ratios may indicate lack of efficiency in the use of current assets. Ultimately, the current ratio adopted may also depend on the industry concerned[26].

$$Current\ Ratio = \frac{Current\ Assets}{Current\ Liabilities}$$

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[26] For instance, airline companies tend to have current ratios below 1.

The Quick Ratio, the Acid Test Ratio, also seeks to understand how the company is able to take advantage of its current assets to pay its debtors. However, it does not consider inventories to be readily transformed into cash, therefore, deducting it from the current assets sum. Hence, the quick ratio, may be regarded as a more conservative approach.

$$Quick\ Ratio = \frac{Current\ Assets - Inventories}{Current\ Liabilities}$$

The Working Capital Turnover Ratio is a measure of working capital effectiveness, exploring the relationship between the company's resources and its revenues. Generally, higher ratio indicates more effectiveness in working capital management, without much need of additional funding. However, if the working capital ratio assumes a value that is extremely high, it may be an indication that the company is unable sustain sales out of its capital, and in the near future it may incur insolvency issues[27].

$$Working\ Capital\ Turnover\ Ratio = \frac{Annual\ Sales}{Working\ Capital}$$

The Inventory to Net Working Capital Ratio shows how a company is able to finance its inventories based on the readily available funds. Typically, more specifically for companies that hold higher levels of inventory, a low ratio indicates higher liquidity. Similarly, they majorly diverge depending on the industry concerned.

$$Inventory\ to\ Net\ Working\ Capital\ Ratio = \frac{Inventory}{Working\ Capital}$$

Annex 4: Cash Conversion Cycle Definitions

The Cash Conversion Cycle, also known as Cash Gap, measures the time in days it takes for a company to convert the resources invested into cash receipts obtained from sales of products or services provided. It is, therefore, used to analyse different working capital management strategies. Usually, a higher CCC is correlated to poor working capital management, and

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[27] When due the company is not able to meet its debt obligations.

consequently, companies look to decrease the CCC period. The cash conversion cycle may be decomposed in three segments:

$$CCC = DIO + DSO - DPO$$

In order increase working capital efficiency companies should not only aim to control one of the components (often the final effects do not align with the management goals). Accordingly, the goal is to manage a balance between the three variables.

Days Inventory Outstanding (DIO) measures the time length, in days, the company holds its inventory before being able to generate sales from it. Therefore, a lower DIO is associated with shorter period to turn inventory into sales, and, thereby, higher liquidity. Although desirable, DIO are more attainable in cases where demand has a predictable nature, and it is highly correlated to seasonality (for instance, flu vaccines). In that case, working capital management adjusts to suit the consumer needs, without the need of holding excessive inventory that may be perishable after a long term.

$$DIO = \frac{Average\ Inventories}{COGS} \times 365$$

Days Sales Outstanding (DSO) measures the time length, in days, between the sale and the moment that the company receives its payment. It is also used as a measure of customer satisfaction. Hence, typically companies seek to decrease their DSO. This may be achieved through early payment incentives, such as exclusive discounts or bundle discounts, and by widening its payment methods' range.

$$DSO = \frac{Average\ Accounts\ Receivable}{Annual\ Sales} \times 365$$

Days Payable Outstanding (DPO) measures the time length it takes for the company to repay its debtors. In common circumstances, companies seek to increase their DPO, which may be attained through better relationships with suppliers or renegotiations, as when sustaining the cash, they are able to increase revenues.

$$DPO = \frac{Average\ Accounts\ Payable}{Annual\ Sales} \times 365$$

Annex 5: Description of the India and the United States Pharmaceutical Markets

Sun Pharma (Indian Company) was considered to be the 4th highest value generic pharmaceuticals companies worldwide in 2016, Pfizer Established Pharma (US company) was the one with the highest estimated value (Statista, 2016). Currently, India is the largest generic provider in the world, supplying approximately 40% of the demand of generics in the US. In 2014, Generics were 76.15% of the Indian sales and originators were 9.85% (IPFMA, 2017). According to IQVIA (2018), by 2020 Indian pharmaceutical spending is expected to be split into: 15% original brands, 75% non-original brands, 7% other, and 3% unbranded. This pharmaceutical market has low concentration, with prices competition to gain market share. In the US, in 2014, originators constituted 72.96% of the total sales and generics constituted 21.14% (IPFMA, 2017). The early entrance and patents' issuance helped companies building strong reputations and market positioning (key strengths), generating larger companies, and consequently, higher market concentration. However, this position may be threatened with the 105 Billion USD expected losses of exclusivity between 2018 and 2022 (IQVIA, 2018).

The pharmaceutical markets are tailored towards addressing the population needs. In the US, 19% is between the ages of 0 and 14 years old, 66% between 14 and 64, and 15% is above or equal to 65%. Life expectancy in the US is approximately 79 years old (World Bank, 2017). The most deadly diseases are heart disease, cancer, chronic obstructive pulmonary disease, accident, Alzheimer's disease (Medical News Today, 2017). The aging population is the fundamental source of pharmaceutical spending. In 2017, GDP per capita was 59,531.7 USD. Assuming a 1.5% annual growth rate of GDP per capita (equal to the one in 2017) (World Bank, 2017), in 2022 GDP per capita is expected to be 64,132.55 USD. This means that, according to IQVIA 1.25% will be pharmaceutical spending. The high health insurance costs, aggravated by the increase in healthcare costs increase in comparison to insurance coverage (the deductible

cost increases more than the increase in insurance covered costs) (Deloitte, 2018), is the main challenge faced by patients in this country, particularly to low income families. This situation may worsen as, net price level is expected to rise 2-5% per year in the United States (IQVIA, 2018). Companies face strict regulations, mainly concerning price (for instance, Affordable Care Act), and quality (controlled by the Food and Drug Administration). The regulations impose, however, are not deemed as enough. Ideas such as the increase in prices in foreign countries, the obligation to presents prices in ads, the elimination of insurance company intermediaries, and the faster generics approval, could be helpful to tailor protection towards patients, rather than just companies (Forbes, 2018). Advantages are given to financially sustainable companies and/ or that commercialize orphan drugs, which may be seen as a barrier of entry to new companies not able to match the early entrants results, contributing also to higher market concentration. The US market is highly dependent on the government (its main customer), leading to higher environmental volatility.

In India, 28% of the total population is younger than 14 years old, 66% is between 14 and 64 years old, and 6% is older than 64 years old. Life expectancy is approximately 69 years old (World Bank, 2017). The most deadly diseases are Heart Disease, Chronic Obstructive Pulmonary Disease, Stroke, and Diarrheal diseases (Institute for Health Metrics and Evaluation, 2017). Some of the deadliest diseases are associated with poor sanitary conditions, such as lack of access to potable water. In 2017, GDP per capita was 1,939.6 USD (World Bank, 2017). Assuming a constant GDP per capita annual growth rate of 5.4% (equal to the one in 2017) GDP per capita is expected to be 2,522.99 USD in 2022. This means that, according to IQVIA 0.991% will be spent in the pharmerging markets. According to Statista (2018) it is expected that by 2022 the GDP per capita will reach 2,803.49 USD, so higher than by assuming 5.4% growth rate. A higher GDP growth increases disposable income, leading to higher healthcare spending. Meanwhile, India is recognised for having lower R&D labour costs, production costs,

and R&D costs. The lower production costs, the focus on generics, and the lower market concentration are responsible for the lower prices of products commercialized. The rise accessibility and acceptability of generics, combined with the higher purchasing power are important growth factors for the Indian pharmaceutical market.

The intense price competition and strict price regulations, although beneficial to patients, are deteriorating to the Indian companies' finances, particularly taking into consideration the presence of organised and disorganised players. If demand is not as elastic as the companies' expect it to be a decrease in price may not lead to an increase in sales proportionally. This would mean a decrease in revenue, and therefore in gross sales margin, asset turnover and Return on Assets. If on the other hand, the decrease in price leads to a disproportioned increase in demand companies' may not be able to supply it while maintaining solid finances. This is mainly due to the lack of proper infrastructure, and investment in sales force, marketing and commercial operations. The lack of product quality recognition in international markets may also be a problem if little to no investment is made on increasing product awareness. As a result, the inefficient working capital management leads to liquidity issues, the depreciation of liquidity ratios, and possibly an increase in cash conversion cycle.

Regarding market size, North America has the largest pharmaceutical drug market, being worth 341.1 Billion USD and a market share of 36.5% share (Reportlinker, 2018). It US holds 33% of the total revenues in the global market and 45% of global sales (Statista, 2017) (position which has been stable since 2015). The US CAGR is expected to be 4.4%, 0.1% higher than the expected North America CAGR, from 2015 to 2020 (Deloitte, 2018).

In 2015, emerging markets held 20% of global pharmaceutical sales. In 2017, they held 22% of global sales (Statista, 2017). In 2017, India held around 1% of total revenue in the pharmaceuticals market (Statista, 2017). If there is an economic slowdown or price controls, and no specific strategy was to be adopted, the market would potentially only reach 35 Billion

USD in 2020 (CAGR=10%). On the other hand, in favourable conditions and aggressive growth, the market's potential would be 70 Billion USD by 2020 (CAGR=17%). In 2020, the base scenario demonstrates that the Indian pharmaceuticals market is expected to reach 55 Billion USD (CAGR=14.5%). It is expected to be ranking at the top, being close 2nd next to the US, in terms of volume. The combination between value and volume proves the market potential in terms of therapy and treatments provided. Hence, in either scenario, this market would still be able to perform higher CAGR than the expected for Asia & Australasia (CAGR=5%). This growth would be attributed 46% by acceptability (main driver), 20% by affordability, 33% by accessibility, and 1% by epidemiological factors (McKinsey, 2010).

Annex 6: Conversion Rates at 31st March

	USD	INR
31/03/2018	1.000	65.137
31/03/2017	1.000	64.859
31/03/2016	1.000	66.175
31/03/2015	1.000	62.336
31/03/2014	1.000	60.059
31/03/2013	1.000	54.285

Annex 7: Companies Website and SEC fillings

Johnson & Johnson: https://www.jnj.com/about-jnj/annual-reports

Pfizer: https://investors.pfizer.com/financials/sec-filings/default.aspx

AbbVie: https://investors.abbvie.com/annual-report-proxy

Merck & Co: https://investors.merck.com/financials/annual-reports-and-proxy/default.aspx

Bristol-Myers Squibb: https://www.bms.com/investors/financial-reporting/annual-reports.html

Abbott Laboratories: https://www.abbottinvestor.com/financials/sec-filings

Eli Lilly & Co: https://investor.lilly.com/financial-information/annual-reports

Biogen: https://biogen.gcs-web.com/financials/annual-reports

Stryker Corporation: https://investors.stryker.com/financial-information/annual-reports/default.aspx

Regeneron Pharmaceuticals Inc.: https://newsroom.regeneron.com/financial-information

Illumina: https://www.illumina.com/company/investor-information/financial-information/sec-filings.html

Mylan: http://investor.mylan.com/financial-information/sec-filings

Alexion Pharmaceuticals: http://ir.alexion.com/financial-information/annual-reports

BioMarin: https://investors.biomarin.com/sec-filings

Incyte: https://investor.incyte.com/financial-information/sec-filings?field_nir_sec_date_filed_value=&items_per_page=50&__aavo=17395084215315229064#views-exposed-form-widget-sec-filings-table

Sun Pharma: http://www.sunpharma.com/investors/annualreports\

Lupin Ltd.: https://www.lupin.com/investors/annual-reports/

Dr. Reddy's Laboratories: http://www.drreddys.com/investors/reports-and-filings/annual-reports/

Cipla: https://www.cipla.com/en/investor-information/annual-reports.html

Aurobindo Pharma: https://www.aurobindo.com/investors/results-reports-presentations/annual-reports/

Zydus Cadila Healthcare: https://zyduscadila.com/financials

Piramal Enterprises: http://www.piramal.com/investor/financial-reports/annual-reports

Glenmark Pharmaceuticals: http://www.glenmarkpharma.com/investors/reports-presentation

Torrent Pharmaceuticals: http://www.torrentpharma.com/Index.php/investors/index

Biocon Ltd.: https://www.biocon.com/biocon_invrelation_annualreports.asp

Ipca Laboratories: https://www.ipca.com/financials.html