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# Analysis on the Predictability of Stock Prices

Tong, Billie

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UNIVERSITY OF CALGARY

Analysis on the Predictability of Stock Prices

by

Billie Wai Guit Tong

A THESIS

SUBMITTED TO THE FACULTY OF GRADUATE STUDIES  
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## **Abstract**

This thesis investigates if it is possible to forecast the intrinsic values of pipeline companies with precision. A widely accepted conjecture is that different valuation techniques yield the same intrinsic value for a given security. However, in practice the intrinsic values estimated using different valuation techniques differ, and in many cases the estimates differ substantially. This is usually because of the varying assumptions required in the different valuation techniques.

This thesis examines the conjecture by estimating the intrinsic values of three pipeline companies by applying three valuation techniques to each company. As pipeline companies are heavily regulated, it is expected that the alternative techniques will lead to similar estimates of each company's intrinsic value.

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## Introduction

This research is based on the conjecture that intrinsic values (i.e. the value that a sophisticated and rational investor with access to all relevant private and public information would place on a stock) for certain companies (e.g. pipeline) can be estimated with precision. It is important, because intrinsic values estimated for other companies may not be as precise because of greater amounts of guesswork.

The logic behind my research is as follows: Because of the unique business model and regulated nature of those companies, equity researchers can develop more precise pro-forma statements. As a result, higher quality estimates of intrinsic values are obtained. This in turn provides investors more accurate indications of when to buy (sell).

In my thesis, I assume that markets are inefficient<sup>1</sup>, which means that supply and demand may drive security prices above or below their fair values.

The challenge is how do I support my claim?

The ideal process is to compare the estimated intrinsic values with the actual intrinsic value across a wide range of companies. However, the problem is: the actual intrinsic value is unknown.

As a substitute, I build on the notion that intrinsic values estimated using different approaches, in theory yields the same estimates (i.e. the actual intrinsic value), given the inputs and the valuation model reflect reality. However the problem is what inputs and valuation models reflect reality? My solution is to justify the inputs and valuation model using economics, statistics, and (or) logic.

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<sup>1</sup> Inefficient security markets are essential to justify technical analysis (e.g. Lo and Hasanhodzic 2011; Sullivan, Timmermann, and White 1999; Balsara, Chen, and Zheng 2007; Lo and Mamaysky 2000).

My thesis can be broken down into three components. First is the overview, where I provide key information about the pipeline companies, industry, and other relevant topics. It is used to illustrate why, I believe equity researchers can estimate the intrinsic values for pipelines with greater precision. Second, I identify structural changes in key variables. Substantial structural changes will likely have significant impacts on the valuation process. For instance, if I identify a significant change in revenues and I believe the change is permanent, then I should not use historical data by itself to forecast the future. Lastly is the equity valuation component, where I estimate the intrinsic values for each company.

In my research, I identify structural changes through three channels. First, I examine changes and potential changes in Porter's 5 forces. Second, I conduct financial statement analysis. Specifically, I look at why each of the companies' ability to generate accounting profits has changed over time, whether it is feasible to use certain approaches to forecast key line items and the quality of the profits. Third, I examine whether there has been distinct changes in pattern that key variables (e.g. price) are changing over time.

There are many ways to estimate intrinsic values. The most common ways is to use the dividend discount model and relative valuation methods. In my research, I deviate from those methods because I feel that there are no good ways to justify the assumptions required (e.g. the growth rate in the DDM). In my research I choose to use: (1) Residual Income model, (2) Time Series Model, and (3) Autoregressive model. I used those models because I am confident I am able to justify the assumptions that have significant impact on the valuation process.

I proceed by identifying structural changes, and finish with equity valuation. I chose this order because the former components assist in analyzing the latter components. I also include an appendix, where I provide a broad overview of the industry, companies, and other relevant topics.

## **Chapter 1: Identifying Structural Changes**

In this chapter, I will be identifying structural changes through three channels. First, I examine whether there has been changes in Porter's 5 forces. Second, I conduct financial statement analysis to see whether there has been a permanent change in each of the companies' ability to generate net income over the long-run. Lastly, I examine visually whether there are structural changes in key variables.

### **1.1 Changes in Porter's 5 Forces**

Changes in any of the Porter's 5 forces will affect an industry's attractiveness and profitability. When one of the 5 forces changes it is important that a company has positioned itself to take advantage of the change. Changes in one of the forces will likely result in a structural change, which may have a permanent effect on the companies' intrinsic value. Hence, will have an impact on the valuation process of a company's stock. In this section, I analyze the most prominent changes in the 5 forces.

#### **1.1.1 Changes in Threat of New Entrants**

Barriers to entries are high only for pipelines. Pipelines companies must go through long regulatory processes to build new infrastructure, or/and expand their existing capacity. Rail on the other hand do not face similar long and through regulatory processes as pipelines. Complaints about rail companies facing no regulatory hurdles<sup>2</sup> for transporting WCSB to markets have been made, but little has been done.

There have not been significant changes in the threat of new entrants over the past few years (i.e. no structural change).

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<sup>2</sup> See news article – No regulatory approval needed for moving tar sands oil by rail



### 1.1.2 Changes in Threat from Substitutes

Tolls associated with pipeline crude transportation historically has averaged about \$5 per barrel, whereas tolls associated with Rail crude transportation has been in the \$10-\$15 per barrel neighborhood. However, in the recent years rail capacity for crude transportation has increased at a very rapid rate. This may allow rail companies to realize significant Economies of Scale, which increases the profitability of the rail company, and may lower prices depending on the source of Economies of Scale. If the source reduces the cost of an additional barrel of crude transported, then tolls should fall.

Church and Ware (2001) argues that Economies of scale (i.e. decreasing long run average cost) occurs because of indivisibilities. Indivisibilities arise when it's not possible to reduce inputs in the same proportions as output. In the case of rail, regardless of how little volume of crude shipped by a rail company, it still needs a right-of-way, two rails, one engineer, and a locomotive. The cost of those assets do not increase with output until the assets are at their limit, hence increasing output over the range in which the assets are below their limit, reduces average cost. In the case of rail there would also be fixed setup costs such as installation, planning, and designing.

In addition, at low levels of volume of crude transported, the Rail companies may need one locomotive and one back up unit, but at higher levels of output they may need two locomotives but only one back up unit because the probability of both locomotives breaking down simultaneously is small. Rail companies can also benefit from volumetric returns to scale, that is the containers holding the crude depends on volume, but the costs depends on surface area. Doubling the surface area of the crude container, roughly doubles the cost, but more than doubles the volume, as a result average cost

declines at higher levels of crude transported. Both of those sources would reduce the additional cost of transporting a barrel of crude via train.

However, companies growing in size may not always result in lower average costs. There may be control, co-ordination, or/and co-operation problems. When there are hundreds or thousands of employees to monitor the quality and productivity of output may be difficult to manage. There may be lockouts, strikes, and absentism because of the monitoring problem. As a result doubling the factors of production (e.g. labour and capital) will lead to a less than a two fold increase of crude transported. If this is the case for rail companies, the additional cost of transporting a barrel of crude oil may increase, and average costs would increase, hence reducing the profitability of the company and leading to higher prices. Rail companies may have difficulties coordinating across intermodal terminals, ports, and destination there may also be troubles in coordinating tolling schedules. It is costly to manage transportation contracts with hundreds of customers, and this reduces productivity. Employees in a large company may not consider themselves as important, hence lowering the employees' productivity. Those problems have the tendency to increase the cost of transporting an additional barrel of crude, resulting in lower profitability for the firm and higher tolls.

If railways continue to expand and are able to solve the managerial problems, it is likely that railway tolls would decrease, and if the decrease brings their tolls closer to the region of pipeline tolls then the threat of substitution would be high. The effect may be offset if the demand for crude transportation continues to increase, and should be temporarily offset if crude pipelines have long-term agreements with shippers.

It is unlikely that rail is able to solve the managerial problems, specifically congestion related problems that arise from have a greater number of rail.

In summary, there has been rapid growth in the rail industry over the past few years; however, it is not likely to be a concern for pipelines.

### **1.1.3 Changes in Rivalry**

Changes in the number of firms competing within a given industry will typically make price competition more intense. International and interprovincial pipelines in North America are regulated utilities, the tolls that pipeline companies charge are in theory just sufficient to cover their costs and allow shareholders a reasonable rate of return with some minor variations depending on the tariff approved by regulators. Since pipelines have no pricing power, there is no pricing competition among pipelines. Rail on the other hand is not regulated based on cost. They are able to profitably raise price above competitive level on the demand that remain after subtracting industry demand by pipeline capacities in a given industry.

In summary, the increase in competition does not appear to be sufficient to affect the pipeline companies' ability to generate revenues.

## **1.2 Identifying Structural Changes Via Financial Analysis**

In this section, I conduct financial analysis on each of the companies. This is useful because this analysis will help identify structural changes. For instance, if through analyses I find that a company's profits is declining and the most prominent root cause is that the company needs to apply for new rates. I can forecast when the company will apply for new rates and if I believe that the new rates will have a sustainable and significant impact on the company's financials, then I would conclude that a structural change has occurred and I would need to make adjustments to my current financial model.

## Financial Statement Adjustments for Analytical Purposes

When analyzing the financial statements I make several adjustments to obtain a better idea of the financial performance and position. I eliminate the effects of capitalizing interests by removing the interest that was capitalized throughout the period and instead expensed it via interest immediately; modified the assets and shareholder equity to adjusted for the change in accounting treatments; and reclassified the treatment of cash outflow and inflows in lieu of this change. I do this because interest is an obligation that companies are obligated to pay, and by performing the adjustment will provide a better measure of the economic position of the company, especially when computing solvency measures.

Operating leases are an off-balance sheet form of financing, but for determining the financial position of the company, I performed adjustments to convert the leases as if it were on balance sheet financing. Traditionally, the methods to perform the adjustment is to either use the interest rate used in the company's lease calculation or to back out the interest rate using capital leases and obtain the presented discounted value of the operating leases using either interest rate. However, neither option is available.

I analyze each of the companies' financials to see if there are inappropriate classifications of investments into associates using the equity method, when they should be classified as investments in financial assets using available for sale or available for trading, because this would likely artificially boost a company's earnings given that the investees are profitable. For joint ventures the equity method is almost always the method used, hence explains why each of the companies uses the equity method. Thus there shouldn't be a concern for management artificially inflating earning (given that the

investees are profitable) by classifying investments using the equity method instead of alternative methods.

I make adjustments on items derived from the defined benefit contribution plans to improve the identification of the companies' economic performance and position. I replaced gross pension assets (liabilities) with net pension assets (liabilities), because the only use for plan assets is for meeting the pension benefit obligations. So if the plan assets exceeds the pension benefit obligations the difference should adjust in the future, but the only benefit in the future is the amount that the asset exceeds the pension benefit obligations.

### 1.2.1 Enbridge

**Table 1: Selected Financial Data - Enbridge**

<i>\$ in millions CAD</i>	<i>2009</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Income Statement</b>						
<b>Total Revenue</b>	12466	15127	27053	24660	32918	<b>37641</b>
Operating Income	1261	1506	2631	1594	1365	<b>3200</b>
Interest Expense	597	687	928	841	947	<b>1129</b>
Equity In Earnings of Affiliate/Joint Ventures	(198)	(38)	(210)	(195)	(330)	<b>(368)</b>
<b>Net Income</b>	1562	970	833	707	629	<b>1405</b>
<b>Balance Sheet</b>						
<b>Total Assets</b>	28169	30220	41494	46800	57568	<b>72857</b>
Accounts Receivable - Affiliates/Non-Trade	--	--	55	12	65	<b>241</b>
<b>Total Shareholders Equity</b>	7261	7565	7483	10246	13496	<b>16786</b>

**Table 2: 5 Stage DuPont Analysis - Enbridge**

	Tax Burden	x	Interest Burden	x	EBIT Margin	x	Asset Turnover	x	Financial Leverage	=	ROE
10	118%		54%		9%		51%		394%		13%
11	48%		64%		9%		75%		394%		9%
12	59%		74%		6%		28%		498%		4%
13	102%		44%		4%		36%		440%		3%
14	<b>64%</b>		<b>67%</b>		<b>9%</b>		<b>58%</b>		<b>431%</b>		<b>9%</b>

**Table 3: Extended 5 Stage DuPont Analysis (Excluding equity income and investment asset) - Enbridge**

	Tax Burden	x	Interest Burden	x	EBIT Margin	x	Asset Turnover	x	Financial Leverage	=	ROE
10	114%		54%		10%		52%		394%		13%
11	37%		65%		10%		76%		394%		7%
12	68%		47%		6%		56%		367%		4%
13	72%		31%		4%		63%		337%		2%
14	<b>48%</b>		<b>68%</b>		<b>9%</b>		<b>58%</b>		<b>431%</b>		<b>7%</b>

I analyze Enbridge's ability to generate net income (see table 1) by breaking return on equity into 5 components (a common method that analysts use). I then examine each of the 5 components (see table 2) to determine which part of the firm has been affecting the company's ability to generate net income the most.

If I have reason to believe that the change is permanent (i.e. structural change), then I would need to take the impact into account in the valuation process.

The extended DuPont Analysis (see table 3), incorporates a couple of adjustments: (1) Reducing Net Income by Equity Income, and (2) Total assets used in the Total Asset Turnover calculation is lowered by the beginning and ending Account Receivables of Affiliates/Non-trades.

The financial leverage was not altered because without further information, the capital structures of the affiliates are assumed to be the same as the parent. By

subtracting the equity income from Enbridge's net income and the investment asset from total asset turnover, I can analyze Enbridge's performance per se. Relative to the ROEs provided in the unadjusted DuPont Analysis, the ROE in the adjusted DuPont analysis is smaller.

The return to equity is a measure that quantifies how profitable a firm is by comparing earnings with shareholder equity. The better management is in using the equity base the greater the return is to investors. The ROE for Enbridge from 2010 to 2013 appears to be trending down significantly. Mostly because of the downward trends in Interest Burden, EBIT Margin, Financial Leverage, and periodical changes in Tax burden. The ROE in 2014 improved considerably from 2012 and 2013 levels, but a large portion of it is due to investment in equity. Interest burden is a measure that indicates the proportion of operating income retained after paying interests. EBIT Margin is roughly the proportion of revenue retained after paying COGS, Selling General and Admin, depreciation and amortization. Financial leverage is the average the amount of assets that arises from an additional dollar of shareholder equity. The tax burden is the amount of profits the company keeps after paying taxes. I will further investigate the various components using both vertical and horizontal common size income statements, to identify the root cause of the reduction in return on equity.

In summary, I have identified a few components that I would like to examine in greater detail. At this point, I cannot determine whether there are structural changes that I need to take into account during the valuation process.

**Table 4: Selected Items Vertical Common Size Income Statement - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>%Rev</i>	<i>2012</i>	<i>%Rev</i>	<i>2013</i>	<i>%Rev</i>	<i>2014</i>	<i>%Rev</i>
<b>Revenue</b>								
Commodity sales	20374	76.1%	18494	75.0%	26039	79.1%	28281	75.1%
Gas distribution sales	1906	7.1%	1910	7.7%	2265	6.9%	2853	7.6%
Transportation and other	4509	16.8%	4256	17.3%	4614	14.0%	6507	17.3%
<b>Total Revenue</b>	<b>26789</b>		<b>24660</b>		<b>32918</b>		<b>37641</b>	
<b>Operating Expenses</b>								
Commodity	19627	73.3%	17959	72.8%	25222	76.6%	27504	73.1%
Gas distribution cost	1281	4.8%	1220	4.9%	1585	4.8%	1979	5.3%
Operating and administrative	2259	8.4%	2739	11.1%	3014	9.2%	3281	8.7%
Depreciation and amortization	1147	4.3%	1236	5.0%	1370	4.2%	1577	4.2%
Environmental costs, net of recoveries	(116)	(0.4%)	(88)	(0.4%)	362	1.1%	100	0.3%
<b>Total Operating Expense</b>	<b>24198</b>	<b>90.3%</b>	<b>23066</b>	<b>93.5%</b>	<b>31553</b>	<b>95.9%</b>	<b>34441</b>	<b>91.5%</b>
<b>EBIT</b>	<b>2591</b>	<b>9.7%</b>	<b>1594</b>	<b>6.5%</b>	<b>1365</b>	<b>4.1%</b>	<b>3200</b>	<b>8.5%</b>
Income from equity investments	233	0.9%	195	0.8%	330	1.0%	368	1.0%
Other income/(expense)	116	0.4%	238	1.0%	(135)	(0.4%)	(266)	(0.7%)
Interest expense	(928)	(3.5%)	(841)	(3.4%)	(947)	(2.9%)	(1129)	(3.0%)
<b>EBT</b>	<b>2012</b>	<b>7.5%</b>	<b>1186</b>	<b>4.8%</b>	<b>613</b>	<b>1.9%</b>	<b>2173</b>	<b>5.8%</b>



**Table 5: Selected Items Horizontal Common Size Income Statement - Enbridge**

<i>\$ in millions CAD</i>	<i>2011 Values</i>	<i>2012 %change</i>	<i>2013 %change</i>	<i>2014 %change</i>
<b>Revenue</b>				
Commodity sales	20374	(9%)	28%	39%
Gas distribution sales	1906	0%	19%	50%
Transportation and other services	4509	(6%)	2%	44%
<b>Total Revenue</b>	26789	(8%)	23%	41%
<b>Expenses</b>				
Commodity	19627	(8%)	29%	40%
Gas distribution cost	1281	(5%)	24%	54%
Operating and administrative	2259	21%	33%	45%
Depreciation and amortization	1147	8%	19%	37%
Environmental costs, net of recoveries	(116)	(24%)	(412%)	(186%)
<b>Total Expense</b>	24198	(5%)	30%	42%
<b>EBIT</b>	2591	(38%)	(47%)	24%
Income from equity investments	233	(16%)	42%	58%
Other income/(expense)	116	105%	(216%)	(329%)
Interest expense	(928)	(9%)	2%	22%
<b>EBT</b>	2012	(41%)	(70%)	8%

**Table 6: Sensitivity Analysis on EBIT in \$Millions CAD - Enbridge**

		<b>%Change in Revenues from 2011 Values</b>											
		<b>-20%</b>	<b>-15%</b>	<b>-10%</b>	<b>-5%</b>	<b>0%</b>	<b>5%</b>	<b>10%</b>	<b>15%</b>	<b>20%</b>	<b>25%</b>	<b>30%</b>	<b>35%</b>
<b>%Change in Expense from 2011 Values</b>	<b>-20%</b>	2073	3412	4752	6091	7431	8770	10110	11449	12788	14128	15467	16807
	<b>-15%</b>	863	2202	3542	4881	6221	7560	8900	10239	11579	12918	14257	15597
	<b>-10%</b>	-347	992	2332	3671	5011	6350	7690	9029	10369	11708	13048	14387
	<b>-5%</b>	-1557	-217	1122	2461	3801	5140	6480	7819	9159	10498	11838	13177
	<b>0%</b>	-2767	-1427	-88	1252	2591	3930	5270	6609	7949	9288	10628	11967
	<b>5%</b>	-3977	-2637	-1298	42	1381	2721	4060	5399	6739	8078	9418	10757
	<b>10%</b>	-5187	-3847	-2508	-1168	171	1511	2850	4190	5529	6868	8208	9547
	<b>15%</b>	-6397	-5057	-3718	-2378	-1039	301	1640	2980	4319	5659	6998	8337
	<b>20%</b>	-7606	-6267	-4928	-3588	-2249	-909	430	1770	3109	4449	5788	7128
	<b>25%</b>	-8816	-7477	-6137	-4798	-3459	-2119	-780	560	1899	3239	4578	5918
	<b>30%</b>	-10026	-8687	-7347	-6008	-4668	-3329	-1990	-650	689	2029	3368	4708
	<b>35%</b>	-11236	-9897	-8557	-7218	-5878	-4539	-3199	-1860	-521	819	2158	3498
	<b>40%</b>	-12446	-11107	-9767	-8428	-7088	-5749	-4409	-3070	-1730	-391	949	2288
	<b>45%</b>	-13656	-12316	-10977	-9638	-8298	-6959	-5619	-4280	-2940	-1601	-261	1078
	<b>50%</b>	-14866	-13526	-12187	-10847	-9508	-8169	-6829	-5490	-4150	-2811	-1471	-132
	<b>55%</b>	-16076	-14736	-13397	-12057	-10718	-9378	-8039	-6700	-5360	-4021	-2681	-1342
<b>60%</b>	-17286	-15946	-14607	-13267	-11928	-10588	-9249	-7909	-6570	-5231	-3891	-2552	

Table 7: Sensitivity Analysis on Commodity Sale Revenues - Commodity Expenses - Enbridge

		%Change in Revenues from 2011 Values										
		-20%	-15%	-10%	-5%	0%	5%	10%	15%	20%	25%	30%
%Change in Expense from 2011 Values	-19%	401	1420	2439	3457	4476	5495	6514	7532	8551	9570	10588
	-14%	-580	439	1457	2476	3495	4513	5532	6551	7570	8588	9607
	-9%	-1561	-543	476	1495	2513	3532	4551	5570	6588	7607	8626
	-4%	-2543	-1524	-505	513	1532	2551	3569	4588	5607	6626	7644
	1%	-3524	-2505	-1487	-468	551	1569	2588	3607	4626	5644	6663
	6%	-4505	-3487	-2468	-1449	-431	588	1607	2625	3644	4663	5682
	11%	-5487	-4468	-3449	-2431	-1412	-393	625	1644	2663	3682	4700
	16%	-6468	-5449	-4431	-3412	-2393	-1375	-356	663	1681	2700	3719
	21%	-7449	-6431	-5412	-4393	-3375	-2356	-1337	-319	700	1719	2738
	26%	-8431	-7412	-6393	-5375	-4356	-3337	-2319	-1300	-281	737	1756
	31%	-9412	-8393	-7375	-6356	-5337	-4319	-3300	-2281	-1263	-244	775
	36%	-10394	-9375	-8356	-7337	-6319	-5300	-4281	-3263	-2244	-1225	-207
	41%	-11375	-10356	-9337	-8319	-7300	-6281	-5263	-4244	-3225	-2207	-1188
	46%	-12356	-11338	-10319	-9300	-8281	-7263	-6244	-5225	-4207	-3188	-2169
51%	-13338	-12319	-11300	-10281	-9263	-8244	-7225	-6207	-5188	-4169	-3151	

**Table 8: Sensitivity Analysis on Gas distribution sales - Gas distribution Costs - Enbridge**

		<b>%Change in Revenues from 2011 Values</b>											
		<b>-20%</b>	<b>-15%</b>	<b>-10%</b>	<b>-5%</b>	<b>0%</b>	<b>5%</b>	<b>10%</b>	<b>15%</b>	<b>20%</b>	<b>25%</b>	<b>30%</b>	<b>35%</b>
<b>%Change in Expense from 2011 Values</b>	<b>-20%</b>	500	595	691	786	881	977	1072	1167	1262	1358	1453	1548
	<b>-15%</b>	436	531	627	722	817	912	1008	1103	1198	1294	1389	1484
	<b>-10%</b>	372	467	563	658	753	848	944	1039	1134	1230	1325	1420
	<b>-5%</b>	308	403	498	594	689	784	880	975	1070	1166	1261	1356
	<b>0%</b>	244	339	434	530	625	720	816	911	1006	1102	1197	1292
	<b>5%</b>	180	275	370	466	561	656	752	847	942	1037	1133	1228
	<b>10%</b>	116	211	306	402	497	592	688	783	878	973	1069	1164
	<b>15%</b>	52	147	242	338	433	528	623	719	814	909	1005	1100
	<b>20%</b>	-12	83	178	274	369	464	559	655	750	845	941	1036
	<b>25%</b>	-76	19	114	209	305	400	495	591	686	781	877	972
	<b>30%</b>	-141	-45	50	145	241	336	431	527	622	717	813	908
	<b>35%</b>	-205	-109	-14	81	177	272	367	463	558	653	748	844
	<b>40%</b>	-269	-173	-78	17	113	208	303	399	494	589	684	780
	<b>45%</b>	-333	-237	-142	-47	49	144	239	334	430	525	620	716
	<b>50%</b>	-397	-301	-206	-111	-16	80	175	270	366	461	556	652
	<b>55%</b>	-461	-365	-270	-175	-80	16	111	206	302	397	492	588
<b>60%</b>	-525	-430	-334	-239	-144	-48	47	142	238	333	428	524	

After analyzing the vertical (see table 4) and horizontal (see table 5) income statements I noticed that one of the key problems resulting in a low ROE is that revenues are growing too slow relative to expenses. Commodity sales revenue appears to be growing at 1% slower than commodity expenses.

Gas distribution sales revenue appears to be growing at 5% slower than gas distribution expenses, but has improved to 4% in 2014 likely because of the new interim incentive rates effective January 2014.

Operating and administrative expenses is growing at a very fast rate (33% increase in 2013 from 2011 levels), and depreciation and amortization expenses is growing at a fairly fast rate. Focus should be placed heavily on commodity sales, such as the purchase and sale of crude, NGL, and natural gas liquids with intent to generate a profit margin because it occupies a very large proportion of the company's revenues (roughly 75 - 80 percent).

A one percent difference in the rate that revenues and expense of "commodity sales" (see table 7 for sensitivity analysis) will have substantial impacts on the financials of Enbridge. Gas Distribution is another area that requires attention. Gas distribution revenues are generated mainly from Enbridge gas distribution, and is contingent on the rates approved by regulators and the amount of volume transported. Gas distributions generates a large size of Enbridge's revenues (roughly 7%). At first glance it may seem that less attention should be placed on Gas distribution relative to commodity sales, that is incorrect. Although the revenues generated by commodity sales are high, but so is the expense.

For instance, in 2013 the revenue minus direct expenses for commodity sales and gas distribution were 817 and 680 million respectively. From the limited amount of

data available, revenues from gas distribution revenues are growing around 5% slower than expenses (see table 8 for sensitivity analysis). Enbridge gas distribution may need to apply for higher rates to attend to this problem.

These two channels help explain why both EBIT margin and interest burden has declined. EBIT margin has declined partly because revenue from commodity sales and natural gas distribution is growing slower than their corresponding direct expenses. Interest expense has not changed much from 2011 to 2013 (increased roughly 2%); however, because EBIT has declined substantially because of the aforementioned reasons, even though interest expense has not changed much in absolute terms, the proportion of interest expense to EBIT has increased, hence lowering the interest burden. I conducted sensitivity analysis on EBIT, the difference between commodity sales revenue and commodity expenditures, and the difference between gas distribution revenues and gas distribution costs.

The growth in the depreciation and amortization expenses is the result of additions to PP&E for new facilities. This can be seen in the horizontal common size balance sheet. PP&E has grown 15% in 2012, 45% in 2013, 85% in 2014 from 2011 levels.

Operating expenses usually consists of expenditures related to pipeline integrity, electricity, rents, leases, repairs and maintenance, employee salaries and property taxes. In the 2014 annual report Enbridge acknowledged that higher earnings from the Regional Oil Sands System was partially offset by higher operating and admin expenditures, higher depreciation costs from adding additional assets. Higher earnings in Enbridge Energy Partners from having additional assets put into operations during 2013 and 2014, and greater throughput from its existing lines, are also partially offset by

higher operating and admin expenditures, from higher electricity expenditures to pump higher volumes of throughput, hydrostatic testing on Line 14, and increased work force.

In summary, I noticed certain forces that are pulling down the profitability of the company. However, these forces aren't likely to be a problem in the long run, because the company will be able to apply for new rates, which would address the problem.

**Table 9: Segmented Information on Operating and Admin Expenses (Percentages are Relative to Total) - Enbridge**

<i>\$ in millions</i>	<i>2011</i>		<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>O&amp;A Expense</b>								
Liquid Pipelines	752	33.3%	942	34.4%	1006	33.4%	<b>1101</b>	<b>33.6%</b>
Gas Distribution	508	22.5%	528	19.3%	534	17.7%	<b>530</b>	<b>16.2%</b>
Gas Pipelines, Processing and Energy Services	116	5.1%	142	5.2%	221	7.3%	<b>175</b>	<b>5.3%</b>
Sponsored Investments	847	37.5%	1076	39.3%	1226	40.7%	<b>1438</b>	<b>43.8%</b>
Corporate	36	1.6%	51	1.9%	27	0.9%	<b>37</b>	<b>1.1%</b>
<b>Consolidated</b>	<b>2259</b>		<b>2739</b>		<b>3014</b>		<b>3281</b>	

**Table 10: Segmented Information on Operating and Admin Expenses (Percentages increase from 2011 Values) - Enbridge**

<i>\$ in millions</i>	<i>2011 Values</i>	<i>2012%delta</i>	<i>2013%delta</i>	<i>2014%delta</i>
<b>O&amp;A Expense</b>				
Liquid Pipelines	752	25.3%	33.8%	<b>46.4%</b>
Gas Distribution	508	3.9%	5.1%	<b>4.3%</b>
Gas Pipelines, Processing and Energy Services	116	22.4%	90.5%	<b>50.9%</b>
Sponsored Investments	847	27.0%	44.7%	<b>69.8%</b>
Corporate	36	41.7%	<b>(25.0%)</b>	<b>2.8%</b>
<b>Consolidated</b>	<b>2259</b>	<b>21.2%</b>	<b>33.4%</b>	<b>45.2%</b>



Operating and admin expenses (see table 9 and 10) has been growing rapidly and is one of the main causes why Enbridge's ROE has declined significantly. Analyzing operating and Admin Expenses by segments the main lines of business resulting in the significant increases in operating expenses are: (1) Sponsored investments; (2) Gas Pipeline, Processing and Energy Services; and (3) Liquid Pipelines. Sponsored Investments occupies the greatest share out of Operating and Admin expenses, and the expenses are growing at a very rapid rate. Sponsored investments consists of 33.7% ownership in Enbridge Energy Partners (EEP), 66.7% investment in the US segment of the Alberta Clipper Project via EEP and Enbridge Energy Limited Partnership, and 66.4% interest in Enbridge Income Fund. EEP provides crude transportation services via Lakehead System, as well as provides transportation, processing, and gathering services for natural gas and NGL.

Enbridge Income Fund provides renewable power generation, liquids pipeline transportation and storage services, and party owns the Canadian portion of the Alliance system (50%). Gas Pipelines, Processing and Energy Services, includes: (i) Aux Sable, (ii) Energy Services, (iii) Alliance Pipeline US, (iv) Vector Pipeline, and (v) Enbridge Offshore Pipelines. Liquid pipelines includes the Canadian Mainline, Regional Oil Sands System, Seaway Pipeline, Spearhead Pipeline, Southern Lights Pipeline, and other pipelines.

**Table 11: Vertical Common size Balance Sheet - Enbridge**

<i>\$ Millions in CAD</i>	<i>2012</i>	<i>%Assets</i>	<i>2013</i>	<i>%Asset</i>	<i>2014</i>	<i>%Asset</i>
<b>Current Assets</b>						
Inventories	779	1.7%	1115	1.9%	1148	1.6%
Restricted Cash	19	0.0%	34	0.1%	47	0.1%
Trade Receivables	4014	8.6%	4956	8.6%	5504	7.6%
Assets Held For Sale	--		24	0.0%	0	
CE	1776	3.8%	756	1.3%	1261	1.7%
Accounts Receivable	12	0.0%	65	0.1%	241	0.3%
<b>Total Current Assets</b>	<b>6600</b>	<b>14.1%</b>	<b>6950</b>	<b>12.1%</b>	<b>8201</b>	<b>11.3%</b>
<b>Noncurrent Assets</b>						
Other Intangible Assets	817	1.7%	1004	1.7%	1166	1.6%
Deferred Costs	2461	5.3%	2662	4.6%	3208	4.4%
Goodwill	419	0.9%	445	0.8%	483	0.7%
Property Plant & Equipment - Net	33318	71.2%	42279	73.4%	53830	73.9%
Deferred Income Tax Asset (Long-Term)	10	0.0%	16	0.0%	561	0.8%
Long Term Investments	3175	6.8%	4212	7.3%	5408	7.4%
<b>Total Assets</b>	<b>46800</b>		<b>57568</b>		<b>72857</b>	
<b>Current Liabilities</b>						
Accounts Payable	0	0.0%	46	0.1%	80	0.1%
Short-Term Borrowings	583	1.2%	374	0.6%	1041	1.4%
Bank Indebtedness	479	1.0%	338	0.6%	507	0.7%
AP and AE	5052	10.8%	6664	11.6%	6444	8.8%
Interest Accrued/Payable	196	0.4%	228	0.4%	264	0.4%
Current Portion of Long-Term Debt	652	1.4%	2811	4.9%	1004	1.4%
Other Current Liabilities	107	0.2%	267	0.5%	161	0.2%
<b>Total Current Liabilities</b>	<b>7069</b>	<b>15.1%</b>	<b>10728</b>	<b>18.6%</b>	<b>9501</b>	<b>13.0%</b>
<b>Non Current Liabilities</b>						
<b>Other Noncurrent Liabilities</b>	<b>2541</b>	<b>5.4%</b>	<b>2995</b>	<b>5.2%</b>	<b>4041</b>	<b>5.5%</b>
Deferred Income Taxes (Liabilities)	2483	5.3%	2925	5.1%	4842	6.6%
Long Term Debt	20203	43.2%	22357	38.8%	33423	45.9%
<b>Total Liabilities</b>	<b>32296</b>	<b>69.0%</b>	<b>39005</b>	<b>67.8%</b>	<b>42306</b>	<b>58.1%</b>

**Table 12: Horizontal Common size Balance Sheet - Enbridge**

<i>\$ Millions in CAD</i>	<i>2011 Values</i>	<i>2012%D</i>	<i>2013%D</i>	<i>2014%D</i>
<b>Current Assets</b>				
Inventories	823	(5%)	35%	39%
Restricted Cash (Short-Term)	17	12%	100%	176%
Accounts Receivable - Trade	4029	0%	23%	37%
Assets Held For Sale	--	--	--	--
Cash and Equivalents	723	146%	5%	74%
AR - Affiliates/Non-Trade	55	(78%)	18%	338%
<b>Total Current Assets</b>	<u>5647</u>	17%	23%	45%
<b>Noncurrent Assets</b>				
Other Intangible Assets	711	15%	41%	64%
Deferred Costs	2500	(2%)	6%	28%
Goodwill	440	(5%)	1%	10%
PP&E - Net	29074	15%	45%	85%
Deferred Income Tax Asset	41	(76%)	(61%)	1268%
Long Term Investments	<u>3081</u>	3%	37%	76%
<b>Total Assets</b>	<u>41494</u>	13%	39%	76%
<b>Current Liabilities</b>				
Accounts Payable - Affiliates/Non-Trade	48	(100%)	(4%)	67%
Short-Term Borrowings	548	6%	(32%)	90%
Bank Indebtedness	102	370%	231%	397%
Accounts Payable and Accrued Expenses	4753	6%	40%	36%
Interest Accrued/Payable	185	6%	23%	43%
Current Portion of LTD	354	84%	694%	184%
Other Current Liabilities	<u>175</u>	(39%)	53%	(8%)
<b>Total Current Liabilities</b>	<u>6165</u>	15%	74%	54%
<b>Non Current Liabilities</b>				
Other Noncurrent Liabilities	2208	15%	36%	83%
Deferred Income Taxes (Liabilities)	2615	(5%)	12%	85%
Long Term Debt	<u>19251</u>	5%	16%	74%
<b>Total Liabilities</b>	<u>30239</u>	7%	29%	40%

**Table 13: Total Assets - Enbridge**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Total Current Assets</b>	6600	14.10%	6950	12.07%	<b>8201</b>	<b>11.26%</b>
Other Intangible Assets	817	1.75%	1004	1.74%	<b>1166</b>	<b>1.60%</b>
Deferred Costs	2461	5.26%	2662	4.62%	<b>3208</b>	<b>4.40%</b>
Goodwill	419	0.90%	445	0.77%	<b>483</b>	<b>0.66%</b>
Property Plant & Equipment - Net	33318	71.19%	42279	73.44%	<b>53830</b>	<b>73.88%</b>
Deferred Income Tax Asset (Long-Term)	10	0.02%	16	0.03%	<b>561</b>	<b>0.77%</b>
Long Term Investments	3175	6.78%	4212	7.32%	<b>5408</b>	<b>7.42%</b>
<b>Total Assets</b>	<b>46800</b>		<b>57568</b>		<b>72857</b>	

**Table 14: Long-Term Debt - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>		<i>2012</i>		<i>2013</i>		<i>2014</i>	
Other Noncurrent Liabilities	2208	6.37%	2541	6.56%	2995	6.54%	<b>4041</b>	<b>9.55%</b>
LTD	19251	55.50%	20203	52.16%	22357	48.83%	<b>33423</b>	<b>79.00%</b>
Deferred Taxes (Liabilities)	2615	7.54%	2483	6.41%	2925	6.39%	<b>4842</b>	<b>11.45%</b>
<b>Equity</b>	<b>10615</b>	<b>30.60%</b>	<b>13504</b>	<b>34.87%</b>	<b>17510</b>	<b>38.24%</b>	<b>16786</b>	<b>39.68%</b>
<b>LTC</b>	<b>34689</b>		<b>38731</b>		<b>45787</b>		<b>42306</b>	

A large pipeline company like Enbridge is expected to have substantial investments in both current assets such as receivables and inventory as well as plant property and equipment (PP&E) (see tables 11-14). PP&E is growing over time indicating that Enbridge is expanding, and at a fairly stable rate. Goodwill has declined marginally indicating that Enbridge has either not or has engaged in very little business acquisitions. How a company finances its operations should be able to withhold the company's objectives, while allowing the firm to meet its future obligations. Enbridge's

long term debt has increased to 79% of long-term capital in 2014 from 55.5%, a large increase in financial leverage. This increases the financial risk of Enbridge (i.e. probability the company cannot cover its debt). Since Enbridge's long-term debt has been increased, I consider the possibility of an offsetting change in Enbridge's working capital.

In summary, this analysis shows that the proportion of total assets accounted for by each asset class is either too small to affect the valuation process or remained fairly stable over time. Hence, this means I can confidently use historical data to forecast these line items, in absence of structural changes. However, the composition of long-term debt has been changing quite rapidly, hence I need to use alternative methods to forecast the components in long-term debt in the valuation process.

**Table 15: Selected Working Capital Information - Enbridge**

<i>\$ in millions CAD</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
Inventories	813	823	779	1115	1148
Restricted Cash (Short-Term)	--	17	19	34	47
Accounts Receivable - Trade	2706	4029	4014	4956	5504
Assets Held For Sale	--	--	0	24	0
Cash and Equivalents	342	723	1776	756	1261
Accounts Receivable - Affiliates/Non-Trade	--	55	12	65	241
<b>Total Current Assets</b>	<b>3861</b>	<b>5647</b>	<b>6600</b>	<b>6950</b>	<b>8201</b>
Accounts Payable - Affiliates/Non-Trade	--	48	0	46	80
Short-Term Borrowings	326	548	583	374	1041
Bank Indebtedness	100	102	479	338	507
Accounts Payable and Accrued Expenses	2688	4753	5052	6664	6444
Interest Accrued/Payable	117	185	196	228	264
Current Portion of Long-Term Debt	224	354	652	2811	1004
Other Current Liabilities	--	175	107	267	161
ST Borrowings and Current Portion of LT Debt	--	--	--	--	--
<b>Total Current Liabilities</b>	<b>3455</b>	<b>6165</b>	<b>7069</b>	<b>10728</b>	<b>9501</b>
<b>Other Information</b>					
Revenue	--	27053	24660	32918	37641
COGS	--	19864	17959	25222	27504
Purchases	--	19874	17915	25558	27537
Average daily expenditures	--	121.33	112.40	155.55	169.71
<b>Working capital ratios</b>					
Current ratio	--	0.92	0.93	0.65	0.86
Quick ratio	--	0.78	0.82	0.54	0.74
Defensive interval ratio	--	39.76	51.79	37.51	41.56
Days sales outstanding	--	45.43	59.52	49.73	50.71
Days inventory on hand	--	15.03	16.28	13.70	15.02
Days payable	--	68.33	99.88	83.66	86.87
<b>Cash conversion cycle</b>		<b>(7.86)</b>	<b>(24.08)</b>	<b>(20.22)</b>	<b>(21.14)</b>

Based on table 15, the quick and current ratios, which measure Enbridge's ability to meet short-term debt obligations, have both decreased from 2011 to 2014. This is because of the increase in current long-term debt and account payables which both increases the denominator of the ratios. The defensive ratio is also larger when comparing 2011 to 2014 levels because of higher cash and equivalents, and account receivables.

However, Enbridge seems to be performing better in managing its receivables, inventory, and payables, which can be seen from a reduction in the cash conversion cycle from 2011 to 2014.

**Table 16: Segmented Enbridge Information on Revenue and EBIT - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>		<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Revenue</b>								
Liquid Pipelines	1934	7%	2445	10%	2272	7%	<b>2283</b>	<b>18%</b>
Gas Distribution	2516	9%	2438	10%	2741	8%	<b>3216</b>	<b>28%</b>
Gas Pipelines, Processing and Energy Services	13343	50%	13106	53%	20310	62%	<b>23023</b>	<b>73%</b>
Sponsored Investments	8996	34%	6671	27%	7595	23%	<b>9119</b>	<b>1%</b>
Corporate	--	--	--	--	--	--	--	--
<b>Consolidated</b>	<b>26789</b>		<b>24660</b>		<b>32918</b>		<b>37641</b>	
<b>EBIT</b>								
Liquid Pipelines	818	32%	1104	69%	758	56%	<b>691</b>	<b>(16%)</b>
Gas Distribution	406	16%	354	22%	301	22%	<b>403</b>	<b>(1%)</b>
Gas Pipelines, Processing and Energy Services	345	13%	<b>(769)</b>	<b>(48%)</b>	<b>(230)</b>	<b>(17%)</b>	<b>813</b>	<b>136%</b>
Sponsored Investments	1070	41%	969	61%	578	42%	<b>1349</b>	<b>26%</b>
Corporate	<b>(48)</b>	<b>(2%)</b>	<b>(64)</b>	<b>(4%)</b>	<b>(42)</b>	<b>(3%)</b>	<b>(56)</b>	<b>17%</b>
<b>Consolidated</b>	<b>2591</b>		<b>1594</b>		<b>1365</b>		<b>3200</b>	



Segmented data on Revenue and EBIT shows that in terms of revenue contribution Gas Pipelines, Processing and Energy services is the largest line of business, while liquid pipelines is the smallest (see table 16). However, in terms of operating income sponsored investments and liquid pipelines are the dominant contributors.

**Table 17: Segmented Information on Assets and CAPEX - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>		<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Assets</b>								
Liquid Pipelines	12348	30%	15124	32%	20950	36%	27657	38%
Gas Distribution	7189	17%	7416	16%	7942	14%	9320	13%
Gas Pipelines, Processing and Energy Services	4468	11%	5349	11%	7015	12%	7601	10%
Sponsored Investments	13492	33%	15648	33%	18527	32%	23515	32%
Corporate	3997	--	3263	--	3134	--	4764	--
<b>Consolidated</b>	<b>41494</b>		<b>46800</b>		<b>57568</b>		<b>72857</b>	
<b>CAPEX</b>								
Liquid Pipelines	909	26%	1927	37%	4360	53%	5917	56%
Gas Distribution	478	14%	445	9%	533	6%	603	6%
Gas Pipelines, Processing and Energy Services	959	27%	933	18%	744	9%	678	6%
Sponsored Investments	1157	33%	1886	36%	2565	31%	3269	31%
Corporate	27	1%	4	0%	34	0%	60	1%
<b>Consolidated</b>	<b>3530</b>		<b>5195</b>		<b>8236</b>		<b>10527</b>	

Enbridge's capital expenditures and assets broken down into segments are shown in the next Figure.

Table 17, indicates that sponsored investments, gas pipelines, processing and energy services, and liquid pipelines require the greatest amount of capital expenditures, while sponsored investments and liquid pipelines require the great amount of assets. Note that capital expenditures of liquid pipelines have increased over the period, while other lines of businesses has dropped.

This indicates to me that Enbridge is expanding the line of businesses that are regulated and expanding less on the unregulated assets (i.e. other energy services). Since regulated assets typically have more predictable revenue streams, revenues should be forecasted with greater precision in the future.

In the next figure, I calculate the ratio of proportional capital expenditure to proportional assets for each segment. A ratio higher than 1 indicates that Enbridge is expanding the line of business by assigning a greater proportion of its CAPEX to a line of business relative to its proportion of total assets. I compare the EBIT margin for each line of business to the ratio of CAPEX to assets for each segment to identify if Enbridge is allocating funds to its most profitable lines of business.

**Table 18: CAPEX% to Segment Asset% and EBIT Margin - Enbridge**

	<i>EBIT Margin</i>				<i>CAPEX%</i> <i>Segment Asset %</i>			
	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
LP	42%	45%	33%	<b>30%</b>	0.87%	1.15%	1.45%	<b>1.48%</b>
GD	16%	15%	11%	<b>13%</b>	0.78%	0.54%	0.47%	<b>0.45%</b>
GPP & ES	3%	<b>(6%)</b>	<b>(1%)</b>	<b>4%</b>	2.52%	1.57%	0.74%	<b>0.62%</b>
Sponsored Investments	12%	15%	8%	<b>15%</b>	1.01%	1.09%	0.97%	<b>0.96%</b>
Corporate	--	--	--	--	0.87%	1.15%	1.45%	<b>1.48%</b>

Table 18, indicates that although gas pipelines, processing and energy services produces the lowest EBIT margin, its corresponding capital expenditures was the highest in 2011 and 2012, but lowered in 2013 and 2014. Enbridge should allocate more of its capital to liquid pipelines and gas distribution and less on Gas pipelines, Processing and Energy Services to increase its profits. Even though there are channels that I believe could help the company increase profits, I expect these opportunities to be captured by the company in the near future, so it will not affect my long-term forecasts of the company's economic profits.

In tables 19-21, I determined the sustainability and persistence of Enbridge's earnings. Earnings that are closely tied to CFO are considered high quality. Since earnings are constrained by accrual accounting methods that require judgment and estimation, it is possible that earnings could be manipulated to indicate better financial performance than reality. To counter this problem, I disaggregate earnings into cash and accruals using both the balance sheet method and the cash flow method.

**Table 19: Selected Cash Flow and Balance Sheet Information - Enbridge**

<i>\$ in millions CAD</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Balance Sheet</b>					
Total Assets	30220	41494	46800	57568	<b>72857</b>
Cash and marketable Securities	(342)	(723)	(1776)	(756)	(1261)
<b>Operating Assets</b>	29878	40771	45024	56812	<b>71596</b>
Total Liabilities	21997	30239	32296	39005	<b>51807</b>
Long-term Debt	(14622)	(19251)	(20203)	(22357)	(33423)
Current Portion of Long-term Debt	(224)	(354)	(652)	(2811)	(1004)
Short-term Debt	(326)	(548)	(583)	(374)	(1041)
<b>Operating Liabilities</b>	6825	10086	10858	13463	<b>16339</b>
<b>Net Operating Assets</b>	23053	30685	34166	43349	<b>55257</b>
<b>Balance Sheet Accruals</b>		7632	3481	9183	<b>11851</b>
<b>Cash Flow Statement</b>					
Net Income	--	833	707	629	<b>1405</b>
(-) CFO	--	3371	2874	3341	<b>2547</b>
(-) CFI	--	(5079)	(6204)	(9431)	(11896)
<b>Cash Flow Accruals</b>	--	2541	4037	6719	<b>10754</b>

**Table 20: CFO before interest and tax to Operating Income - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>CFO</b>	3371	2874	3341	<b>2547</b>
(+) Cash Interest paid	915	773	936	<b>1093</b>
(+) Cash taxes paid	25	212	(157)	<b>(1685)</b>
<b>CFO before interest and taxes</b>	4311	3859	4120	<b>1955</b>
<b>EBIT</b>	2631	1594	1365	<b>3200</b>
<b>CFO before interest and taxes</b>				
<u>EBIT</u>	1.64	2.42	3.02	<b>0.61</b>

**Table 21: Cash Flow and Balance Sheet Accruals Ratios - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Balance sheet approach</b>				
<u>BS Accruals</u>				
Average NOA	28.4%	10.7%	23.7%	<b>24.0%</b>
<b>Cash flow statement approach</b>				
<u>Cash Flow Accruals</u>				
Average NOA	9.5%	12.5%	17.3%	<b>21.8%</b>

Using the balance sheet approach, I noticed that the accrual ratio has been quite volatile, over 2011 to 2013, and increasing from 2013 to 2014. While the cash flow statement approach indicates that the accruals ratio has been increasing throughout the period. Neither is a good sign; these phenomena are sometimes the result of earnings manipulations.

I investigate this issue further by comparing Enbridge's operating cash flow to its EBIT. The ratio of CFO to EBIT validates that operating cash flow has surpassed EBIT over 2011 to 2013. The results reduces the probability of earning manipulation in 2011 to 2013. However, the usage of accruals to increase earnings may be present from 2013 to 2014, CFO to EBIT in 2014 has fallen drastically, which does not confirm operating profits. However, more data is required to confirm findings.

**Table 22: Cash Return on Total Assets - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
CFO	3371	2874	3341	2547
Average Total Assets	35857	44147	52184	65213
<b>CFO</b>				
<b>Average Total Assets</b>	9.4%	6.5%	6.4%	3.9%

**Table 23: Selected Cash Flow Ratios - Enbridge**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Cash flow to reinvestment</b>				
CFO	3371	2874	3341	2547
CAPEX	10238	5700	10187	10527
<u>CFO</u> CAPEX	32.9%	50.4%	32.8%	24.2%
<b>Cash flow to total debt</b>				
CFO before interest and taxes	4311	3859	4120	1955
Total debt	15172	20153	21438	35468
<u>CFO before interest and taxes</u> Total Debt	28.4%	19.1%	19.2%	5.5%
<b>Cash flow interest coverage</b>				
CFO before interest and taxes	4311	3859	4120	1955
Cash interest paid	915	773	936	1093
<u>CFO before interest and taxes</u> Cash Interest Paid	4.7	5.0	4.4	1.8

The Cash return on average total assets ratio (see table 22) has declined over 2011 to 2014, which seems to not justify the newly purchased assets. However, this may be a result of increases in capital expenditures on projects that are not currently in operations, hence explaining the decline in the ratio. Once the capital expenditures on project are operational the ratios should rebound.

The operating cash flows ratios of all three measures indicate that Enbridge's ability to meet its obligations is now lower (see table 23). This may make Enbridge appear more risky.

In summary, the earnings quality of the company has declined. However, I do not believe the decline is permanent. The change appears to be due to the company's expansion projects. Once the projects become operational the earnings quality of the company should revert to normal. Expanding the company will increase its ability to generate revenues in the future would be higher, and stabilized by the regulatory models. This might generate positive structural changes in the future.



## 1.2.2 TransCanada

**Table 24: Selected Financial Data - TransCanada**

<i>\$ in millions CAD</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Income Statement</b>					
Total Revenue	--	7839	8007	8797	<b>10185</b>
Equity In Earnings of Affiliate/Joint Ventures	--	<b>(415)</b>	<b>(257)</b>	<b>(597)</b>	<b>(522)</b>
Income Before Income Taxes	1767	2285	1938	2522	<b>2824</b>
Net Income	1272	1581	1354	1786	<b>1840</b>
EBIT		2752	2572	2876	<b>3292</b>
<b>Balance Sheet</b>					
Total Assets	46794	47338	48333	53898	<b>58947</b>
Investment In Affiliates/Joint Ventures	--	5077	5366	5759	<b>5598</b>
<b>Total Shareholders Equity</b>	<b>17884</b>	<b>18259</b>	<b>18336</b>	<b>20136</b>	<b>20653</b>

**Table 25: 5 Stage DuPont Analysis - TransCanada**

	<b>Tax Burden</b>	<b>x</b>	<b>Interest Burden</b>	<b>x</b>	<b>EBIT Margin</b>	<b>x</b>	<b>Total Asset Turnover</b>	<b>x</b>	<b>Financial Leverage</b>	<b>=</b>	<b>ROE</b>
2011	69.2%		83.0%		35.1%		16.7%		260.4%		8.7%
2012	69.9%		75.3%		32.1%		16.7%		261.4%		7.4%
2013	70.8%		87.7%		32.7%		17.2%		265.7%		9.3%
2014	<b>65.2%</b>		<b>85.8%</b>		<b>32.3%</b>		<b>18.1%</b>		<b>276.7%</b>		<b>9.0%</b>

**Table 26: Extended 5 Stage DuPont Analysis (Excluding Equity Income and Investment Account) - TransCanada**

	<b>Tax Burden</b>	<b>x</b>	<b>Interest Burden</b>	<b>x</b>	<b>EBIT Margin</b>	<b>x</b>	<b>Total Asset Turnover</b>	<b>x</b>	<b>Financial Leverage</b>	<b>=</b>	<b>ROE</b>
2011	51.0%		83.0%		35.1%		--		260.4%		--
2012	56.6%		75.3%		32.1%		18.8%		261.4%		6.7%
2013	47.1%		87.7%		32.7%		19.3%		265.7%		6.9%
2014	<b>46.7%</b>		<b>85.8%</b>		<b>32.3%</b>		<b>20.1%</b>		<b>276.7%</b>		<b>7.2%</b>

In this section, I analyze TransCanada's ability to generate earnings over time using the 5 Stage DuPont and the extended 5 stage DuPont analysis (see figures 24-26). If I identify a permanent change in the companies' ability to generate earnings, then I should not base my forecasts of the key line items based purely on historical information.

In summary, TransCanada's ability to generate net income has been fairly stable over time. This means that forecasting economic profits using historical information should be fairly reliable.

**Table 27: Selected Items Vertical Common Size Income Statement - TransCanada**

<i>\$ in millions</i>						
<i>CAD</i>	<i>2012</i>	<i>%Revenue</i>	<i>2013</i>	<i>%Revenue</i>	<i>2014</i>	<i>%Revenue</i>
<b>Revenue</b>						
Natural Gas Pipelines	4264	53.3%	4497	51.1%	<b>4913</b>	<b>48.2%</b>
Liquids Pipelines	1039	13.0%	1124	12.8%	<b>1547</b>	<b>15.2%</b>
Energy	2704	33.8%	3176	36.1%	<b>3725</b>	<b>36.6%</b>
<b>Operating Expense</b>						
Plant Operating cost and other	2577	32.2%	2674	30.4%	<b>2973</b>	<b>29.2%</b>
Commodity purchases resold	1049	13.1%	1317	15.0%	<b>1836</b>	<b>18.0%</b>
Property taxes	434	5.4%	445	5.1%	<b>473</b>	<b>4.6%</b>
Depreciation and amortization	1375	17.2%	1485	16.9%	<b>1611</b>	<b>15.8%</b>
<b>EBIT</b>	<u>2572</u>	32.1%	<u>2876</u>	32.7%	<u><b>3292</b></u>	<u><b>32.3%</b></u>
Income from equity investments						
	257	3.2%	597	6.8%	<b>522</b>	<b>5.1%</b>
Gain on Sale of Assets						
	117	1.5%				
Interest Expense						
	976	12.2%	985	11.2%	<b>1198</b>	<b>11.8%</b>
Interest income and other						
	-85	-1.1%	-91	-1.0%	<b>-34</b>	<b>-0.3%</b>
<b>EBT</b>	<u>1938</u>	24.2%	<u>2522</u>	28.7%	<u><b>2824</b></u>	<u><b>27.7%</b></u>

**Table 28: Selected Items Horizontal Common Size Income Statement - TransCanada**

<i>\$ in millions CAD</i>	<i>2012 values</i>	<i>2013%delta</i>	<i>2014%delta</i>
<b>Revenue</b>			
Natural Gas Pipelines	4264	5.5%	<b>15.2%</b>
Liquids Pipelines	1039	8.2%	<b>48.9%</b>
Energy	2704	17.5%	<b>37.8%</b>
<b>Operating Expense</b>			
Plant Operating cost and other	2577	3.8%	<b>15.4%</b>
Commodity purchases resold	1049	25.5%	<b>75.0%</b>
Property taxes	434	2.5%	<b>9.0%</b>
Depreciation and amortization	1375	8.0%	<b>17.2%</b>
<b>EBIT</b>	<hr/> 2572	11.8%	<b>28.0%</b>
Income from equity investments	257	132.3%	<b>103.1%</b>
Gain on Sale of Assets	117		
Interest Expense	976	0.9%	<b>22.7%</b>
Interest income and other	-85	7.1%	<b>-60.0%</b>
<b>EBT</b>	<hr/> 1938	30.1%	<b>45.7%</b>

After analyzing the vertical (see table 27) and horizontal income (see table 28) statements I noticed that TransCanada's revenues from liquid pipelines and energy has been growing quite rapidly. Plant operating cost and other seems to growing at a stable rate relative to revenue. The plant operating costs and other is basically TransCanada's operating expenses (e.g. salaries and rent expenses) and includes cost of fuel generated. My concerns for TransCanada are the rapid growth in commodity purchases resold (expense), and the reduced income from equity investments. Commodity purchase resold includes the cost of fuel and the power used to generate electricity. I investigate further the reduced income from equity investments by subdividing the income into individual equity investments.

In summary, the company has been rapidly expanding its energy line of business. I need to determine whether this would result in a noticeable structural change in the valuation process.

**Table 29: Equity Investments - Income (Percentage relative to Total) - TransCanada**

<i>\$ in millions CAD</i>	<i>Ownership Interest at</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Natural Gas Pipelines</b>	<b>December 31, 2014</b>						
Northern Border	50.0%	72	28.0%	66	11.1%	<b>76</b>	<b>14.6%</b>
Iroquois	44.5%	41	16.0%	41	6.9%	<b>43</b>	<b>8.2%</b>
TQM	50.0%	16	6.2%	13	2.2%	<b>12</b>	<b>2.3%</b>
Other	Various	28	10.9%	25	4.2%	<b>32</b>	<b>6.1%</b>
<b>Energy</b>							
Bruce A	48.9%	-149	-58.0%	202	33.8%	<b>209</b>	<b>40.0%</b>
Bruce B	31.6%	163	63.4%	108	18.1%	<b>105</b>	<b>20.1%</b>
ASTC Power Partnership	50.0%	40	15.6%	110	18.4%	<b>8</b>	<b>1.5%</b>
Portlands Energy	50.0%	28	10.9%	31	5.2%	<b>36</b>	<b>6.9%</b>
Other	Various	18	7.0%	1	0.2%	<b>1</b>	<b>0.2%</b>
<b>Liquids Pipelines</b>							
Grand Rapids	50.0%	--		--		<b>--</b>	
<b>Total</b>		<b>257</b>		<b>597</b>		<b>522</b>	

**Table 30: Equity Investments Income (Percentage change relative 2012 values) - TransCanada**

<i>\$ in millions CAD</i>	<i>Ownership Interest at</i>	<i>2012 Values</i>	<i>2013%D</i>	<i>2014%D</i>
<b>Natural Gas Pipelines</b>		<b>December 31</b>		
Northern Border	50.0%	72	-8%	<b>6%</b>
Iroquois	44.5%	41	0%	<b>5%</b>
TQM	50.0%	16	-19%	<b>-25%</b>
Other	Various	28	-11%	<b>14%</b>
<b>Energy</b>				
Bruce A	48.9%	-149	-236%	<b>-240%</b>
Bruce B	31.6%	163	-34%	<b>-36%</b>
ASTC Power Partnership	50.0%	40	175%	<b>-80%</b>
Portlands Energy	50.0%	28	11%	<b>29%</b>
Other	Various	18	-94%	<b>-94%</b>
<b>Liquids Pipelines</b>				
Grand Rapids	50.0%	--		
<b>Total</b>		<b>257</b>	<b>132%</b>	<b>103%</b>

Based on figures 29 and 30, it appears that Bruce B and ASTC Power Partnership are the main culprits for the reduced income. The income generated by Bruce B and ASTC Power Partnership, has fallen by 36% and 80% respectively in 2014 relative to 2012 levels. TQM has been performing poorly as well, however, it occupies a fairly small proportion of total equity investment income. Bruce A has been performing significantly better.

**Table 31: Segmented Information on Plant Operating Costs and Other - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>P&amp;O Expense</b>						
Natural Gas Pipelines	1365	53.0%	1405	52.5%	<b>1501</b>	<b>50.5%</b>
Liquid Pipelines	296	11.5%	328	12.3%	<b>426</b>	<b>14.3%</b>
Energy	819	31.8%	833	31.2%	<b>919</b>	<b>30.9%</b>
Corporate	<u>97</u>	3.8%	<u>108</u>	4.0%	<u><b>127</b></u>	<b>4.3%</b>
<b>Consolidated</b>	<b>2577</b>		<b>2674</b>		<b>2973</b>	

**Table 32: Segmented Information on Plant Operating Costs and Other - TransCanada**

<i>\$ in millions CAD</i>	<i>2012 Values</i>	<i>2013%Delta</i>	<i>2014%Delta</i>
<b>P&amp;O Expense</b>			
Natural Gas Pipelines	1365	2.9%	<b>10.0%</b>
Liquid Pipelines	296	10.8%	<b>43.9%</b>
Energy	819	1.7%	<b>12.2%</b>
Corporate	<u>97</u>	11.3%	<b>30.9%</b>
<b>Consolidated</b>	<b>2577</b>	3.8%	<b>15.4%</b>



Plant Operating Costs (see tables 31 and 32) and others have been growing rapidly however, the impacts has been matched by a fairly strong increase in revenues, this is reflected in the relatively stable EBIT margin. Analyzing the expenses by segments the main lines of business resulting in the significant increases in plant operating expenses and others are: (1) Natural Gas Pipelines; (2) Liquid Pipelines; (3) Energy; and (4) Corporate. Corporate and Liquid pipelines accounts for the smallest proportion of operating expenses but has increased the most. This is likely the result of expansions within those sectors. Natural Gas Pipelines and Energy occupies the greatest proportion of operating expenses but has grown at a slower rate relative to the other two segments.

In summary, the proportion of cost accounted for each line of business has remained fairly stable. Which indicates to me that using historical relationships to forecast costs is a reasonable approach.

**Table 33: Long-Term Debt - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Other Noncurrent Liabilities</b>	268	0.7%	303	0.7%	<b>362</b>	<b>1.5%</b>
Long Term Debt	18019	46.8%	21892	50.2%	<b>22960</b>	<b>92.2%</b>
Notes Payable (Long-Term)	994	2.6%	1063	2.4%	<b>1160</b>	<b>4.7%</b>
Deferred Expenses (Long-Term)	882	2.3%	--	--	--	--
Derivative Liabilities (Long-Term)	--	--	255	0.6%	<b>411</b>	<b>1.7%</b>
Total Shareholders Equity	<u>18336</u>	47.6%	<u>20136</u>	46.1%	<u><b>20653</b></u>	<b>83.0%</b>
<b>Total Long-term Capital</b>	<b>38499</b>		<b>43649</b>		<b>24893</b>	

**Table 34: Total Assets - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Total Current Assets</b>	2824	5.8%	3147	5.8%	<b>3540</b>	<b>6.0%</b>
Other Intangible Assets	1343	2.8%	1955	3.6%	--	--
Accumulated Depreciation	--	--	--	--	<b>19563</b>	<b>33.2%</b>
Investment In Affiliates/Joint Ventures	5366	11.1%	5759	10.7%	<b>5598</b>	<b>9.5%</b>
Goodwill	3458	7.2%	3696	6.9%	<b>4034</b>	<b>6.8%</b>
Other Noncurrent Assets	1629	3.4%	1735	3.2%	<b>4001</b>	<b>6.8%</b>
Property Plant & Equipment - Net	<u>33713</u>	69.8%	<u>37606</u>	69.8%	<u><b>41774</b></u>	<b>70.9%</b>
<b>Total Assets</b>	<b>48333</b>		<b>53898</b>		<b>58947</b>	

A large pipeline company like TransCanada<sup>3</sup> is expected to have substantial investments in both current assets such as receivables and inventory as well as plant property and equipment (PP&E). PP&E is growing over time indicating that TransCanada is expanding, and at a fairly stable rate relative to total assets. Goodwill has declined marginally, indicating that TransCanada has either not or has engaged in very little business acquisitions. TransCanada's long term debt has increased from 46.8% of long-term capital in 2012 to 83% in 2014, which leads to a high financial leverage. This increases the financial risk of TransCanada (i.e. probability the company cannot cover its debt). Since TransCanada's long-term debt has increased, I consider the possibility of an offsetting change in TransCanada's working capital.

In summary, forecasting each long-term debt component using historical relationships of those components with long-term debt seems like a bad idea. I would need to come up with a different approach in the valuation section.

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<sup>3</sup> For the following analysis refer to tables 33 and 34.

**Table 35: Selected Working Capital and Ratio Information - TransCanada**

<i>\$ in millions</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Balance sheet</b>				
Inventories	248	224	251	292
Accounts Receivable - Trade	1094	1052	1122	1313
Other Current Assets	1114	997	847	1446
Cash and Equivalents	654	551	927	489
<b>Total Current Assets</b>	<b>3110</b>	<b>2824</b>	<b>3147</b>	<b>3540</b>
Current Portion of Long-Term Debt	935	894	973	1797
Notes Payable (Short-Term)	1863	2275	1842	2467
Interest Accrued/Payable	365	368	388	424
Dividends Accrued/Payable	--	--	338	--
Other Current Liabilities	--	--	568	--
Accounts Payable - Trade	2359	2344	866	--
Derivative Liabilities (Short-Term)	--	--	357	--
Accounts Payable and Accrued Expenses	--	--	--	2896
Deferred Income Tax Liability (Short-Term)	--	--	26	--
<b>Total Current Liabilities</b>	<b>5522</b>	<b>5881</b>	<b>5358</b>	<b>7584</b>
<b>Other Information</b>				
Total Revenue	7839	8007	8797	10185
Cost of Goods Sold	2358	2577	2674	2973
Purchases	2181	2553	2701	3014
Average daily expenditures	20.4	22.0	23.5	27.0
<b>Working capital ratios</b>				
Current ratio		0.48	0.59	0.47
Quick ratio		0.44	0.54	0.43
Defensive interval ratio		118.45	122.98	120.16
Days' sales outstanding		48.91	45.10	43.63
Days' inventory on hand		33.43	32.42	33.33
Days' payables		336.19	216.89	227.79
<b>Cash conversion cycle</b>		<b>(253.85)</b>	<b>(139.37)</b>	<b>(150.83)</b>

Based on table 35, the quick and current ratios, which measures TransCanada's ability to meet short-term debt obligations, has increased in 2013 but dropped back down in 2014. This is because of the increase in current portion of long-term debt and account payables and accrued expenses in 2014 which both increases the denominator of the ratios. The defensive ratio is increasing from 2011 to 2014 because of higher average daily expenditures.

However, TransCanada seems to be performing worse in managing its receivables, inventory, and payables, which can be seen from an increase in the cash conversion cycle from 2012 levels in 2013 and 2014. The cash conversion cycle did improve in 2014 relative to 2013 but is still a lot worse than 2012 levels. However, the negative cash conversion cycle means that TransCanada should be able to meet a high leverage ratio.

**Table 36: CAPEX% to SegAsset% and EBIT Margin - TransCanada**

	<i>EBIT Margin</i>			<i>CAPEX%</i> <i>Segment Asset %</i>		
	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
Natural Gas Pipelines	42%	42%	<b>44%</b>	1.11%	0.89%	<b>1.08%</b>
Liquid Pipelines	53%	54%	<b>54%</b>	2.03%	2.18%	<b>1.58%</b>
Energy	21%	35%	<b>25%</b>	0.03%	0.14%	<b>0.24%</b>
<b>Corporate</b>	--	--	<b>--</b>	0.47%	0.36%	<b>0.50%</b>

Table 36, indicates that TransCanada is allocating its investments to its most profitable sectors. That is the highest CAPEX%/Segment Asset% segments corresponds with the highest proportion of revenues retained after paying operating expenses.

In tables 37 and 38, I determined the sustainability and persistence of TransCanada's earnings. Earnings that are closely tied to CFO are considered high quality. Since earnings are constrained by accrual accounting methods that require judgment and estimation, it is possible that earnings could be manipulated to indicate better financial performance than reality. To counter this problem, I disaggregate earnings into cash and accruals using both the balance sheet method and the cash flow method.

**Table 37: Segmented Data on Assets and CAPEX - TransCanada**

<i>\$ in millions</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Assets</b>						
Natural Gas Pipelines	23210	48%	25165	47%	<b>27103</b>	<b>46%</b>
Liquid Pipelines	10485	22%	13253	25%	<b>16116</b>	<b>27%</b>
Energy	13157	27%	13747	26%	<b>14197</b>	<b>24%</b>
Corporate	1481	3%	1733	3%	<b>1531</b>	<b>3%</b>
<b>Consolidated</b>	<b>48333</b>		<b>53898</b>		<b>58947</b>	
<b>CAPEX</b>						
Natural Gas Pipelines	1389	54%	1776	42%	<b>1768</b>	<b>50%</b>
Liquid Pipelines	1145	44%	2286	54%	<b>1530</b>	<b>43%</b>
Energy	24	1%	152	4%	<b>206</b>	<b>6%</b>
Corporate	37	1%	50	1%	<b>46</b>	<b>1%</b>
<b>Consolidated</b>	<b>2595</b>		<b>4264</b>		<b>3550</b>	

**Table 38: Segmented Data on Revenue and EBIT - TransCanada**

<i>\$ in millions</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Revenue</b>						
Natural Gas Pipelines	4264	9%	4497	8%	<b>4913</b>	<b>8%</b>
Liquid Pipelines	1039	2%	1124	2%	<b>1547</b>	<b>3%</b>
Energy	2704	6%	3176	6%	<b>3725</b>	<b>6%</b>
Corporate	0	0%	0	0%	<b>0</b>	<b>0%</b>
<b>Consolidated</b>	<b>8007</b>		<b>8797</b>		<b>10185</b>	
<b>EBIT</b>						
Natural Gas Pipelines	1808	70%	1881	44%	<b>2178</b>	<b>61%</b>
Liquid Pipelines	553	21%	603	14%	<b>843</b>	<b>24%</b>
Energy	579	22%	1113	26%	<b>943</b>	<b>27%</b>
Corporate	<b>(111)</b>	<b>(4%)</b>	<b>(124)</b>	<b>(3%)</b>	<b>(150)</b>	<b>(4%)</b>
<b>Consolidated</b>	<b>2829</b>		<b>3473</b>		<b>3814</b>	



**Table 39: Selected Cash Flow and Balance Sheet Information - TransCanada**

<i>\$ in millions CAD</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Balance Sheet</b>				
Total Assets	47221	48332	53898	<b>58947</b>
Cash and marketable Securities	(654)	(551)	(927)	(489)
<b>Operating Assets</b>	46567	47781	52971	<b>58458</b>
Total Liabilities	23557	30060	33762	<b>38294</b>
Long-term Debt	(18019)	(21892)	(22960)	(18019)
Current Portion of Long-term Debt	(935)	(894)	(973)	(1797)
Short-term Debt	(1863)	(2275)	(1842)	(2467)
<b>Operating Liabilities</b>	3035	8872	9055	<b>11070</b>
<b>Net Operating Assets</b>	43532	38909	43916	<b>47388</b>
<b>Balance Sheet Accruals</b>		(4623)	5007	<b>3472</b>
<b>Cash Flow Statement</b>				
Net Income		1354	1786	<b>1840</b>
(-) CFO		3571	3674	<b>4079</b>
(-) CFI		(3256)	(5120)	(4144)
<b>Cash Flow Accruals</b>		1039	3232	<b>1905</b>

**Table 40: Cash Flow and Balance Sheet Accruals Ratios - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Balance sheet approach</b>			
<u>BS Accruals</u>	28.4%	23.7%	<b>24.0%</b>
Average NOA			
<b>Cash flow statement approach</b>			
<u>Cash Flow Accruals</u>	9.5%	17.3%	<b>21.8%</b>
Average NOA			

**Table 41: CFO before interest and tax to Operating Income - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
CFO	3571	3674	<b>4079</b>
(+) Cash Interest paid	973	965	<b>1162</b>
(+) Cash taxes paid	956	997	<b>1116</b>
CFO before interest and taxes	5500	5636	<b>6357</b>
EBIT	5178	5324	<b>6371</b>
<u>CFO before interest and taxes</u>	106%	106%	<b>100%</b>
EBIT			

Using the balance sheet approach (see tables 39-40), I noticed that the accrual ratio has been declining from 2012 to 2014, which is a good sign. While the cash flow statement approach indicates that the accruals ratio has been increasing throughout the period, which is a contradicting sign. The latter phenomena are sometimes the result of earnings manipulations. I investigate this issue further by comparing TransCanada's operating cash flow to its EBIT (see table 41). The ratio of CFO to EBIT validates that operating cash flow has matched EBIT over 2012 to 2014. The results reduces the probability of earning manipulations.

**Table 42: Cash Return on Total Assets - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
CFO	3571	3674	4079
Average Total Assets	47777	51115	56423
<b>CFO</b>	7.5%	7.2%	7.2%
<b>Average Total Assets</b>			

The Cash return on average total assets ratio (see table 42) has dropped slightly in 2013 and 2014 relative to 2012 levels, which usually indicates that the new investments in assets are not justified. However, this is likely a result of increases in capital expenditures on projects that are not currently in operations, hence generating less CFO and explaining the decline in the ratio. Once the capital expenditures on project are full operational the ratios should return to normal levels.

**Table 43: Selected Cash Flow Ratios - TransCanada**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Cash flow to reinvestment</b>			
CFO	3571	3674	<b>4079</b>
CAPEX	2595	4264	<b>3550</b>
<u>CFO</u> CAPEX	1.38	0.86	<b>1.15</b>
<b>Cash flow to total debt</b>			
CFO before interest and taxes	5500	5636	<b>6357</b>
Total debt	20522	21188	<b>24707</b>
<u>CFO before interest and taxes</u> Total Debt	0.27	0.27	<b>0.26</b>
<b>Cash flow interest coverage</b>			
CFO before interest and taxes	5500	5636	<b>6357</b>
Cash interest paid	973	965	<b>1162</b>
<u>CFO before interest and taxes</u> Cash Interest Paid	5.65	5.84	<b>5.47</b>

In the following analysis refer to table 43. The CFO/CAPEX ratio dropped in 2013 but has increased back up in 2014. A ratio lower than one means that TransCanada isn't generated sufficient cash flows to cover their capital expenditures, since the ratio has increased back to moderate levels I will not further investigate in this issue. CFO/Debt ratio has remained fairly constant (roughly in the 26-27% range), which confirms TransCanada's high leverage position. The Cash flow interest coverage ratio is fairly high roughly in the 5 to 6 range, which means that the amount of cash from TransCanada's day to day operations can easily cover interest payments.

In summary, TransCanada's earning's quality has been quite stable over time. Hence, I believe using historical information to forecast the company's future performance is reliable.

### 1.2.3 Kinder Morgan

**Table 44: Selected Financial Data - KMI**

<i>\$ in millions CAD</i>	<i>2010</i>	<i>2011</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Income Statement</b>					
Total Revenue	8190.6	7943	9973	14070	<b>16226</b>
Operating Income	1280.7	1423	2593	3990	<b>4448</b>
EBT	467.9	810	1343	3438	<b>3091</b>
Interest Expense	668.3	703	1399	1675	<b>1798</b>
Equity In Earnings of Affiliate/JV	186.2	<b>(226)</b>	<b>(153)</b>	<b>(327)</b>	<b>(406)</b>
Net Income	<b>(41.3)</b>	594	315	1193	<b>1026</b>
<b>Balance Sheet</b>					
Total Assets	30220	41494	46800	57568	<b>72857</b>
Accounts Receivable - Affiliates/Non-Trade	--	55	12	65	<b>241</b>
Total Shareholders Equity	7565	10615	13504	17510	<b>35587</b>

**Table 45: 5 Stage DuPont Analysis - KMI**

	<b>Tax Burden</b>	<b>x</b>	<b>Interest Burden</b>	<b>x</b>	<b>EBIT Margin</b>	<b>x</b>	<b>Total Asset Turnover</b>	<b>x</b>	<b>Financial Leverage</b>	<b>=</b>	<b>ROE</b>
2011	0.73		0.57		0.18		0.22		3.94		0.07
2012	0.23		0.52		0.26		0.23		3.66		0.03
2013	0.35		0.86		0.28		0.27		3.37		0.08
2014	<b>0.33</b>		<b>0.69</b>		<b>0.27</b>		<b>0.25</b>		<b>2.46</b>		<b>0.04</b>

**Table 46: Extended 5 Stage DuPont Analysis (Excluding equity income and investment asset) - KMI**

	Tax Burden	x	Interest Burden	x	EBIT Margin	x	Total Asset Turnover	x	Financial Leverage	=	ROE
2011	1.01		0.57		0.18		0.22		3.94		0.09
2012	0.35		0.52		0.26		0.23		3.66		0.04
2013	0.44		0.86		0.28		0.27		3.37		0.10
2014	<b>0.46</b>		<b>0.69</b>		<b>0.27</b>		<b>0.25</b>		<b>2.46</b>		<b>0.05</b>

In this section, I analyze Kinder Morgan's ability to generate profits over time (see tables 44-46), and to identify why it has changed over time. If it has changed I would need to see if the effects are permanent and whether I need to make adjustments in the valuation process to account for it.

**Table 47: Selected Items Vertical Common Size Income Statement - KMI**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Revenue</b>						
Service Revenue	5013	50.3%	6677	47.5%	7650	47.1%
Product Revenue	2449	24.6%	3788	26.9%	4461	27.5%
Natural Gas Revenue	2511	25.2%	3605	25.6%	4115	25.4%
<b>Total Revenue</b>	9973		14070		16226	
<b>Operating Expense</b>						
Taxes Other Than Income	286	2.9%	395	2.8%	418	2.6%
Depreciation Depletion And Amortization	1419	14.2%	1806	12.8%	2040	12.6%
General and Administrative Expenses	929	9.3%	613	4.4%	610	3.8%
Cost of Goods Sold	3057	30.7%	5253	37.3%	6278	38.7%
Other Operating Expenses	1702	17.1%	2112	15.0%	2157	13.3%
Other Operating Income	(13)	(0.1%)	(99)	(0.7%)	3	0.0%
Total Operating Expenses	7380	74.0%	10080	71.6%	11778	72.6%
<b>EBIT</b>	2593	26.0%	3990	28.4%	4448	27.4%
Income from equity investments	153	1.5%	327	2.3%	406	2.5%
Other income/(expense)	(19)	(0.2%)	(53)	(0.4%)	(80)	(0.5%)
Interest expense	1399	14.0%	1675	11.9%	1798	11.1%
<b>EBT</b>	1343	13.5%	3438	24.4%	3091	19.0%



**Table 48: Selected Items Horizontal Common Size Income Statement - KMI**

<i>\$ in millions CAD</i>	<i>2012 Values</i>	<i>2013 %delta</i>	<i>2014 %delta</i>
<b>Revenue</b>			
Service Revenue	5013	33.2%	52.6%
Product Revenue	2449	54.7%	82.2%
Natural Gas Revenue	2511	43.6%	63.9%
<b>Total Revenue</b>	<b>9973</b>	<b>41.1%</b>	<b>62.7%</b>
<b>Operating Expense</b>			
Taxes Other Than Income	286	38.1%	46.2%
Depreciation Depletion And Amortization	1419	27.3%	43.8%
General and Administrative Expenses	929	(34.0%)	(34.3%)
Cost of Goods Sold	3057	71.8%	105.4%
Other Operating Expenses	1702	24.1%	26.7%
Other Operating Income	(13)	661.5%	(123.1%)
<b>Total Operating Expenses</b>	<b>7380</b>	<b>36.6%</b>	<b>59.6%</b>
<b>EBIT</b>	<b>2593</b>	<b>53.9%</b>	<b>71.5%</b>
Income from equity investments	153	113.7%	165.4%
Other income/(expense)	(19)	178.9%	321.1%
Interest expense	1399	19.7%	28.5%
<b>EBT</b>	<b>1343</b>	<b>156.0%</b>	<b>130.2%</b>

After analyzing the vertical (see table 47) and horizontal income (see table 48) statements, I noticed that the most prominent reasons for the varying interest burden are because of the growth in interest expense and income from equity investments. Both of these items grew quite rapidly in 2013. In 2014, these categories also increased by at a lesser rate. Revenue and operating expenses has been growing at a fairly consistently rate, which is reflected in the fairly stable EBIT margin over 2012 to 2014.

Growth in interest expense is not likely to be sustainable, and income from equity investments accounts for a fairly small proportion of revenues. Hence, I do not believe either will affect the valuation process.

**Table 49: Segmented Information on Operating Expenses (Percentages are relative to 2012 values) - KMI**

<i>\$ in millions CAD</i>	<i>2012 Value</i>	<i>2013%Delta</i>	<i>2014%Delta</i>
<b>Operating Expense</b>			
Natural Gas Pipelines	3111	68.3%	100.6%
CO2	381	15.2%	29.7%
Terminals	685	(4.1%)	8.9%
Products Pipelines	759	70.6%	65.7%
Kinder Morgan Canada	103	6.8%	2.9%
Other	5	500.0%	380.0%
<b>Consolidated</b>	<b>5044</b>	<b>54.0%</b>	<b>75.8%</b>

**Table 50: Segmented Information on Operating Expenses (Percentages are relative to Total) - KMI**

<i>\$ in millions CAD</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Operating Expense</b>						
Natural Gas Pipelines	3111	61.7%	5235	67.4%	6241	70.4%
CO2	381	7.6%	439	5.7%	494	5.6%
Terminals	685	13.6%	657	8.5%	746	8.4%
Products Pipelines	759	15.0%	1295	16.7%	1258	14.2%
Kinder Morgan Canada	103	2.0%	110	1.4%	106	1.2%
Other	5	0.1%	30	0.4%	24	0.3%
<b>Consolidated</b>	<b>5044</b>		<b>7766</b>		<b>8869</b>	

Operating and admin expense (see tables 49-50) have been growing at a fairly consistent rate with revenue. After, analyzing operating and admin expenses by segment, the main lines of business driving increases in OPEX are: (1) Natural Gas, (2) Products pipelines, and (3) Others. However, examining the trends and the magnitude of the trends of OPEX associated with each line of business is not enough. If Kinder Morgan wants to identify the best ways to reduce OPEX, the overall impact of a percentage change in OPEX also needs to be taken into account. To determine the overall impact, I would look at the proportion of total operating expense accounted for by each line of business.

In summary, after analyzing this component estimating the operating expenditure by line of business doesn't seem like a feasible approach. First, the proportion of OPEX accounted for each segment seems to be changing by a sizable amount over time. Second the growth of each segment doesn't appear to be based on a constant growth rate. Third, strictly using percentage change relative to 2012 values does not seem like a good methodology to forecast operating expenses.

**Table 51: Segmented Data on Assets and CAPEX - KMI**

<b>\$ in millions</b>	<b>2012</b>		<b>2013</b>		<b>2014</b>	
<b>Assets</b>						
Natural Gas Pipelines	46600	72%	52357	74%	<b>52523</b>	<b>74%</b>
CO2	4148	6%	4708	7%	<b>5227</b>	<b>7%</b>
Terminals	6089	9%	6888	10%	<b>8850</b>	<b>13%</b>
Products Pipelines	5931	9%	6648	9%	<b>7179</b>	<b>10%</b>
Kinder Morgan Canada	1724	3%	1677	2%	<b>1593</b>	<b>2%</b>
Other	601	1%	568	1%	<b>459</b>	<b>1%</b>
<b>Consolidated</b>	<b>65093</b>		<b>70601</b>		<b>75831</b>	
<b>CAPEX</b>						
Natural Gas Pipelines	499	25%	1085	32%	<b>935</b>	<b>26%</b>
CO2	453	22%	667	20%	<b>792</b>	<b>22%</b>
Terminals	707	35%	1108	33%	<b>1049</b>	<b>29%</b>
Products Pipelines	307	15%	416	12%	<b>680</b>	<b>19%</b>
Kinder Morgan Canada	16	1%	77	2%	<b>156</b>	<b>4%</b>
Other	40	2%	16	0%	<b>5</b>	<b>0%</b>
<b>Consolidated</b>	<b>2022</b>		<b>3369</b>		<b>3617</b>	

**Table 52: Segmented Data on Revenue and EBDA - KMI**

<i>\$ in millions</i>	<i>2012</i>		<i>2013</i>		<i>2014</i>	
<b>Revenue</b>						
Natural Gas Pipelines	5230	53%	8617	63%	<b>10168</b>	<b>63%</b>
CO2	1677	17%	1857	14%	<b>1960</b>	<b>12%</b>
Terminals	1359	14%	1410	10%	<b>1718</b>	<b>11%</b>
Products Pipelines	1370	14%	1853	13%	<b>2068</b>	<b>13%</b>
Kinder Morgan Canada	311	3%	302	2%	<b>291</b>	<b>2%</b>
Other	<b>(6)</b>	0%	1	0%	<b>1</b>	<b>0%</b>
<b>Consolidated</b>	9941		13737		<b>16206</b>	
<b>EBDA</b>						
Natural Gas Pipelines	2174	43%	4207	56%	<b>4259</b>	<b>57%</b>
CO2	1322	26%	1435	19%	<b>1240</b>	<b>17%</b>
Terminals	708	14%	836	11%	<b>944</b>	<b>13%</b>
Products Pipelines	668	13%	602	8%	<b>856</b>	<b>11%</b>
Kinder Morgan Canada	229	4%	424	6%	<b>182</b>	<b>2%</b>
Other	7	0%	<b>(5)</b>	0%	<b>13</b>	<b>0%</b>
<b>Consolidated</b>	5108		7499		<b>7494</b>	

**Table 53: CAPEX% to SegAsset% and EBDA Margin - KMI**

	EBDA Margin			<i>CAPEX%</i> <i>Segment Asset %</i>		
	<i>2012</i>	<i>2013</i>	<i>2014</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
Natural Gas Pipelines	42%	49%	<b>42%</b>	0.34%	0.43%	<b>0.35%</b>
CO2 Terminals	79%	77%	<b>63%</b>	3.52%	2.97%	<b>2.96%</b>
Products Pipelines	52%	59%	<b>55%</b>	3.74%	3.37%	<b>2.31%</b>
Kindergas Pipelines	49%	32%	<b>41%</b>	1.67%	1.31%	<b>1.85%</b>
Kindergas Canada	74%	140%	<b>63%</b>	0.30%	0.96%	<b>1.91%</b>
Other	<b>(117%)</b>	<b>(500%)</b>	<b>1300%</b>	2.14%	0.59%	<b>0.21%</b>

Figures 51-53, indicates that Kinder Morgan is expanding the sectors that are consistently generating the most earnings (i.e. CO2 and Kinder Morgan Canada). Kinder Morgan Canada is the sector that is consistently generating the most earnings, and should hence be allocated the most resources. For instance, Terminals is able to generate consistent amount of earnings, however Kinder Morgan Canada is able to generate more, hence the CAPEX%/SegAsset% should be higher for Kinder Morgan Canada.

In summary, since Kinder Morgan has been allocating its resources to the most profitable segments which are primary pipeline assets, revenues of the company should become more predictable in the future.

**Table 54: Selected Cash Flow and Balance Sheet Information - KMI**

<b>\$ in millions CAD</b>	<b>2011</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Balance Sheet</b>				
Total Assets	30717	67947	75185	<b>83198</b>
Cash and marketable Securities	(411)	(714)	(598)	(315)
<b>Operating Assets</b>	30306	67233	74587	<b>82883</b>
Total Liabilities	22149	44146	46900	<b>48772</b>
Long-term Debt	(14356)	(32000)	(33887)	(40246)
Current Portion of Long-term Debt	(2899)	(2402)	(2306)	(2717)
Short-term Debt	0	0	0	0
Operating Liabilities	4894	9744	10707	<b>5809</b>
Net Operating Assets	25412	57489	63880	<b>77074</b>
<b>Balance Sheet Accruals</b>		32077	6391	<b>13194</b>
<b>Cash Flow Statement</b>				
Net Income		315	1193	<b>1026</b>
(-) CFO		2808	4122	<b>4467</b>
(-) CFI		(5097)	(3122)	(5210)
<b>Cash Flow Accruals</b>		2604	193	<b>1769</b>

**Table 55: Cash Flow and Balance Sheet Accruals Ratios - KMI**

<b>\$ in millions CAD</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>
<b>Balance sheet approach</b>			
<b>BS Accruals</b>			
<b>Average NOA</b>	77%	11%	<b>19%</b>
<b>Cash flow statement approach</b>			
<b>Cash Flow Accruals</b>			
<b>Average NOA</b>	6%	0%	<b>3%</b>



**Table 56: CFO before interest and tax to Operating Income - KMI**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>CFO</b>	2808	4122	<b>4467</b>
(+) Cash Interest paid	1582	1727	<b>1870</b>
(+) Cash taxes paid	2819	1314	<b>(3910)</b>
<b>CFO before interest and taxes</b>	7209	7163	<b>2427</b>
<b>EBIT</b>	2593	3990	<b>4448</b>
<b>CFO before interest and taxes</b>			
<b>EBIT</b>	278%	180%	<b>55%</b>

For the following analysis refer to tables 54-56. Using the balance sheet approach, I noticed that the accrual ratio has been declining relative to 2012 value, which is a good sign. This means that Kinder Morgan's earnings quality is improving. The cash flow method is telling a different story, it indicates that the earnings quality was better in 2012 when compared to the latter years.

The CFO before interest and taxes per unit of EBIT, has been declining over time which reinforces the notion that earnings quality for the company has declined.

**Table 57: Cash Return on Total Assets - KMI**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
CFO	2808	4122	<b>4467</b>
Average Total Assets	49332	71566	<b>79192</b>
<b>CFO</b>	5.7%	5.8%	<b>5.6%</b>
<b>Average Total Assets</b>			

The Cash return on average total asset ratio (see table 57) has remained fairly constant over time, which means that new investment in assets are generating consistent cash flows.

**Table 58: Selected Cash Flow Ratios - KMI**

<i>\$ in millions CAD</i>	<i>2012</i>	<i>2013</i>	<i>2014</i>
<b>Cash flow to reinvestment</b>			
CFO	2808	4122	4467
CAPEX	2022	3369	3617
<u>CFO</u> <u>CAPEX</u>	1.39	1.22	1.24
<b>Cash flow to total debt</b>			
CFO before interest and taxes	7209	7163	2427
Total debt	17255	34402	36193
<u>CFO before interest and taxes</u> <u>Total Debt</u>	0.42	0.21	0.07
<b>Cash flow interest coverage</b>			
CFO before interest and taxes	7209	7163	2427
Cash interest paid	1582	1727	1870
<u>CFO before interest and taxes</u> <u>Cash Interest Paid</u>	4.56	4.15	1.30

For the following analysis refer to table 58. The CFO/CAPEX ratio is lower in 2013 and 2014 relative to 2012 values, however the ratio remains over one, which means that Kinder Morgan is generating adequate cash flows to cover their capital expenditures. The remaining two ratios has declined over time, which means for each additional unit of debt (interest paid) less cash is generated. In general, the earnings quality of the company has declined. With the information on hand I cannot conclude whether the reduction in earnings will have a permanent effect on the company's financials. I do not expect this to be a permanent problem, hence I continue to use

historical relationships to forecast the intrinsic values. However, if additional inflow of information suggests that there will be permanent effects, then adjustment to historical relationships would need to be made.

### **1.3 Visual Structural Changes**

In this section, I examine visually whether there have been structural changes in key variables for each company.

#### **1.3.1 Enbridge<sup>45</sup>**

I started by examining Enbridge's quarterly revenues over time, and noticed a structural change in 2011. Hence in my valuation process, I did not use the revenue data before the change to forecast future revenues.

Next I examined price, and I did not see a structural change for the data post 2009. This indicates, that I can confidently use the data post 2009 to forecast future prices.

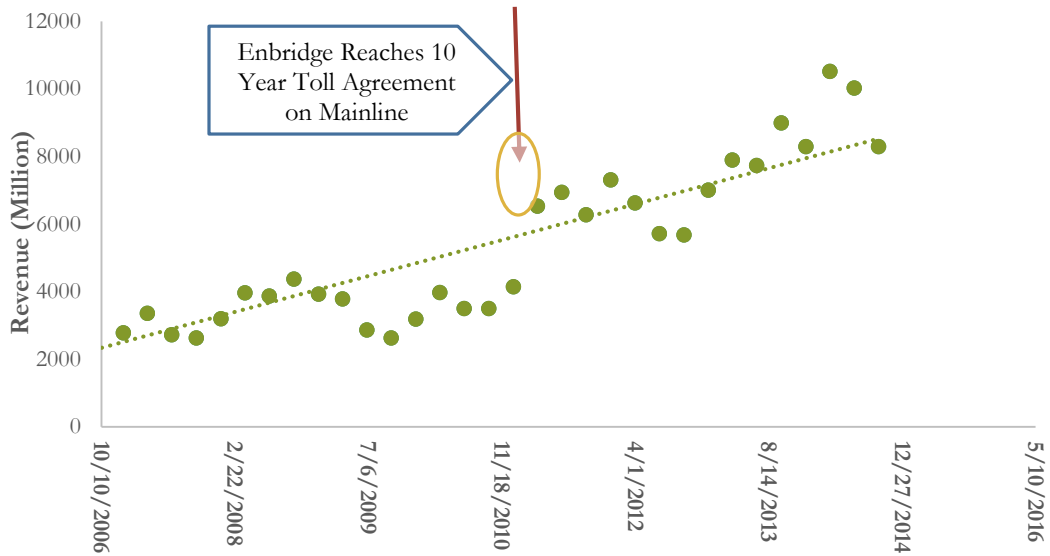
Lastly, I inspected net income and found that the data does not follow a linear line. Which means, that I should not forecast net income using time series data.

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<sup>4</sup> Refer to figures 1-5.

<sup>5</sup> Data obtained from Bloomberg Terminal.

**Figure 1: Enbridge Quarterly Revenue from Mar 31, 2005 - Sept 30, 2014**



**Figure 2: Enbridge Quarterly Revenue from Mar 2012 - Sept 30, 2014**

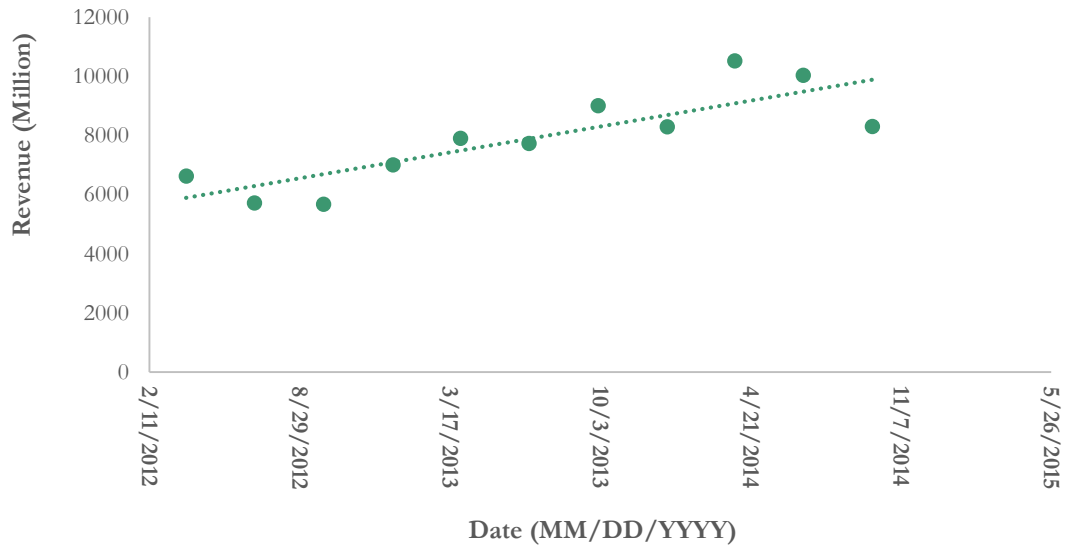


Figure 3: Enbridge's Adjusted Closing Price from Dec 31, 2009 - Dec 29, 2014

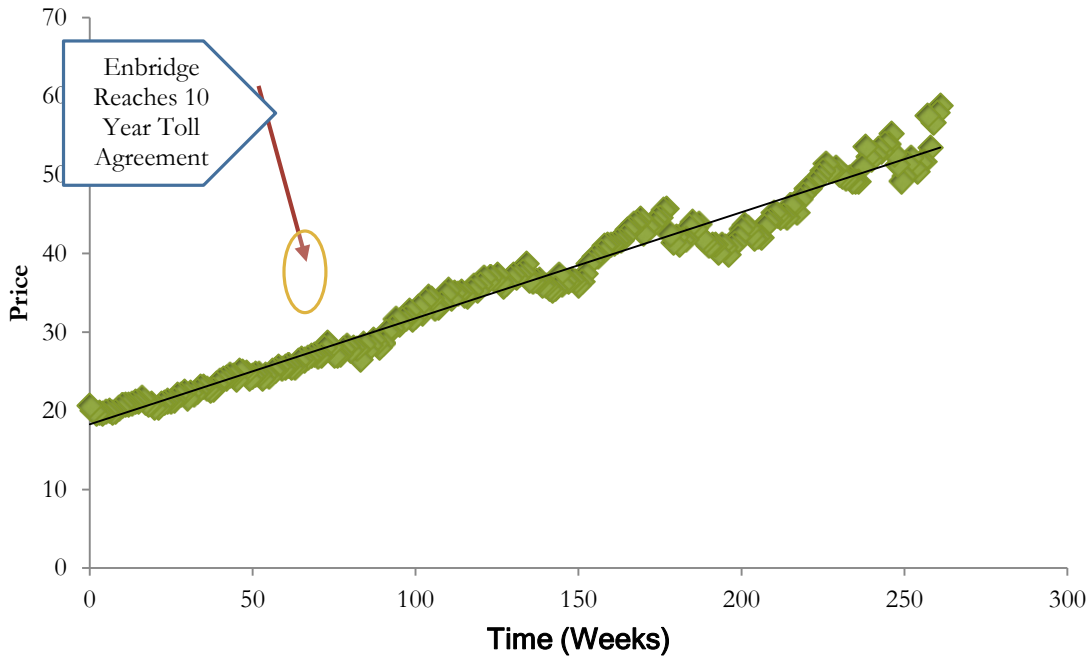


Figure 4: Enbridge Net Income from Mar 31, 2005 to Sept 30, 2014

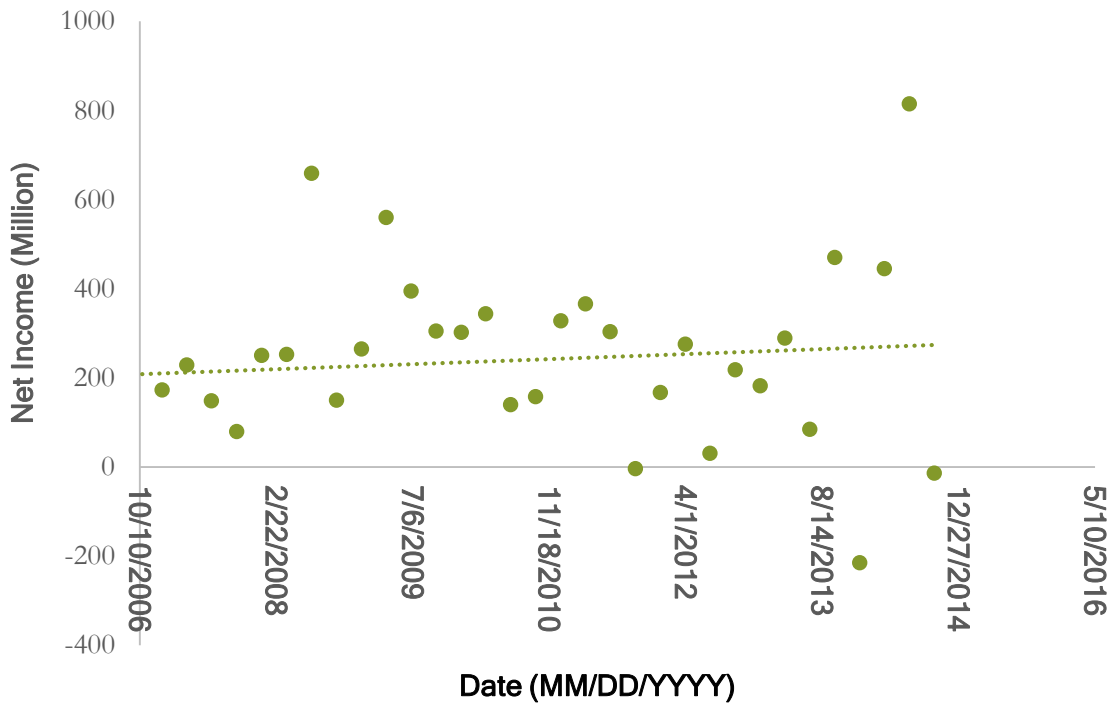
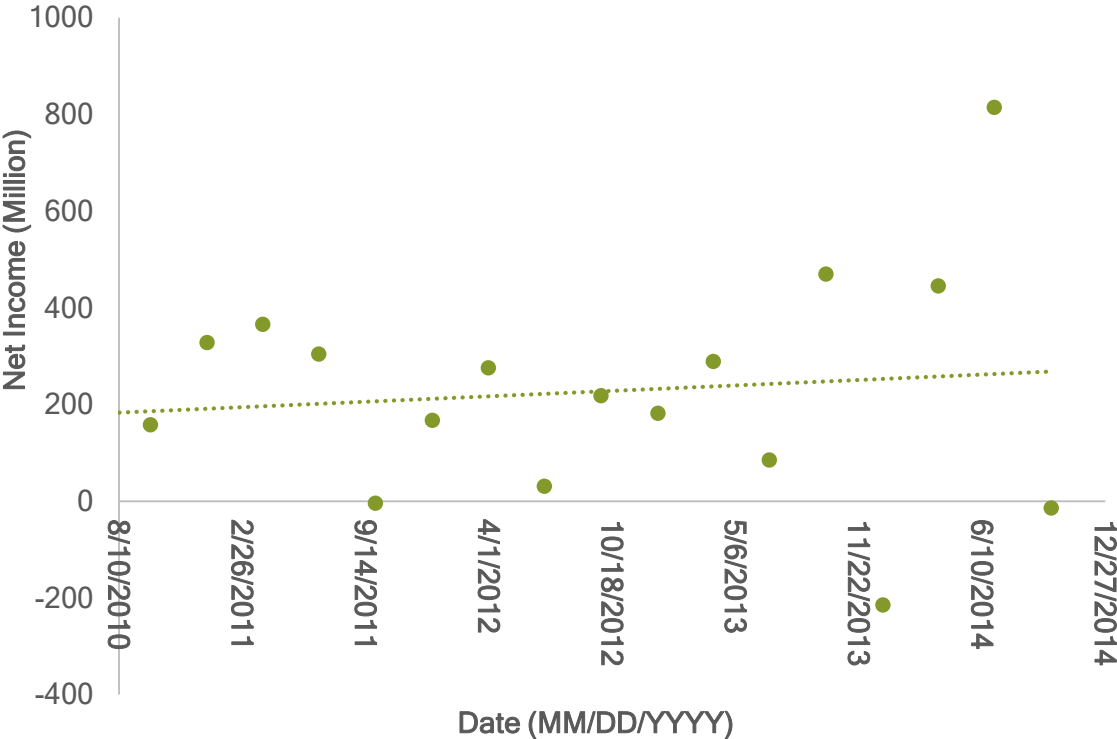


Figure 5: Enbridge Net Income from Jun 30, 2010 to Sept 30, 2014



### 1.3.2 TransCanada<sup>67</sup>

I began by inspecting TransCanada's quarterly revenues. I noticed that revenue has roughly followed a linear time trend. In addition, I did not identify any structural changes post March 2005. Which means that, I can confidently use the data post March 2005 to forecast future revenue.

Next, I examined net income. I noticed that net income does appear to follow a linear time trend. However, the data predicted by the line has a fairly large margin of error, which makes me hesitant in using the line to predict the company's net income.

Lastly, I examined the company's price. I noticed a minor structural change. Although, I do not believe the structural change is significant because the data post change has roughly followed the same linear line.

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<sup>6</sup> Refer to figures 6-10.

<sup>7</sup> Data on the variables are obtained from Bloomberg Terminal.



Figure 6: TransCanada Quarterly Revenue from Dec 31, 2008 - Sept 30, 2014

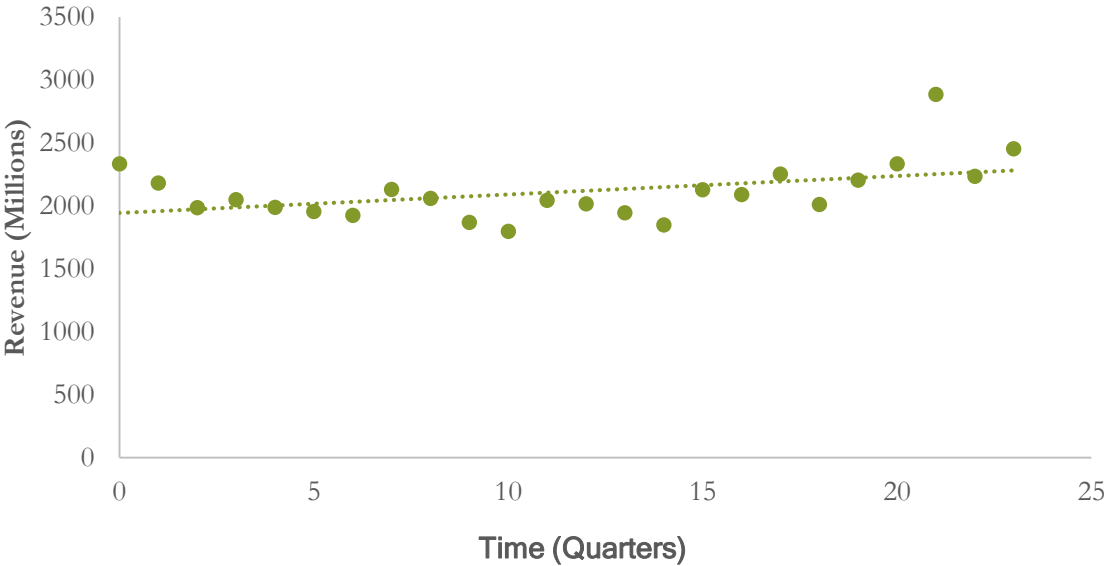


Figure 7: TransCanada Quarterly Revenue from Mar 31, 2005 - Sept 30, 2014

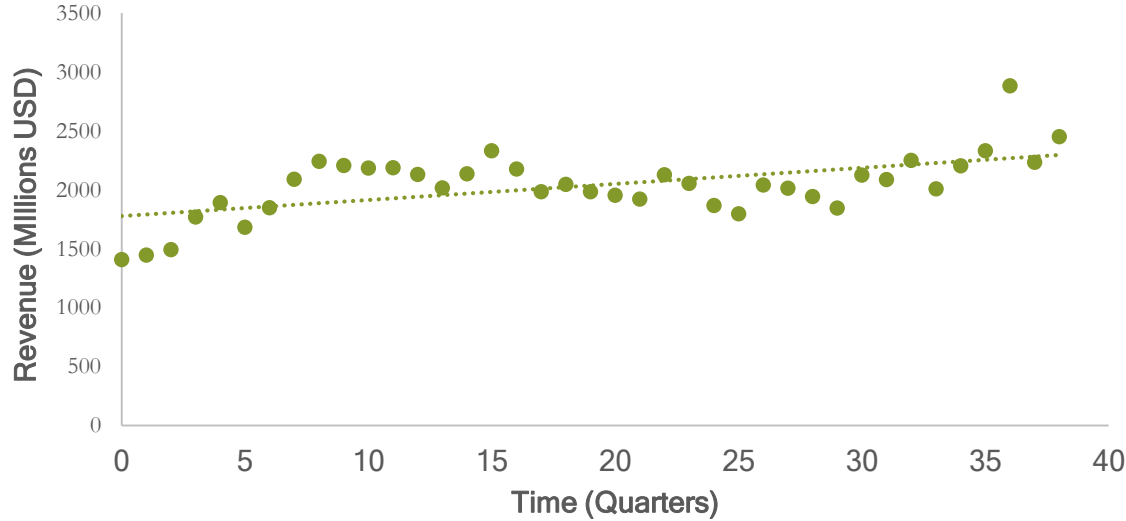


Figure 8: TransCanada Net Income from Dec 31, 2008 - Sept 30, 2014

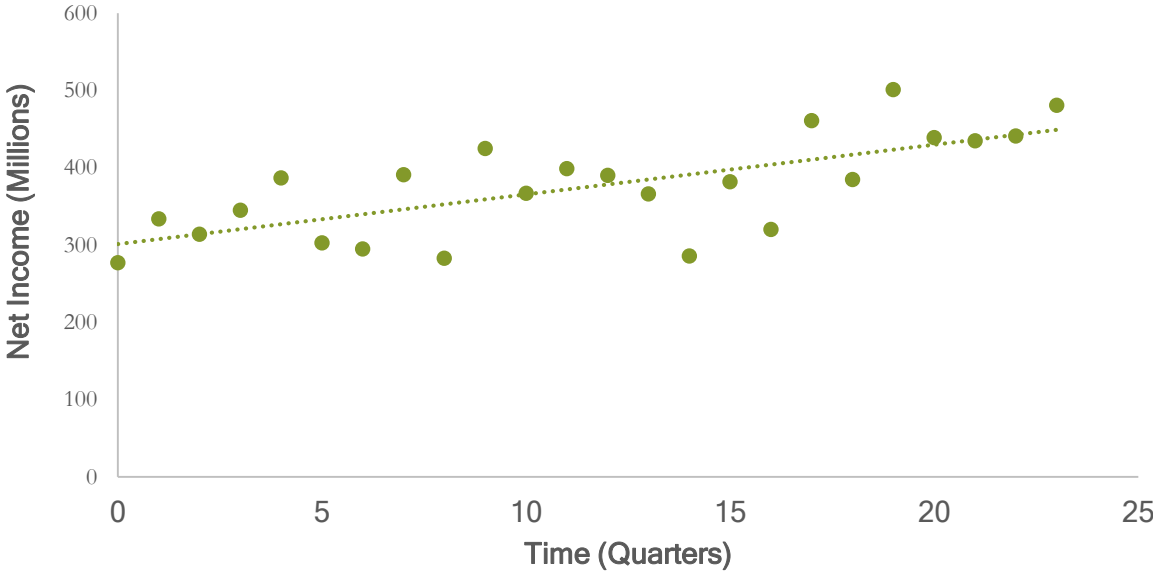


Figure 9: TransCanada Net Income from Mar 31, 2005 - Sept 30, 2014

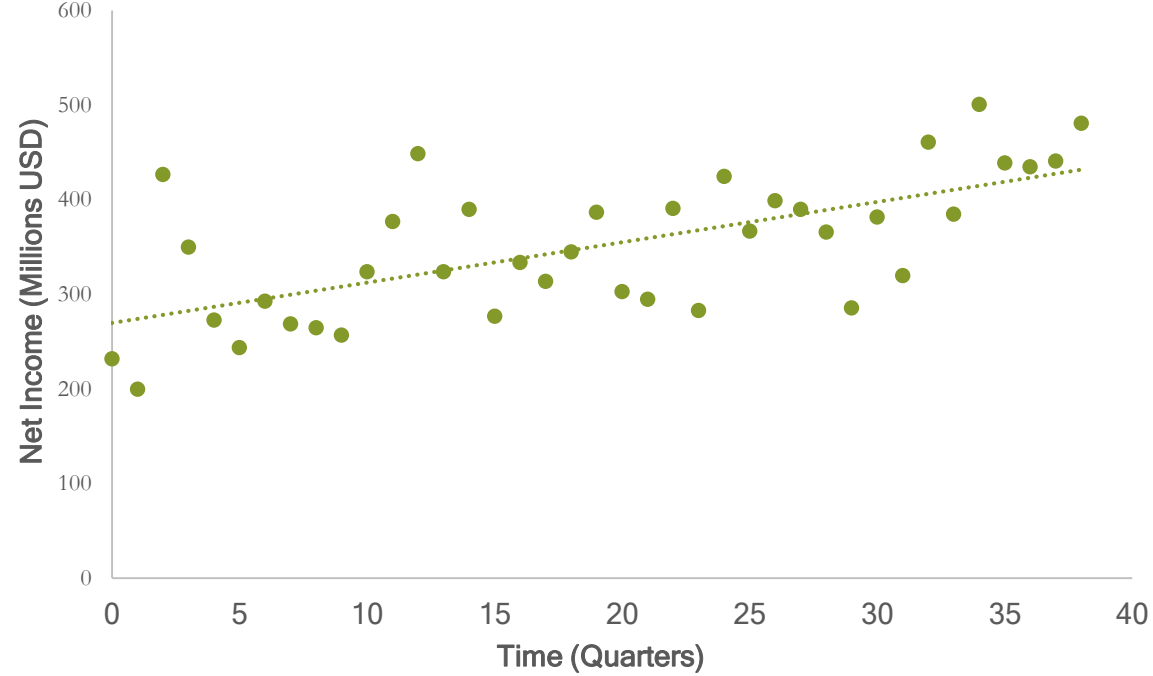
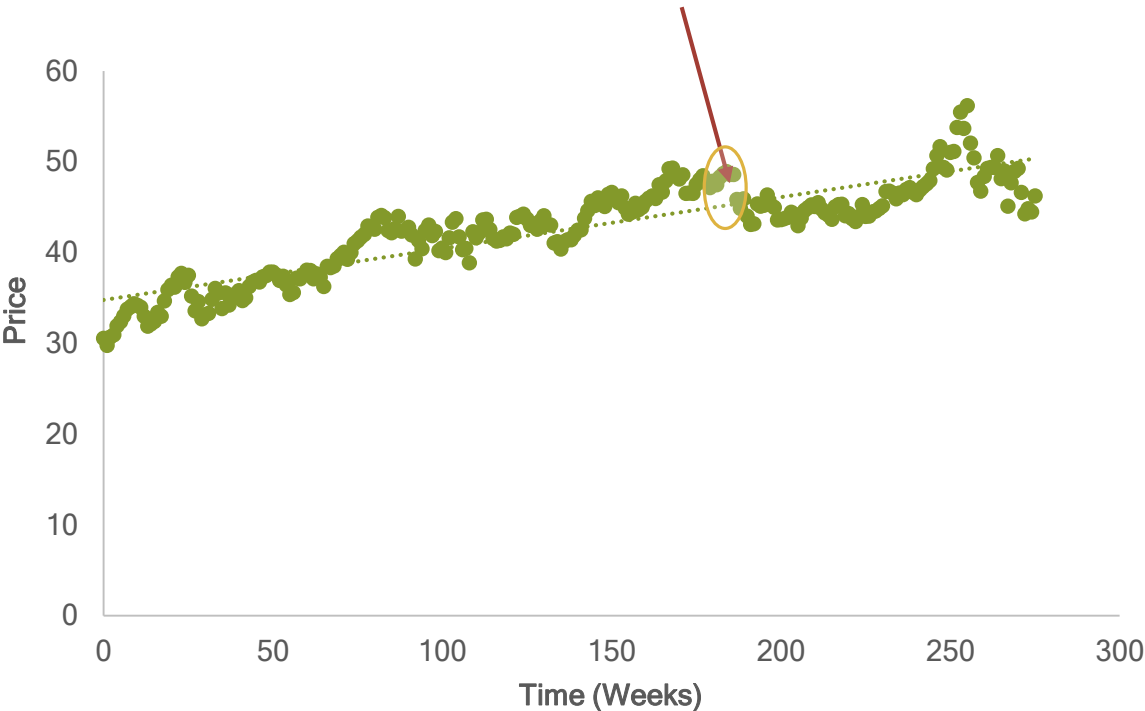


Figure 10: TransCanada Closing Price from Oct 30, 2009 - Feb 6, 2015



### 1.3.3 Kinder Morgan<sup>89</sup>

I started by evaluating Kinder Morgan's price. I noticed that the price roughly follows a linear line, however not to the extent of the other companies. I decided to investigate further, to see whether I should use historical data and the linear trend method to forecast the company's price. The plot indicates to me that the residuals appear to be following a pattern, which may result in bias in my regression estimates. However over the long-run price appears to following the linear trend line.

Next, I examined revenues. I noticed that revenue closely follows a linear time trend over the 4-5 year period. This means that I should be able to use the data over that period to forecast future revenues.

Lastly, I inspected net income. The linear time trend is a poor predictor of the time series. Hence, I do not use historical net income to forecast future net income.

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<sup>8</sup> Refer to figures 11-14.

<sup>9</sup> Data obtained from Bloomberg Terminal.

Figure 11: Kinder Morgan Closing Price from Feb 11, 2011 - Feb 11, 2015

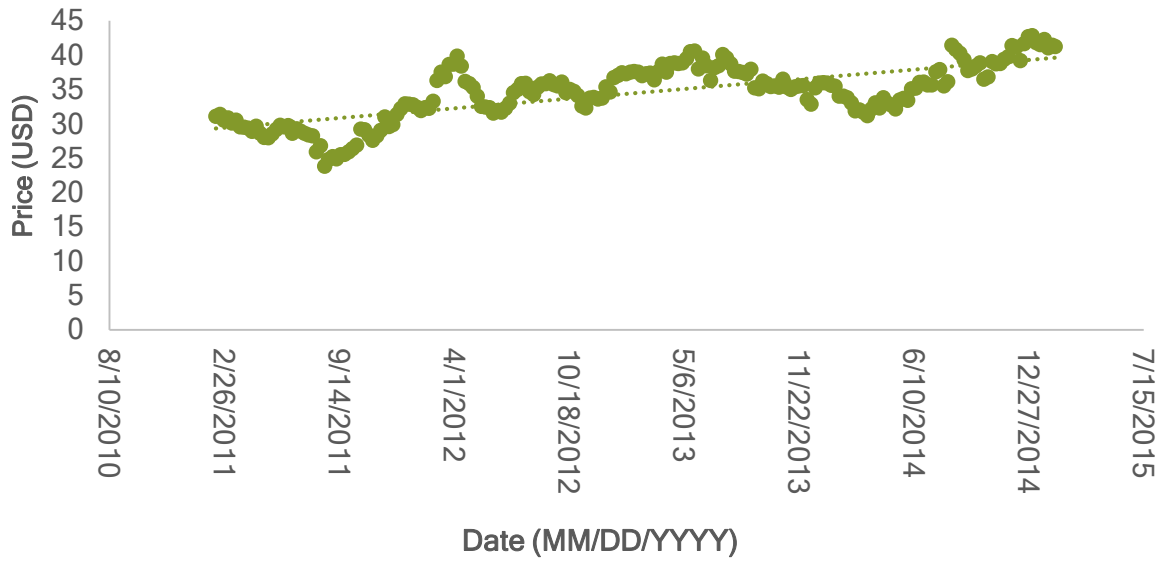


Figure 12: Kinder Morgan Closing Price Residual Plot

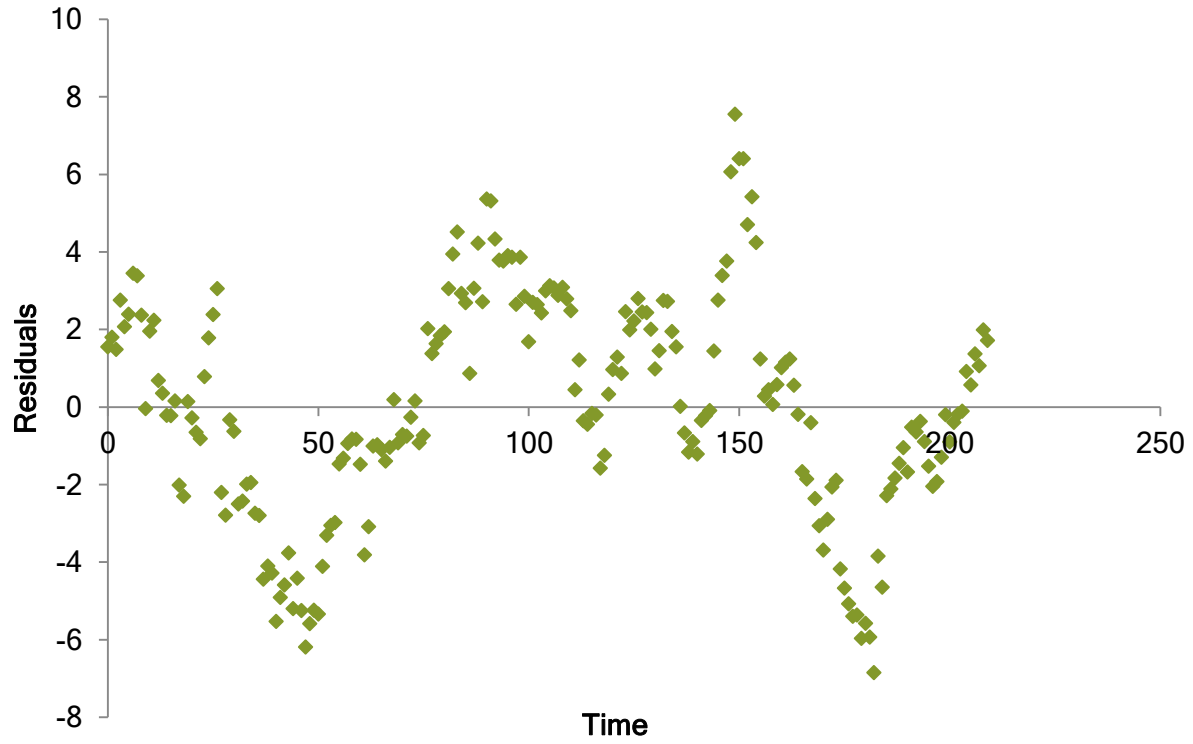


Figure 13: Kinder Morgan Revenues

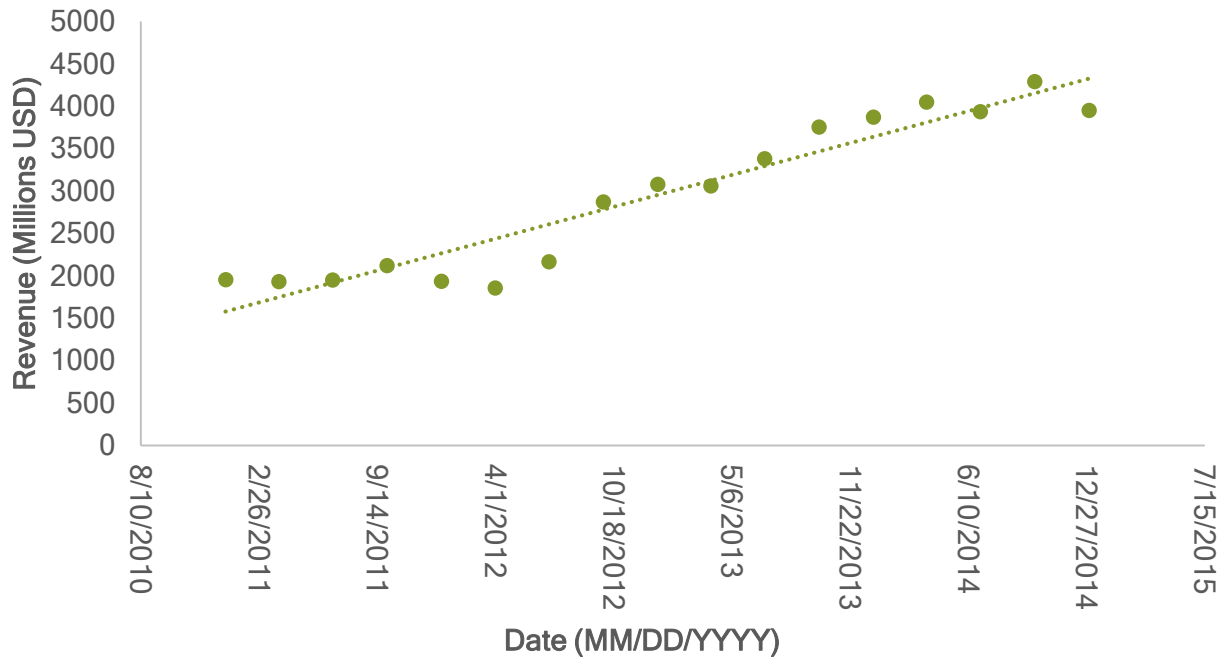
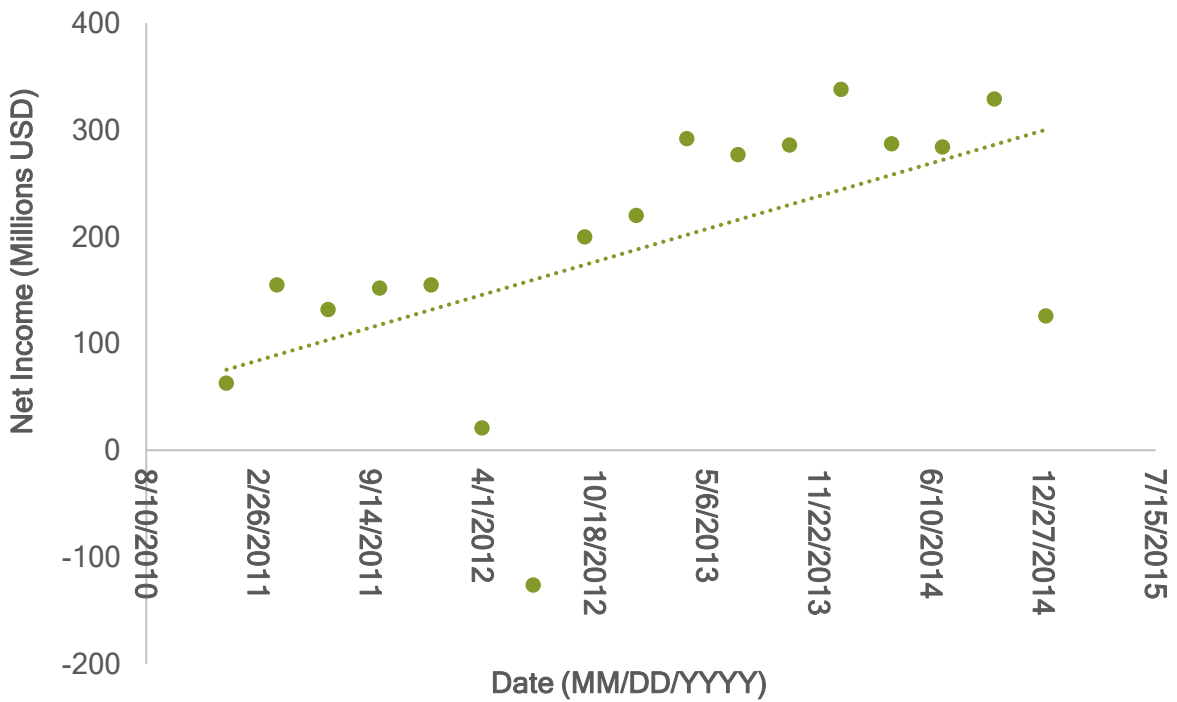


Figure 14: Kinder Morgan Net Income



## Chapter 2: Equity Valuation

In this chapter, I perform equity valuation for each company. I use three methods to value each company's stock. The first method is the time series trend model. Second, I use the autoregressive model. The last method is the residual income method, where I use the company's ability to generate economic profits to value each of the companies' stock.

### 2.1 Time Series Analysis

In this section, I will be determining whether it is feasible to estimate the intrinsic values of the companies using time series analysis or not. If it is, and the estimated values are similar to the estimates using other approaches, then I will have found support for my hypothesis. Before I begin my analysis, I will briefly explain the use of time series analysis and my approach.

A time series refers to a collection of realized values for a variable over time usually over fixed intervals, such as stock returns for this month, last month, the month before that and so on. Typically time series analysis is used to create an empirical abstract representation of the relationship between a dependent variable and a collection of explanatory variables. Another use is to create an empirical abstract representation of a single variable over time. In this part of the thesis I will be performing time series analysis for each of the companies' earnings, returns, and price. My hypothesis is that these factors can be predicted and with a high degree of accuracy using simple econometric tools because of the regulated nature of pipelines. If these

factors can be predicted it is possible to obtain a better forecast of each item, which can subsequently be used to develop better estimates of the stock's intrinsic value.

I will then run regressions of Kinder Morgan, Enbridge, and Kinder Morgan's stock returns on market returns. I will then use the estimated Betas to determine stock returns using the CAPM, Fama-French 3 Factor, and Fama-French 5 Factor models. The analyses are primarily motivated by the Economic and Finance literatures that have provided evidence that stocks returns are predictable over a long period of time. (e.g. Cochrane, 1999). A vast set of Finance literatures has suggested that stock returns can be explained by variables such as, earnings-price ratio and dividend-price ratio (e.g. Hodrick (1992), and Campbell (1987)). Another typical strategy is to develop an abstract representation of a time series on one or more lagged version of itself. For instance, the collection of stock returns of a company omitting the latest period's return may be used to predict stock returns of a company.

Abstract representation of a complex problem, a relationship between one variable and another variable, or a variable over time is referred to as a model. Identifying the objective is the first step in modeling. My objectives are to create OLS regression models that quantifies the relationship between stock return and variables that theory has predicted to explain stock returns, and the relationship between stock return and time, for each of the pipeline companies. Assumptions are made when modeling. Violating the assumptions would likely lead to incorrect inferences. Some of the assumptions can be relaxed, and some violations can be fixed by performing adjustments. When the key assumptions are not violated, or there is compelling reason to believe that violations would not significantly affect the estimates, then it is possible to make "on average" inferences about a dependent variable based on changes in the



explanatory variables. The dependent variable is the variable an experimenter is trying to explain using the explanatory variables. The dependent variable in my experiment is stock return (I'll perform one experiment for each company) and I will use the dividend-price ratio and earning-price ratio to explain stock returns. The common assumptions used in OLS regressions are:

1. There is a linear relationship between the dependent variable and the explanatory variables.

- $y_t = x_t\beta + u_t$

2. The explanatory variables are non-stochastic, and none of the explanatory variables can be written as a linear combination of any other explanatory variables and the unit vector. It is possible to have stochastic explanatory variables given several other assumptions, but for my analysis it is not necessary. The part of the assumption is a mathematical requirement that needs to be satisfied to find estimates of Beta. Intuitively it just means that not enough useful information was given, to find unique solutions of Beta, some of the information is redundant.
3. No autocorrelation, that is there is no systematic linear relationship between the residual (i.e. different between the observed dependent variable and the prediction for given levels of the explanatory variables) and the residual last period.
4. The Error term is normally distributed
5. Homoskedastic errors, that is the variance of the error terms is constant for all time periods

- $E(u_i^2) = \sigma_u^2$

6. On average the error term given the explanatory variables is zero.

- $E(u|x) = 0$

The process of modeling is complicated, and violations of different assumptions will have different impacts on the estimates. There are different methods to identify which assumptions are violated and many involve either graphs or hypothesis testing. The reliability of empirical inferences is highly dependent on the assumptions made, and whether there are methods to mitigate the effects of the violated assumptions. A vast amount of literature has provided arguments and analytical results that suggests that when the explanatory variable is persistent and its random error is strongly systematically related with a company's returns, then the estimation procedure may produce bad estimates, even if the sample size is large (e.g. Mankiw and Shapiro, 1986).

### 2.1.1 Trend Models

The purpose of this section is to determine whether there are support from statistics to forecast the company's revenues and intrinsic value using the time series trend model. I provide a brief description of the technique, and run a series of regressions for each company.

When a variable is regressed on time the model is referred to as a trend model. Linear and Log-linear trend models are often the most commonly used trend models. Log-linear trend models are from the regression of the log of a variable on time. To determine which model is the best for a given time series, a scatter plot of the variable over time is created. A log linear model is created when the data appears to be growing exponentially and a linear model is used when the data appears to be growing linearly.

I use two years of weekly data obtained from yahoo finance in my analysis. And, I regress each of the stock prices of Enbridge, Kinder Morgan, and Kinder Morgan traded on the NYSE over time.

- $Stock Price_t = \beta time + u_t$

#### 2.1.1.1 Closing Price Regression Results - Enbridge

From previous analysis, Enbridge's adjusted Closing price from December 31, 2009 to December 29, 2015 (weekly data), over time, indicates that Enbridge's Closing price closely follows a linear trend. Examining the plot, I can conclude that there are no structural changes in Enbridge's Closing price.

Structural changes means that there is a distinct change in the pattern of the data after a point in time. In those circumstances regressions should only include the data after the structural change(s), because using the entire collection of data when there are structural changes will likely produce unreliable results. Since there appear to be no structural changes the entire sample is used.

The regression of Enbridge's closing price on a linear trend (see table 59) is a highly significant model. The significance F is close to zero indicating that the time variable is highly relevant in explaining Enbridge's closing price. The R<sup>2</sup> is about 97.26%, which indicates that approximately 97.26% of the variation in Enbridge's historical stock price can be explained by a linear time trend.

In summary, the linear time trend model is a strong predictor of Enbridge's intrinsic value.

**Table 59: Enbridge Inc (TSX) Data from December 31st 2009 to 2014**

<i>Regression Statistics</i>	
Multiple R	0.986194351
R Square	0.972579298
Adjusted R Square	0.972473834
Standard Error	1.730118806
Observations	262

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	27603.97677	27603.97677	9221.887074	4.4693E-205
Residual	260	778.2608812	2.993311082		
Total	261	28382.23765			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	18.44358895	0.2131637	86.52312275	1.1642E-193	18.02384191	18.86333598
Time	0.135714945	0.001413246	96.03065695	4.4693E-205	0.13293208	0.138497811

### 2.1.1.2 Closing Price Regressions Results

From previous analysis, TransCanada's adjusted closing price from December 31, 2009 to December 29, 2014 (weekly data), over time, indicates that TransCanada's closing price roughly follows a linear trend. Examining the plot there does not appear to be structural changes in TransCanada's Closing price. Since there appear to be no structural changes the entire sample is used. The significance F from the regression of TransCanada's Closing Price trend on a linear time trend (see table 60) is close to zero, indicating that the model is highly significant. The  $R^2$  is approximately 78.39%, which indicates that 78.39% of the variation of TransCanada's Historical Closing Price can be explained by a linear time trend.

In summary, the time series trend model is good predictor of TransCanada's stock.

**Table 60: TransCanada Closing Price Trend Analysis using weekly data from October 30, 2009 - February 6, 2015**

<i>Regression Statistics</i>	
Multiple R	0.88540944
R Square	0.783949877
Adjusted R Square	0.783161373
Standard Error	2.376255949
Observations	276

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	5613.978894	5613.978894	994.2242257	3.70733E-93
Residual	274	1547.1663	5.646592337		
Total	275	7161.145194			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	34.78677026	0.285291997	121.9339156	9.4146E-241	34.22512742	35.3484131
Time	0.056606361	0.001795242	31.53132134	3.70733E-93	0.05307214	0.060140582

### **2.1.1.3 Time Series Analysis Closing Price - Kinder Morgan**

From previous analysis, Kinder Morgan's adjusted Closing price from February 11, 2011 to February 11, 2015 (weekly data), over time, indicates that Kinder Morgan's Closing price does not seem to follow a linear price trend like Enbridge and Kinder Morgan. Examining the plot there does not appear to be structural changes in Kinder Morgan's Closing price. Regressing Kinder Morgan's Historical Closing Price on a linear time trend (see table 61) indicates that 70.86% of the variation of Kinder Morgan's closing price can be explained by a linear time trend variable. The linear time trend is highly significant, which indicates that it should be a relevant variable.

In summary, the time series trend model is a fair predictor of Kinder Morgan's intrinsic value.

**Table 61: KMI Corp (NYSE) Data from February 11, 2011 to December 31, 2014**

<i>Regression Statistics</i>	
Multiple R	0.841774504
R Square	0.708584315
Adjusted R Square	0.707141663
Standard Error	2.563048051
Observations	204

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	3226.587723	3226.587723	491.1679052	5.47602E-56
Residual	202	1326.981493	6.56921531		
Total	203	4553.569216			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	24.54667384	0.35758306	68.64607581	5.7644E-142	23.84159965	25.25174803
Regressor	0.067533977	0.003047245	22.16230821	5.47602E-56	0.061525489	0.073542466



### 2.1.2 Running Autoregressive Models

The purpose of this section is to see whether it makes sense to use the autoregressive model to forecast each of the company's intrinsic values. I provide a description of the technique and the common issues that need to be addressed using it, and then run a series of regressions for each company.

An autoregressive model is a time series model that is regressed on one or more lags of itself. In the simplest case a time series would be regressed on the first lag of itself. So, what happens is that there would be observation of a variable, for instance the time series could be Enbridge's stock return on a weekly basis.

Each observation would be Enbridge's stock return for a given week. The lag version of it would drop the latest stock return. That means the lag version would contain one less observation. Imagine a spreadsheet in one column there is Enbridge's stock return for 10 weeks. The lagged Enbridge's stock return would contain Enbridge's stock return for 9 weeks. The latest observation of Enbridge's stock returns will be parallel to the latest observations of Enbridge's lagged stock returns.

Performing the regression will result in an estimate of the average effect of Enbridge's last period returns on this period's return. Basically the coefficient associated with the lagged time series, is estimating the systematic linear relationship between this period's return with last period's return, and standardizing the relationship by the volatility of the lagged time series.

It is important to note that the interpretation of the coefficient needs to be used with care. Even when all the necessary assumption holds, the coefficient can only be interpreted as an on average causal effect, where causality means the effect of one

variable on another variable (e.g. The effect of Enbridge's last period stock returns on this period's stock returns).

In practice the coefficient are said to be causal if the assumption can either be justified through economic arguments or the impact of the violation can be reduced significantly or eliminated by adjusting the equations or computation methodology. An autoregressive model with a one period lag is given as follows:

$$x_t = \alpha + \beta x_{t-1} + \mu_t$$

For inferences for time series are only valid if it is covariance stationary. A time series is covariance stationary if:

- The time series has a tendency to move back to it's average value
- The distribution of the time series' has a fixed average distance between the mean, and the distance is not growing without bound
- The systematic linear relationship between a time series with lags of itself is constant and is not growing without bound

A common violation of the covariance stationarity assumption occurs when the time series exhibits a random walk process. A random walk means the observation in one period is equal to the observation of the last period plus a random error. A random walk with drift is a variation of the random walk model, but the observation in one period is equal to the observation of the last period plus a constant value and a random error. A time series that follows a random walk process is not covariance stationary because the mean reverting condition is violated. The mean reverting level approaches infinity when the time series follows a random walk. A time series follows a random walk with drift occurs when  $\beta = 1$ , and  $\alpha \neq 0$ , and when  $\alpha = 0$  it follows a random walk. From the

definition of a random walk  $xfitted_t = x_{t-1}$ , at the mean. Running a regression will yield, the predicted line of best fit for the data.

- $xfitted_t = \alpha + \beta x_{t-1}$
- $xfitted_t = \alpha / (1 - \beta)$  (mean)

Notice when  $\beta = 1$  the denominator is zero. The limit as  $\beta$  approaches 1 will make the mean value approach infinity.

The Dickey Fuller's test is often used to test whether the time series follows a random walk process (Dickey and Fuller 1979). In order to perform the test the AR(1) model is converted. The reason why it is converted is because the AR(1) model violates the covariance stationarity condition, hence inferences may be incorrect. Starting with the AR(1) model  $x_{t-1}$  is subtracted by both sides.

$$(1) x_t - x_{t-1} = \alpha + \beta x_{t-1} - x_{t-1} + \mu_t$$

$$(2) x_t - x_{t-1} = \alpha + x_{t-1}(\beta - 1) + \mu_t$$

A regression was run and  $(\beta - 1) = g$ , is tested to see if it is significantly different from zero, using hypothesis testing. If it is not significantly different from zero then conclude that the time series follows a random walk. In the event that the time series does follow a random walk, first differencing the time series will satisfy the covariance stationarity condition.

Time series sometimes face seasonal trends, for instance sales for a company may be higher in certain season relative to other season (e.g. sales of ice cream). In these circumstances a seasonal variable is included which is to control for the sales in the same period last year. For instance, if the time series is observed quarterly, meaning there are four observations in a year, then the fourth lag of the time series is added. If

seasonal trends exist it is important to include the variable, as it will affect the validity of the estimates.

Autoregressive conditional heteroskedasticity (Engel 1982) is another common problem when analyzing time series. ARCH occurs when the average distance between the mean of the difference between the actual observed values and the predicted values is dependent of that of the previous period. That is, the volatility of the residuals obtained in the current period from the regression is contingent on the volatility of the residuals last period. The ARCH(1) model is given as:

$$\mu_{fitted_t}^2 = v_t + \pi \mu_{fitted_t}^2 + \xi_t$$

$v_t$  is a constant

$\xi_t$  is a random error

If  $\pi$  is significant, then the time series exhibits autoregressive conditional heteroskedasticity, which means that the average distance from the mean of the estimator in the AR(1) model is invalid, regardless of the sample size. This problem needs to be attended using GLS or alternative correction methods, or else hypothesis tests on the estimator associated with the lagged time series will provide in valid results.

### 2.1.2.1 Closing Price Autoregressive Regression Results - Enbridge

Autoregressive models ranging from AR(1) to AR(3) were run (see table 62-64), for the closing price of Enbridge, using weekly data from December 31, 2009 to December 29, 2014. Out of the three regressions the AR(2) model has the highest adjusted  $R^2$ . Adjusted  $R^2$  is often the rule of thumb used by academics to decide which model is better at explaining the data.

The lag variables are all significant in the AR(1) and AR(2) regressions, but only the first lag is significant in the AR(3) regression. The intercept for all models are not significant. Because the AR(2) model has the highest  $R^2$  and the variables are all significant the AR(2) model should be used to explain the closing price of Enbridge. The  $R^2$  associated with the AR(2) model indicates that 99.28% of the variation of Enbridge's stock prices can be explained by the first two lags of Enbridge's stock prices. Since the  $R^2$  is extremely high which is a strong indication of the presence of a unit root, and I only intend to use the autoregressive models as sanity checks, I do not use the DF test to check for a unit root.

In summary, the autoregressive model is able to explain a high percentage of the variation in Enbridge's stock price. However, this result is likely due to trending and will cease if the trend stops. In addition, this methodology is highly sensitive to short-run fluctuation in price. For those reasons, I use this approach only as a sanity check.

**Table 62: Enbridge AR(1) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99625
R Square	0.9925
Adjusted R Square	0.99248
Standard Error	0.89575
Observations	261

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	27,517.94742	27,517.94742	34,295.81247	0.E+0
Residual	259.	207.81395	0.80237		
Total	260.	27,725.76137			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.08924	0.20138	0.44315	0.65803	-0.38216	0.56064
Lag Last Price	1.0016	0.00541	185.19129	0.E+0	0.98894	1.01426

**Table 63: Enbridge AR(2) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99637
R Square	0.99275
Adjusted R Square	0.99269
Standard Error	0.88048
Observations	260

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2.	27,273.85173	13,636.92587	17,590.58472	0.E+0
Residual	257.	199.23669	0.77524		
Total	259.	27,473.08843			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.07229	0.19931	0.36267	0.71715	-0.39429	0.53887
Lag Last Price	0.8041	0.06115	13.15011	0.E+0	0.66096	0.94725
Lag-2 Last Price	0.19884	0.06145	3.23596	0.00137	0.05499	0.34268

**Table 64: Enbridge AR(3) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99634
R Square	0.99269
Adjusted R Square	0.99261
Standard Error	0.88302
Observations	259

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3.	27,007.00135	9,002.33378	11,545.42041	0.E+0
Residual	255.	198.83166	0.77973		
Total	258.	27,205.83301			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.08801	0.20118	0.43747	0.66214	-0.38296	0.55898
Lag Last Price	0.8024	0.06268	12.80069	0.E+0	0.65565	0.94915
Lag-2 Last Price	0.20214	0.07933	2.54797	0.01142	0.01642	0.38787
Lag-3 Last Price	-0.00198	0.06306	-0.03135	0.97502	-0.14961	0.14565



### 2.1.2.2 Closing Price Autoregressive Regression Results - TransCanada

Autoregressive models ranging from AR(1) to AR(3) were run, for the closing price of TransCanada (see tables 65-67), using weekly data from December 31, 2009 to December 29, 2014. The AR(1) regression provide the highest  $R^2$  out of the autoregressive models, and the lag stock price is very significant. That is why I chose to use the AR(1) model to explain TransCanada's stock price. The intercept in the AR(1) model is significant at the 5% level, the p-value associated with the intercept is about 1.04%, implying that there is about 99% chance that the intercept should be included in the model. The model explains approximately 95.56% of the variations in TransCanada's stock price. Inferences on autoregressive models would be problematic if the time series is not covariance stationary.

A common violation of covariance stationarity occurs when the time series contains a unit root, implying that the time series does not have a tendency to move towards its mean, which is necessary for a time series to be covariance stationary. I use the DF test (see table 68) to identify whether it is likely that the time series does not contain a unit root. The test indicates that there is not sufficient evidence to conclude that the time series does not contain a unit root. Hence inferences using the autoregressive model should not be used.

In summary, the autoregressive model is not a reliable method to estimate the intrinsic value of TransCanada's stock price because there is a high probability that the time series of TransCanada's stock price contains a unit root. In addition, this prediction methodology is highly sensitive to short-run fluctuations in price.

**Table 65: TransCanada AR(1) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.9936
R Square	0.98725
Adjusted R Square	0.9872
Standard Error	0.85542
Observations	261

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	14,672.80068	14,672.80068	20,052.0068	0.E+0
Residual	259.	189.51995	0.73174		
Total	260.	14,862.32063			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.14776	0.28436	0.51962	0.60377	-0.51789	0.81341
Lag Last Price	0.99887	0.00705	141.60511	0.E+0	0.98236	1.01538

**Table 66: TransCanada AR(2) Closing Price**

<i>Regression Statistics</i>						
Multiple R	0.99365					
R Square	0.98735					
Adjusted R Square	0.98725					
Standard Error	0.85171					
Observations	260					

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	2.	14,545.69668	7,272.84834	10,025.73409	0.E+0	
Residual	257.	186.43244	0.72542			
Total	259.	14,732.12912				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.14041	0.28524	0.49225	0.62296	-0.52731	0.80813
Lag Last Price	0.88986	0.06196	14.36154	0.E+0	0.74482	1.03491
Lag-2 Last Price	0.10956	0.06225	1.76008	0.07958	-0.03616	0.25527

**Table 67: TransCanada AR(3) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99367
R Square	0.98739
Adjusted R Square	0.98724
Standard Error	0.84955
Observations	259

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3.	14,409.78006	4,803.26002	6,655.22815	0.E+0
Residual	255.	184.04047	0.72173		
Total	258.	14,593.82053			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.18674	0.28643	0.65196	0.51502	-0.4838	0.85727
Lag Last Price	0.89954	0.06235	14.42665	0.E+0	0.75357	1.04552
Lag-2 Last Price	0.20598	0.08302	2.48126	0.01374	0.01164	0.40033
Last-3 Price	-0.10751	0.06272	-1.71401	0.08774	-0.25435	0.03933

**Table 68: Dickey Fuller Test For Unit Root TransCanada**

<i>Regression Statistics</i>	
Multiple R	0.01571
R Square	0.00025
Adjusted R Square	-0.00363
Standard Error	0.85517
Observations	260

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	0.04659	0.04659	0.06371	0.80093
Residual	258.	188.67969	0.73132		
Total	259.	188.72628			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.17734	0.28562	0.62088	0.53522	-0.49126	0.84594
Lag Last Price	-0.00179	0.00708	-0.2524	0.80093	-0.01836	0.01478

### 2.1.2.3 Closing Price Autoregressive Regression Results

Autoregressive models ranging from AR(1) to AR(3) were run (see tables 69-71), for the closing price of Kinder Morgan (NYSE), using weekly data from September 11<sup>th</sup>, 2011 to December 29, 2014.

The AR(1) regression provides the highest adjusted  $R^2$  out of the autoregressive model. In addition, the lag stock price is very significant. That is why I chose to use the AR(1) model to explain Kinder Morgan's stock price. The intercept in the AR(1) model is not significant.

I use the DF test (see table 72) to identify whether it is likely that the time series does not contain a unit root. The test indicates that there is a significant chance that there is a unit root. Inferences on the AR(1) model are not valid unless the standard errors have been adjusted.

**Table 69: Kinder Morgan AR(1) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.97828
R Square	0.95702
Adjusted R Square	0.95681
Standard Error	0.97316
Observations	203

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	4,239.00049	4,239.00049	4,476.07692	0.E+0
Residual	201.	190.35399	0.94703		
Total	202.	4,429.35448			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.46302	0.46275	1.00057	0.31824	-0.62216	1.54819
Lag Last Price	0.9875	0.01476	66.90349	0.E+0	0.95289	1.02211

**Table 70: Kinder Morgan AR(2) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.97822
R Square	0.95691
Adjusted R Square	0.95648
Standard Error	0.97678
Observations	202

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2.	4,216.90782	2,108.45391	2,209.88734	0.E+0
Residual	199.	189.86594	0.9541		
Total	201.	4,406.77376			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.41054	0.47095	0.87173	0.38441	-0.69395	1.51503
Lag Last Price	0.93903	0.07082	13.25987	0.E+0	0.77294	1.10511
Lag-2 Last Price	0.05027	0.07158	0.70227	0.48333	-0.11761	0.21815



**Table 71: Kinder Morgan AR(3) Closing Price**

<i>Regression Statistics</i>						
Multiple R	0.9786					
R Square	0.95766					
Adjusted R Square	0.95701					
Standard Error	0.96986					
Observations	201					

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	3.	4,191.13223	1,397.04408	1,485.21924	0.E+0	
Residual	197.	185.30442	0.94063			
Total	200.	4,376.43664				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.31972	0.47335	0.67544	0.50019	-0.79049	1.42993
Lag Last Price	0.9327	0.0704	13.24818	0.E+0	0.76758	1.09783
Lag-2 Last Price	-0.08389	0.09676	-0.867	0.387	-0.31083	0.14305
Lag-3 Last Price	0.14391	0.07124	2.02012	0.04473	-0.02317	0.31099

**Table 72: Dickey Fuller Test For Unit Root Kinder Morgan**

<i>Regression Statistics</i>	
Multiple R	0.05962
R Square	0.00355
Adjusted R Square	-0.0014
Standard Error	0.97316
Observations	203

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	0.67903	0.67903	0.71701	0.39813
Residual	201.	190.35399	0.94703		
Total	202.	191.03302			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.46302	0.46275	1.00057	0.31824	-0.62216	1.54819
Last Price	-0.0125	0.01476	-0.84676	0.39813	-0.04711	0.02211

## **2.2 Residual Income Model**

I begin the equity valuation section using the residual income method, which requires three broad categories of inputs, which are: (1) the cost of equity, (2) the future economic profits and current book value per share of the company, and (3) the persistence factor.

In my research, I begin by estimating the cost of equity. There are many different ways to estimate the cost of equity. In this research, I estimate the cost of equity using two of the most common methods (i.e. the CAPM and Fama-French).

To estimate the future economic profits and current BVPS of the company, I develop financial models and use economics, statistics, and/or logic to justify my forecast of line items that would have a substantial impact on the valuation process.

As for the persistence factor, I use the industry analysis that I conducted in early parts of the research to justify the value I use.

There would be substantial differences in the estimated intrinsic values using different inputs, hence I conduct sensitivity analysis to see how changes in assumptions would affect the values.

### **2.2.1 Cost of Equity**

Before I begin estimating the cost of equity using the CAPM approaches, I provide a brief discussion of the theories behind the models.

#### **2.2.1.1 Theory Behind CAPM Pricing Model**

Sharpe (1964) pioneered the CAPM Pricing Model (see figure 15) one of the most widely used models in the finance industry, to determine the cost of common equity. It is designed to estimate the opportunity costs of investors.

The idea is that an investor is able to earn the risk free interest rate without internalizing any risk, but if the investor chooses to invest in a company's stocks, she should be compensated by a premium, and that premium should depend on how much less/more risk the investor internalizes by purchasing the stock relative to the market.

CAPM is widely used because of its simplicity. However, caution is warranted because the model has a poor record of providing accurate results, which may have severe ramifications on its applications. The greatest problem of CAPM is its oversimplifying assumptions. Many of those assumptions cannot be justified.

The CAPM model assumes that: (1) Investors are risk averse, (2) No transaction costs or other fees associated with trading, (3) Perfect Competition, (4) Investors Maximize Utility, (5) Homogenous Expectation, (6) Investment are infinitely divisible, and (7) one period horizon.

This model begins with a group of investors that needs to choose a portfolio, each. The investors are calibrated to choose portfolios that yield the highest expected returns given a level of variance. The CAPM model conjectures that expected returns for all portfolios in equilibrium are solely based on non-diversifiable risk. Merton (1973) creates an intertemporal model that builds on the foundations of CAPM. The model is similar to CAPM, in the sense that investors still choose the portfolio with the highest expected return given a level of risk. However, this is a multi-period model. In this model the investors also evaluate the systematic relationships between asset classes to determine the optimal risk portfolio. This version of CAPM, is typically the one used in modern finance.

The CAPM Equation is:

$$\circ E(R_i) = R_f + \beta_i(E(R_{market}) - R_f)$$

- $E(R_i)$  is the expected return for stock i
- $R_f$  is the risk free rate
- $\beta_i$  is obtained from the regression of the return of stock i, on the market return
- $E(R_{market})$  is the expected market return

The CAPM relationship plotted on a graph with expected return on the y-axis and Beta on the x-axis is referred to the Security Market Line (SML). The SML line is often contrasted with the Capital Market Line (CML). The capital market line is obtained by connecting a constant with a line that is tangent to the efficient frontier, which also identifies the optimal risky portfolio. In practice an efficient portfolio is derived from multiplying the inverse sample variance-covariance matrix of the investible asset class identified in the Investment Policy Statement that portfolio managers create for their investors, and the vector of excess returns for each asset class. The resulting vector is then adjusted so that the sum of the asset classes is equal to 100%. The convex combinations of two optimal portfolio risky portfolios forms the efficient frontier. The Two Fund Separation Theorem (Markowitz 1952) argues that the optimal portfolio is a combination of the risk free rate and the optimal risky portfolio. If all investors are assumed to have the same expectations of risk, return, covariance, and also are willing to invest in the same set of asset classes, then the optimal risky portfolio is defined as point M in the figure (15) below.

- Capital Market Line

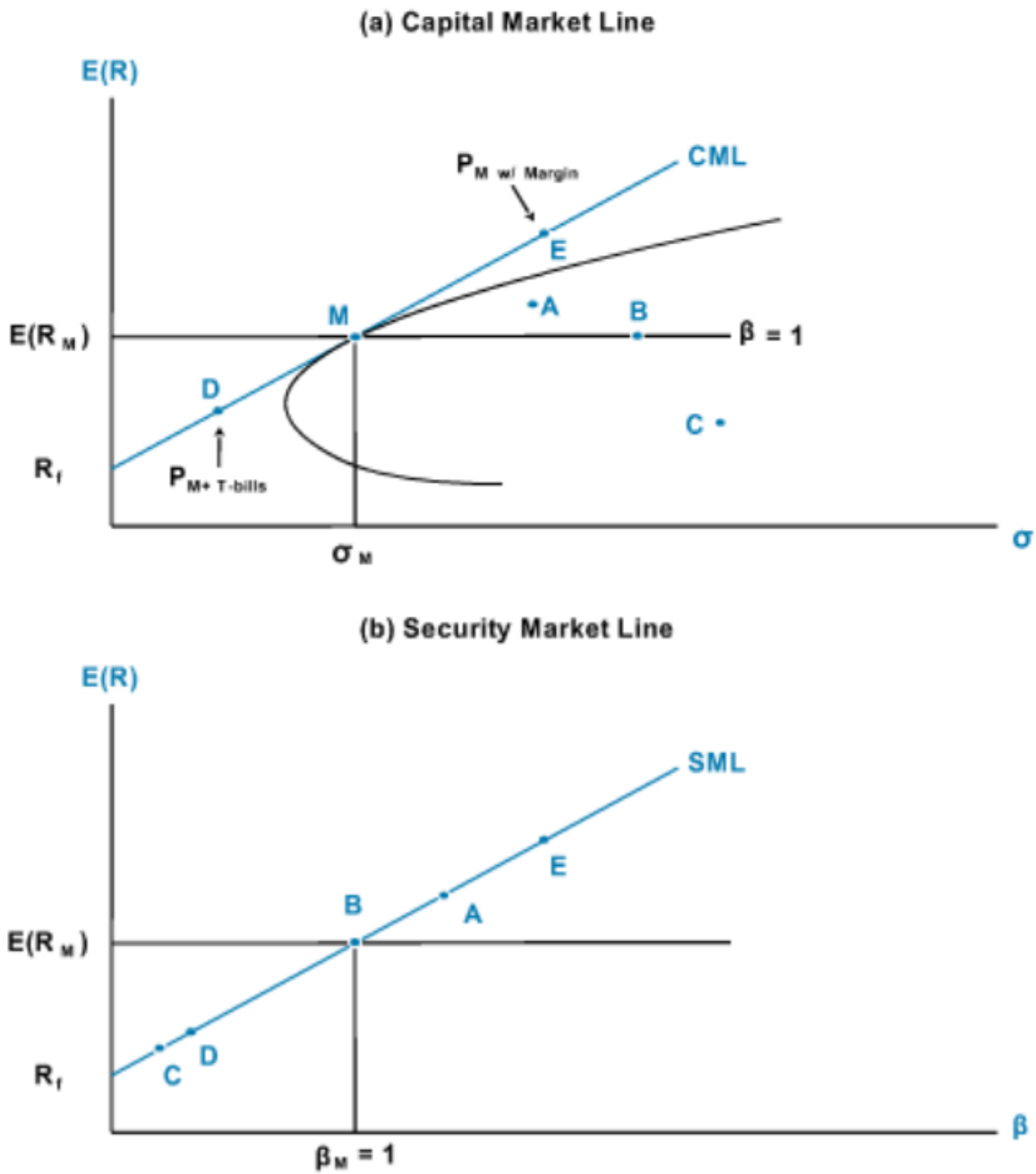
- $E(R_p) = R_f + (E(R_M) - R_f)\left(\frac{\sigma_p}{\sigma_M}\right)$

- $\sigma_p$  is the risk associated with the portfolio
- $\sigma_M$  is the risk associated with the market

Points within the efficient frontier are poorly diversified. That is why there exists a feasible portfolio that yield the same expected return, but internalize a lower risk. Points to the right of the CML are obtainable because it is assumed that investors can borrow at the risk free rate. If the investor cannot borrow at the risk free rate, but instead at a higher rate the slope would be flatter assuming the expected market return is still greater than the higher interest rates of borrowing.

The plot of CML uses total risk on the x-axis, but the SML uses just the non-diversifiable component. CAPM is sometimes used to identify mispriced securities. For instance, an investor may have a forecast about a stock's return (e.g. 14%), and the required return obtained from the CAPM model suggest that she should be earning (e.g. 16%). In this case the stock is undervalued, according to CAPM. The investor should be earning 16% but is only forecasted to earn 14%. If the CAPM return is higher than the forecast, then the stock is undervalued. The steps to using the capital asset pricing model are: (1) use the risk free rate of government bonds with maturities similar to that of the relevant project; (2) regress the stock return on market return and obtain the Beta; (3) estimate the expected return of the market; and (4) plug in values into the CAPM equation.

Figure 15: Capital Market Line and Security Market Line<sup>10</sup>



<sup>10</sup> [Capital Market Line and Security Market Line]. Retrieved from <https://classconnection.s3.amazonaws.com/50/flashcards/619050/png/cml1312861688889.png>

### 2.2.1.2 Estimating Cost of Equity using CAPM

The cost of equity is a critical factor in the residual income valuation model. In this section, I estimate the cost of equity for each of the companies using the CAPM model and weekly data<sup>11</sup>.

#### 2.2.1.2.1 Cost of Equity for Enbridge<sup>12</sup>

The regression of Enbridge Inc.'s yields a beta coefficient of approximately 0.87. This value is smaller than 1, indicating that a unit increase in market premium leads to a smaller than 1 unit increase in Enbridge's stock return.

The beta is often used a measure of non-diversifiable risk, and higher values of beta indicates higher non-diversifiable risk. Non-diversifiable risk is the uncertainty inherent in the macro economy which affects all industries. A low value implies that Enbridge's returns are weakly dependent of the macro economy, such as changes in business cycles, which is expected because the lines of businesses of Enbridge are defensive. That is, regardless of the state of the economy customers of Enbridge will continue to consume Enbridge's services. For example, natural gas distribution, regardless of whether the economy is in a recession or in an expansion phase, customers such as households would not significantly reduce their consumption of natural gas for home heating, cooling, and cooking.

The  $R^2$  is small (0.2577), which means that only 25.77% of the variation of Enbridge's stock return can be explained by the market premium. The significance F is

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<sup>11</sup> The data on market premium by week is obtained from Dr. French's website: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html).

<sup>12</sup> See tables 73-75.



fairly close to zero, which implies that the model is significant, meaning that market premium is a good explanatory variable for explaining Enbridge's stock returns.

Application of CAPM usually ignores how good the regression model is in explaining returns, whether the model is significant, and whether the beta coefficient is causal. Using a 10-year government bond yield of 2.12%, and a 5.5% market risk premium, I obtained a required rate of return for Enbridge of 6.91%. However, using the risk premium based on the Brealey and Myers (2003) of 9.1% the required rate of return is 10.05%. Using historical average equity returns estimated from 1926-2013 of 10.97% and assuming the current risk free rate is constant throughout the period, the required rate of return is 9.83%. The three methods of estimations are all logical methods to determine the cost of equity; however, certain methods will produce estimate higher returns to Enbridge's shareholders.

**Table 73: Enbridge CAPM Using Implied Market Premium of 5.5%**

<i>Regression Statistics</i>	
Multiple R	0.507615451
R Square	0.257673446
Adjusted R Square	0.250466392
Standard Error	2.283579309
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	186.4421458	186.4421458	35.75295103	3.26114E-08
Residual	103	537.1176494	5.214734461		
Total	104	723.5597952			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.196473101	0.230918985	0.850831302	0.396836719	0.654446445	0.261500243
Mkt-RF	0.871695913	0.145783732	5.979377144	3.26114E-08	0.582568265	1.160823561

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	87.17%
<b>Market Risk Premium</b>	5.50%
<b>Required Rate of Return for Enbridge</b>	6.91%

**Table 74: Enbridge CAPM Based using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>	
Multiple R	0.507615451
R Square	0.257673446
Adjusted R Square	0.250466392
Standard Error	2.283579309
Observations	105

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	186.4421458	186.4421458	35.75295103	3.26114E-08	
Residual	103	537.1176494	5.214734461			
Total	104	723.5597952				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.196473101	0.230918985	0.850831302	0.396836719	0.654446445	0.261500243
Mkt-RF	0.871695913	0.145783732	5.979377144	3.26114E-08	0.582568265	1.160823561

**10-Year Government Bond Yield**                    2.12%  
**Market Risk Coefficient (Beta)**                    87.17%  
**Market Risk Premium**                                8.85%  
**Required Rate of Return for Enbridge**                    9.83%

**Table 75: Enbridge CAPM Based on Richard Brealey and Steward Myers Principles of Corporate Finance Average risk premium estimates**

<i>Regression Statistics</i>	
Multiple R	0.507615451
R Square	0.257673446
Adjusted R Square	0.250466392
Standard Error	2.283579309
Observations	105

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	186.4421458	186.4421458	35.75295103	3.26114E-08
Residual	103	537.1176494	5.214734461		
Total	104	723.5597952			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.196473101	0.230918985	0.850831302	0.396836719	0.654446445	0.261500243
Mkt-RF	0.871695913	0.145783732	5.979377144	3.26114E-08	0.582568265	1.160823561

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	87.17%
<b>Market Risk Premium</b>	9.10%
<b>Required Rate of Return for Enbridge</b>	10.05%

### 2.2.1.2.2 Cost of Equity for TransCanada<sup>13</sup>

The regression of TransCanada Corp.'s yields a beta coefficient of approximately 0.9025. This value is smaller than 1 indicating that a unit increase in market premium leads to less than a unit increase in TransCanada's stock return.

A value lower than 1 implies that TransCanada's returns are weakly dependent of the macro economy, such as changes in business cycles, which is expected because the lines of businesses of TransCanada are defensive. That is regardless of the state of the economy customers of TransCanada will continue to consume TransCanada's services. For example, electricity generation, regardless of whether the economy is in a recession or in an expansion phase, customers such as households would not significantly reduce their consumption of electricity for watching tv, lighting up the house, and for other electrical appliances.

The  $R^2$  is small (0.3121), which means that only 31.21% of the variation of TransCanada's stock return can be explained by the market premium. The significance F is roughly zero which implies that the model is significant, meaning that market premium is a good explanatory variable for explaining TransCanada's stock returns. Using a 10 year government bond yield of 1.98%, and a 5.5% market risk premium, I obtained a required rate of return for TransCanada of 7.08%. However, using the risk premium based on the Brealey and Myers (2003) of 9.1% the required rate of return is 10.33%. Using historical average equity returns estimated from 1926-2013 of 10.97% and assuming the current risk free rate is constant throughout the period, the required rate of return is 10.11%.

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<sup>13</sup> See tables 76-78.

The three methods of estimations are all logical methods to determine the cost of equity. However, certain methods will estimate substantially higher returns to TransCanada's shareholders.

**Table 76: TransCanada CAPM Based on Richard Brealey and Steward Myers Principles of Corporate Finance Average risk premium estimates**

<i>Regression Statistics</i>	
Multiple R	0.558685846
R Square	0.312129875
Adjusted R Square	0.305451524
Standard Error	2.067924474
Observations	105

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	199.8644075	199.8644075	46.73756845	5.89106E-10
Residual	103	440.4600979	4.27631163		
Total	104	640.3245055			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.34590539	0.209111643	-1.654166092	0.101138234	-0.760629014	0.068818235
Mkt-RF	0.90252802	0.132016324	6.83648802	5.89106E-10	0.640704777	1.164351262

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.25%
<b>Market Risk Premium</b>	9.10%
<b>Required Rate of Return for TransCanada</b>	10.33%

**Table 77: TransCanada CAPM Using an Implied Market Premium of 5.5%**

<i>Regression Statistics</i>						
Multiple R	0.558685846					
R Square	0.312129875					
Adjusted R Square	0.305451524					
Standard Error	2.067924474					
Observations	105					

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	199.8644075	199.8644075	46.73756845	5.89106E-10	
Residual	103	440.4600979	4.27631163			
Total	104	640.3245055				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.34590539	0.209111643	-1.654166092	0.101138234	-0.760629014	0.068818235
Mkt-RF	0.90252802	0.132016324	6.83648802	5.89106E-10	0.640704777	1.164351262

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.25%
<b>Market Risk Premium</b>	5.50%
<b>Required Rate of Return for TransCanada</b>	7.08%



**Table 78: TransCanada CAPM using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>						
Multiple R	0.558685846					
R Square	0.312129875					
Adjusted R Square	0.305451524					
Standard Error	2.067924474					
Observations	105					

<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	199.8644075	199.8644075	46.73756845	5.89106E-10	
Residual	103	440.4600979	4.27631163			
Total	104	640.3245055				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.34590539	0.209111643	1.654166092	0.101138234	0.760629014	0.068818235
Mkt-RF	0.90252802	0.132016324	6.83648802	5.89106E-10	0.640704777	1.164351262

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.25%
<b>Market Risk Premium</b>	8.85%
<b>Required Rate of Return for TransCanada</b>	10.11%

### 2.2.1.2.3 Cost of Equity for Kinder Morgan<sup>14</sup>

The regression of Kinder Morgan's yields a beta coefficient of approximately 0.9961. This value is fairly close to 1 indicating that a unit increase in market premium leads to about a unit increase in Kinder Morgan's stock return. A value close to one means that the non-diversifiable risk internalized by Kinder Morgan are similar to that of the market. There are differences between the beta estimates for the companies in my research, likely because the companies operate in different lines of businesses.

The R<sup>2</sup> is small (0.2350), which means that only 23.50% of the variation of Kinder Morgan's stock return can be explained by the market premium. The significance F is fairly close to zero which implies that the model is significant, meaning that market premium is a good explanatory variable for explaining Kinder Morgan's stock returns. Using a 10 year government bond yield of 1.98%, and a 5.5% market risk premium, I obtained a required rate of return for Kinder Morgan of 7.60%. However, using the risk premium based on the Brealey and Myers (2003) of 11.18% the required rate of return is 10.94%. Using historical average equity returns estimated from 1926-2013 of 10.97% and assuming the current risk free rate is constant throughout the period, the required rate of return is 10.11%. The three methods of estimations are all logical methods to determine the cost of equity, however, certain methods will estimate substantially higher returns to Kinder Morgan's shareholders.

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<sup>14</sup> See tables 79-81.

**Table 79: Kinder Morgan CAPM Using an Implied Market Premium of 5.5%**

<i>Regression Statistics</i>						
Multiple R	0.484747702					
R Square	0.234980335					
Adjusted R Square	0.22755296					
Standard Error	2.773908269					
Observations	105					

<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	1	243.4334952	243.4334952	31.6370619	1.60517E-07	
Residual	103	792.5404099	7.694567086			
Total	104	1035.973905				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.23358	0.2805	-0.83271693	0.406931072	-0.76062901	0.068818235
Mkt-RF	0.996054567	0.177086339	5.624683271	1.60517E-07	0.640704777	1.164351262

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	99.61%
<b>Market Risk Premium</b>	5.50%
<b>Required Rate of Return for KMI</b>	7.60%

**Table 80: Kinder Morgan CAPM Based on Richard Brealey and Steward Myers Principles of Corporate Finance Average risk premium estimates**

<i>Regression Statistics</i>	
Multiple R	0.484747702
R Square	0.234980335
Adjusted R Square	0.22755296
Standard Error	2.773908269
Observations	105

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	243.4334952	243.4334952	31.6370619	1.60517E-07
Residual	103	792.5404099	7.694567086		
Total	104	1035.973905			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.23358	0.2805	-0.832716939	0.406931072	-0.760629014	0.068818235
Mkt-RF	0.996054567	0.177086339	5.624683271	1.60517E-07	0.640704777	1.164351262

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	99.61%
<b>Market Risk Premium</b>	9.10%
<b>Required Rate of Return for Kinder Morgan</b>	11.18%

**Table 81: Kinder Morgan CAPM using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>	
Multiple R	0.558685846
R Square	0.312129875
Adjusted R Square	0.305451524
Standard Error	2.067924474
Observations	105

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	243.4334952	243.4334952	31.6370619	1.60517E-07
Residual	103	792.5404099	7.694567086		
Total	104	1035.973905			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.23358	0.2805	-0.83271693	0.406931072	-0.76062901	0.068818235
Mkt-RF	0.996054567	0.177086339	5.624683271	1.60517E-07	0.640704777	1.164351262

**10-Year Government Bond**

**Yield**

2.12%

**Market Risk Coefficient (Beta)**

99.61%

**Market Risk Premium**

8.85%

**Required Rate of Return for Kinder**

**Morgan**

10.94%

### 2.2.1.3 Theory of the Fama-French Model

The Fama and French (1992) developed a multifactor model that explained a greater proportion of the variation in portfolio returns relative to the CAPM model. The model was able to explain roughly 90% of the variations as opposed to 70% with the CAPM model. In addition to the factors included in the CAPM model Fama and French (1992) accounts for differences in returns between high book-to-market equity assets and low book-to-market equity assets, and the return of a portfolio longing small Cap stocks and shorting large Cap stocks. The model is given as:

- $E(R_i) - R_f = b_i(E(R_M) - R_f) + s_iE(SMB) + h_iE(HML)$ 
  - $E(R_i)$  is the Expected rate of asset return
  - $R_f$  is the Risk free rate of return
  - $E(R_M) - R_f$  is the market premium
  - $E(SMB)$  is the Expected return of a portfolio longing small Cap stocks and shorting large Cap stocks
  - $E(HML)$  is the Expected difference in return between high book-to-market equity assets and low book-to market equity assets

Fama and French (1993) uses the Fama-French model to conjecture why there is a difference between returns on average for the NYSE and NASD. Over their sample period, the stocks on the NYSE had on average greater returns than that of the NASD. Their assessment suggests that there is a difference because an investor investing in NASD and NYSE internalizes different levels of risk. They argue that the book to market ratio is the most prominent factor to explaining the difference. Equity that have low beta

coefficients associated with the book to market factor showed consistent large net income resulting in small Book to market ratios.

The Fama-French model should not be thought of as a model with no problems. Levhari, David, and Levy (1977) found that the regression coefficients using monthly and annual data are different. Black (1993) believes that the findings may be an outcome of repeating statistical analysis over the available data. That is the findings are subject to data mining bias. Novy Marx (2012) argues that the model is incomplete because the three factors do not capture most of the variation in average returns related to profitability and investment.

#### **2.2.1.4 Estimating Cost of Equity using FFM**

In this section, I estimate the cost of equity for each of the companies using the Fama-French method.

##### **2.2.1.4.1 Enbridge<sup>15</sup>**

The regression of Enbridge's (TSX) weekly continuous returns on the market premium, size risk premium, and value risk premium<sup>16</sup>, yields a beta coefficient of approximately 0.9. This value is fairly close to one indicating that a unit increase in market premium leads an almost equal increase in Enbridge's stock return. The beta associated with the size risk premium is around -0.46, which is expected because Enbridge has a large market capitalization, and hence should be relatively less risky than companies with smaller market capitalization, thus require a lower return on equity.

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<sup>15</sup> See tables 82-84.

<sup>16</sup> Data on the weekly premium factors are obtained from Dr. French's website: [http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data\\_library.html](http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/data_library.html)

Fama and French (1992) developed the size premium which is the difference between the returns from large cap and small cap stocks, to capture the higher required returns for small cap stocks relative to large cap stocks. Historically, small cap stocks on average generate a higher return relative to large cap stock. One of the most common explanations for this is that small cap stocks are more risky (historically), hence investors require a greater return. The beta associated with the value risk premium is around 0.54, which is not expected because Enbridge is a value stock (i.e. relatively high book to market ratio). Historically, growth stocks has generated higher returns than value stocks, thus this also lowers the required return on shareholder equity.

The  $R^2$  is low (32%), which means that 32% of the variation of Enbridge's stock return can be explained by the market premium, size risk premium, and value risk premium. The significance F is fairly close to zero which implies that the model is significant, meaning that market premium, SMB, and HML are jointly good explanatory variable for explaining Enbridge's stock returns. Both the intercept and the market premium variable are significant at the 5% level, but the SMB and HML variables are not (but are at the 10% level).

Application of FFM usually ignores how good the regression model is in explaining returns, whether the model is significant, and whether the beta coefficients are causal. Using a 10-year government bond yield of 2.12%, and a 5.5% market risk premium, size risk premium of 2%, and value risk premium of 4.3% I obtained a required rate of return for Enbridge of 8.51%, which is larger than the CAPM value of 6.91%. Using different estimates of market premium also leads to higher rate of return for Enbridge.



**Table 82: Enbridge FFM using implied market premium of 5.5%**

<i>Regression Statistics</i>	
Multiple R	0.563813829
R Square	0.317886033
Adjusted R Square	0.297625222
Standard Error	2.210573695
Observations	105

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	3	230.0095531	76.66985103	15.68969943	1.89234E-08	
Residual	101	493.5502421	4.886636061			
Total	104	723.5597952				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.203339702	0.224855716	-0.90431191	0.36798201	0.649392957	0.242713553
Mkt-RF	0.900411415	0.145266088	6.19835933	1.25312E-08	0.612242571	1.188580258
SMB	-0.460604101	0.244320278	-1.88524712	0.062270654	-0.94526981	0.024061609
HML	0.549537468	0.313393303	1.753507374	0.082548689	-0.07215054	1.17122548

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.04%
<b>Market Risk Premium</b>	5.50%
<b>Size Risk Coefficient</b>	-46.06%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	54.95%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for Enbridge</b>	8.51%

**Table 83: Enbridge FFM using Average risk premium estimate (9.1%)**

<i>Regression Statistics</i>	
Multiple R	0.563813829
R Square	0.317886033
Adjusted R Square	0.297625222
Standard Error	2.210573695
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	230.0095531	76.66985103	15.68969943	1.89234E-08
Residual	101	493.5502421	4.886636061		
Total	104	723.5597952			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.203339702	0.224855716	-0.90431191	0.36798201	-0.649392957	0.242713553
Mkt-RF	0.900411415	0.145266088	6.19835933	1.25312E-08	0.612242571	1.188580258
SMB	-0.460604101	0.244320278	-1.885247124	0.062270654	-0.945269811	0.024061609
HML	0.549537468	0.313393303	1.753507374	0.082548689	-0.072150544	1.17122548

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.04%
<b>Market Risk Premium</b>	9.10%
<b>Size Risk Coefficient</b>	-46.06%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	54.95%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for Enbridge</b>	11.76%

**Table 84: Enbridge FFM Based using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>	
Multiple R	0.563813829
R Square	0.317886033
Adjusted R Square	0.297625222
Standard Error	2.210573695
Observations	105

ANOVA

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	230.0095531	76.66985103	15.68969943	1.89234E-08
Residual	101	493.5502421	4.886636061		
Total	104	723.5597952			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.203339702	0.224855716	-0.90431191	0.36798201	-0.649392957	0.242713553
Mkt-RF	0.900411415	0.145266088	6.19835933	1.25312E-08	0.612242571	1.188580258
SMB	-0.460604101	0.244320278	-1.885247124	0.062270654	-0.945269811	0.024061609
HML	0.549537468	0.313393303	1.753507374	0.082548689	-0.072150544	1.17122548

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	90.04%
<b>Market Risk Premium</b>	8.85%
<b>Size Risk Coefficient</b>	-46.06%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	54.95%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for Enbridge</b>	11.53%

#### 2.2.1.4.2 TransCanada<sup>17</sup>

The regression of TransCanada (TSX) monthly excess continuous returns on the market premium, size risk premium, and value risk premium obtained from Dr. French's website from January 2010 - 2015 yields a beta coefficient of approximately 0.77.

Monthly excess returns was used instead of weekly excess returns because weekly factors are not available. This value is smaller than the original FFM, which should be a combined effect of using data with different periodicity and adding additional factors. The beta associated with the size risk premium is around -0.83, which is expected because TransCanada has a large market capitalization. Hence it should be relatively less risky than companies with smaller market capitalization, thus requiring a lower return on equity.

The beta associated with the value risk premium is around 0.57, which is not expected because TransCanada is a value stock (i.e. relatively high book to market ratio). Historically, growth stocks has generated higher returns than value stocks, thus lowering the required return on shareholder equity.

The beta associated with RMW is roughly -0.1, and the beta associated with CMA is roughly -0.14.

The R<sup>2</sup> is low (40%), which means that 40% of the variation of TransCanada's stock return can be explained by the market premium, size risk premium, value risk premium, operating profit risk premium, and investment style risk premium. The significance F is very close to zero which implies that the model is significant, meaning

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<sup>17</sup> See tables 85-87.

that the factors are jointly good explanatory variable for explaining TransCanada's stock returns.

However, out of all of the factors only the market premium and SMB are significant. This is likely the result of multicollinearity. That is there are strong linear relationships between the factors or/and combinations of factors.

**Table 85: TransCanada FFM implied market risk premium of 5.5%**

<i>Regression Statistics</i>	
Multiple R	0.639107915
R Square	0.408458926
Adjusted R Square	0.3908884
Standard Error	1.937845239
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	261.8924875	87.29749585	23.24682281	1.59993E-11
Residual	101	379.2796612	3.75524417		
Total	104	641.1721487			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.428470662	0.197114251	-2.17371732	0.032062804	0.819492314	0.037449011
Mkt-RF	0.978508527	0.127343955	7.683980946	1.02919E-11	0.725892374	1.231124679
SMB	-0.747843831	0.214177382	-3.49170310	0.000713343	-1.17271414	-0.32297351
HML	0.28655433	0.274728557	1.043045301	0.299417489	-0.25843322	0.831541886

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	97.85%
<b>Market Risk Premium</b>	5.50%
<b>Size Risk Coefficient</b>	-74.78%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	28.66%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for TransCanada</b>	7.24%

**Table 86: TransCanada FFM using Average risk premium estimate (9.1%)**

<i>Regression Statistics</i>	
Multiple R	0.639107915
R Square	0.408458926
Adjusted R Square	0.3908884
Standard Error	1.937845239
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	261.8924875	87.29749585	23.24682281	1.59993E-11
Residual	101	379.2796612	3.75524417		
Total	104	641.1721487			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.428470662	0.197114251	-2.173717322	0.032062804	-0.819492314	-0.037449011
Mkt-RF	0.978508527	0.127343955	7.683980946	1.02919E-11	0.725892374	1.231124679
SMB	-0.747843831	0.214177382	-3.491703107	0.000713343	-1.172714145	-0.322973518
HML	0.28655433	0.274728557	1.043045301	0.299417489	-0.258433225	0.831541886

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	97.85%
<b>Market Risk Premium</b>	9.10%
<b>Size Risk Coefficient</b>	-74.78%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	28.66%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for TransCanada</b>	10.76%

**Table 87: TransCanada FFM using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>	
Multiple R	0.639107915
R Square	0.408458926
Adjusted R Square	0.3908884
Standard Error	1.937845239
Observations	105

**ANOVA**

	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	261.8924875	87.29749585	23.24682281	1.59993E-11
Residual	101	379.2796612	3.75524417		
Total	104	641.1721487			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.428470662	0.197114251	-2.17371732	0.032062804	-0.81949231	-0.03744901
Mkt-RF	0.978508527	0.127343955	7.683980946	1.02919E-11	0.725892374	1.231124679
SMB	-0.747843831	0.214177382	-3.49170310	0.000713343	-1.17271414	-0.32297351
HML	0.28655433	0.274728557	1.043045301	0.299417489	-0.25843322	0.831541886

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	97.85%
<b>Market Risk Premium</b>	8.85%
<b>Size Risk Coefficient</b>	-74.78%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	28.66%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for TransCanada</b>	10.52%



### 2.2.1.4.3 Kinder Morgan<sup>18</sup>

The regression of Kinder Morgan's (NYSE) yields a Beta that is roughly equal to 1, indicating that a unit increase in market premium leads a small increase in Kinder Morgan's stock return. The beta associated with the size risk premium is around -0.54, which is expected because Kinder Morgan has a large market capitalization, and hence should be relatively less risky than companies with smaller market capitalization, thus requiring a lower return on equity. The beta associated with the value risk premium is around -0.70, which is expected because Kinder Morgan is a value stock (i.e. relatively high book to market ratio). Historically, growth stocks have generated higher returns than value stocks, thus lowering the return on shareholder equity.

The R<sup>2</sup> is small (0.273), which means that only 27.3% of the variation of Kinder Morgan's stock return can be explained by the market premium, size risk premium, and value risk premium. The significance F is close to zero which implies that the model is significant, meaning that the regressors are jointly good explanatory variable for explaining Kinder Morgan's stock returns. The intercept and the market premium explanatory variable are significant, but the SMB and HML variables are not at the 5% level.

Application of FFM usually ignores how good the regression model is in explaining returns, whether the model is significant, and whether the beta coefficients are causal. Using a 10 year government bond yield of 2.12%, and a 5.5% market risk premium, size risk premium of 2%, and value risk premium of 4.3% I obtained a required

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<sup>18</sup> See tables 88-90.

rate of return for Kinder Morgan of 4.00%, which is smaller than the CAPM value of 7.6%.

However, using the risk premium based on the Brealey and Myers (2003) of 9.1%, with the risk premiums for size and value unchanged the required rate of return is 10.33%. Using historical average equity returns estimated from 1926-2013 of 10.97% and assuming the current risk free rate is constant throughout the period, with the risk premiums for size and value unchanged the required rate of return is 10.11%.

The three methods of estimations are all logical methods to determine the cost of equity. However, certain methods will estimate substantially higher returns to the company's shareholders. The Fama-French method provides higher cost of equity for shareholders.

**Table 88: KMI FFM using implied market risk premium of 5.5%**

<i>Regression Statistics</i>	
Multiple R	0.52209895
R Square	0.27258731
Adjusted R Square	0.250981
Standard Error	2.73151856
Observations	105

<i>ANOVA</i>					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	282.3933447	94.1311149	12.61609323	4.5273E-07
Residual	101	753.5805603	7.461193666		
Total	104	1035.973905			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.3020794	0.277845323	-1.08722132	0.279526816	-0.85324974	0.249091022
Mkt-RF	1.09007239	0.179499565	6.072841364	2.22687E-08	0.733993532	1.446151238
SMB	-0.5452524	0.301896913	-1.80608813	0.073882956	-1.14413469	0.053629834
HML	-0.703577	0.387247721	-1.81686531	0.072203358	-1.47177226	0.064618357

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	109.01%
<b>Market Risk Premium</b>	5.50%
<b>Size Risk Coefficient</b>	-54.53%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	-70.36%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for KMI</b>	4.00%

**Table 89: KMI FFM using Richard Brealey and Steward Myers Principles of Corporate Finance Average risk premium estimate (9.1%)**

<i>Regression Statistics</i>	
Multiple R	0.522098951
R Square	0.272587315
Adjusted R Square	0.250980997
Standard Error	2.731518564
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	282.3933447	94.1311149	12.61609323	4.5273E-07
Residual	101	753.5805603	7.461193666		
Total	104	1035.973905			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.30207936	0.277845323	-1.08722132	0.279526816	-0.85324974	0.249091022
Mkt-RF	1.090072385	0.179499565	6.072841364	2.22687E-08	0.733993532	1.446151238
SMB	-0.54525243	0.301896913	-1.80608813	0.073882956	-1.14413469	0.053629834
HML	-0.70357695	0.387247721	-1.81686531	0.072203358	-1.47177226	0.064618357

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	109.01%
<b>Market Risk Premium</b>	9.10%
<b>Size Risk Coefficient</b>	-54.53%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	-70.36%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for KMI</b>	7.92%

**Table 90: KMI FFM Based using historical returns from 1926-2013 in US (10.97%)**

<i>Regression Statistics</i>	
Multiple R	0.522098951
R Square	0.272587315
Adjusted R Square	0.250980997
Standard Error	2.731518564
Observations	105

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	3	282.3933447	94.1311149	12.61609323	4.5273E-07
Residual	101	753.5805603	7.461193666		
Total	104	1035.973905			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.30207936	0.277845323	-1.08722132	0.279526816	-0.853249741	0.249091022
Mkt-RF	1.090072385	0.179499565	6.072841364	2.22687E-08	0.733993532	1.446151238
SMB	-0.54525243	0.301896913	-1.80608813	0.073882956	-1.144134699	0.053629834
HML	-0.70357695	0.387247721	-1.81686531	0.072203358	-1.471772264	0.064618357

<b>10-Year Government Bond Yield</b>	2.12%
<b>Market Risk Coefficient (Beta)</b>	109.01%
<b>Market Risk Premium</b>	8.85%
<b>Size Risk Coefficient</b>	-54.53%
<b>Size Risk Premium</b>	2.00%
<b>Value Risk Coefficient</b>	-70.36%
<b>Value Risk Premium</b>	4.30%
<b>Required Rate of Return for KMI</b>	7.65%

### 2.2.1.5 Theory Behind Fama-French Five Factor Pricing Model

Fama and French (2014) argues that it is possible to improve on their previous model (Fama and French 1993). The five factor model includes a profitability and investment variables on top of the original three factor model. The primary reason that lead to the development of the five factor pricing model is to address the literatures that critiqued the predecessor and its lack of ability to capture a large proportion of the variation in average returns related to investment and profitability.

- $r_A - r_f = \alpha + \beta_A(r_M - r_F) + s_A SMB + h_A HML + r_A RMW + c_A CMA + e$ 
  - CMA is the spread between the returns of diversified portfolios of low and high investment companies, and are referred to as conservative and aggressive firms respectively
  - RMW is the spread between the returns on diversified portfolios of equity with robust and weak profitability

If the five factors are able to explain 100% of the variation in the average returns, then the constant alpha in the model would be equal to zero. Fama and French (2014) proposes three methods to construct the factors to see if the finding from the asset pricing models are consistent across methods.

They show that the construction method does not result in significant differences in the findings. I do not want to over-complicate the analysis, when it is not expected to provide additional benefits that is, why I chose to use and explain their simpler method. In that method, the Size and B/M factors are constructed by using independent sorts of equity into two Size classes and three B/M classes.

The median market cap stock in the NYSE determines and distinguishes which Size class the stocks are sorted in. The 30<sup>th</sup> and 70<sup>th</sup> percentiles of B/M for NYSE equity are determined and distinguish which B/M class the stocks are sorted in. The SMB factor is obtained by subtracting the average of the small portfolios and the average of the big portfolio.

The HML factor is obtained by subtracting the average of the high B/M portfolio returns and the low B/M portfolio returns. The RMW and CMW factors are obtained in a similar fashion to the HML factor. However, instead of using the size groups, they use either robust and weak (operating profitability) groups or conservative and aggressive (conservative minus aggressive) groups.

#### **2.2.1.5.1 Regression Results - Enbridge**

The regression of Enbridge's (TSX) monthly excess continuous returns yields a beta coefficient of approximately 0.51 (see table 91).

Monthly excess returns was used instead of weekly excess returns because weekly factors are not available. This value is much smaller than the original FFM, which should be a combined effect of using data with different periodicity and adding additional factors.

The beta associated with the size risk premium is around -0.32, which is expected because Enbridge has a large market capitalization. Hence it should be relatively less risky than companies with smaller market capitalization, thus require a lower return on equity.

The beta associated with the value risk premium is around 0.40, which is not expected because Enbridge is a value stock (i.e. relatively high book to market ratio),

and historically, growth stocks has generated higher returns than value stocks, thus this also lowers the required return on shareholder equity. The beta associated with RMW is roughly 0.23, and the beta associated with CMA is roughly 0.33.

The  $R^2$  is low (25%), which means that 25% of the variation of Enbridge's stock return can be explained by the market premium, size risk premium, value risk premium, operating profit risk premium, and investment style risk premium. The significance F is close to zero which implies that the model is significant, meaning that the factors are jointly good explanatory variable for explaining Enbridge's stock returns. However, out of all of the factors only the market premium is significant. This is likely the result of multicollinearity. That is there are strong linear relationships between the factors or/and combinations of factors.



**Table 91: Enbridge FFM 5 Factor Model**

<i>Regression Statistics</i>						
Multiple R	0.500135115					
R Square	0.250135133					
Adjusted R Square	0.180703201					
Standard Error	3.902440662					
Observations	60					

<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	5	274.3203743	54.86407486	3.602595017	0.006954942	
Residual	54	822.3683284	15.22904312			
Total	59	1096.688703				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0.666151444	0.564490557	1.180093156	0.243135679	-0.46558398	1.79788687
Mkt-RF	0.509673999	0.157800859	3.229855677	0.002110116	0.193302326	0.826045673
SMB	-0.31984936	0.292593712	-1.09315187	0.279179857	-0.90646443	0.266765708
HML	0.396667965	0.382552307	1.036898635	0.30440413	-0.37030323	1.163639162
RMW	0.232103525	0.402606095	0.576502761	0.56667081	-0.57507309	1.039280146
CMA	0.327310456	0.550652885	0.594404325	0.554724066	-0.77668210	1.43130302

### 2.2.1.5.2 Regression Results - TransCanada

The regression of TransCanada's monthly excess continuous returns yields a beta coefficient of approximately 0.77 (see table 92).

Monthly excess returns was used instead of weekly excess returns because weekly factors are not available. This value is smaller than the original FFM, which should be a combined effect of using data with different periodicity and adding additional factors.

The beta associated with the size risk premium is around -0.83, which is expected because TransCanada has a large market capitalization. Hence it should be relatively less risky than companies with smaller market capitalization, thus require a lower return on equity.

The beta associated with the value risk premium is around 0.57, which is not expected because TransCanada is a value stock (i.e. relatively high book to market ratio), and historically, growth stocks has generated higher returns than value stocks, thus this also lowers the required return on shareholder equity. The beta associated with RMW is roughly -0.1, and the beta associated with CMA is roughly -0.14.

The  $R^2$  is low (40%), which means that 40% of the variation of TransCanada's stock return can be explained by the market premium, size risk premium, value risk premium, operating profit risk premium, and investment style risk premium. The significance F is very close to zero which implies that the model is significant, meaning that the factors are jointly good explanatory variable for explaining TransCanada's stock returns. However, out of all of the factors only the market premium and SMB are

significant. This is likely the result of multicollinearity. That is there are strong linear relationships between the factors or/and combinations of factors.

**Table 92: TRP 5 Factor FFM**

<i>Regression Statistics</i>					
Multiple R	0.629397592				
R Square	0.396141328				
Adjusted R Square	0.340228488				
Standard Error	3.782381812				
Observations	60				

<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	5	506.8031891	101.3606378	7.084979561	3.71372E-05	
Residual	54	772.5462573	14.30641217			
Total	59	1279.349446				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.23317148	0.547123967	-0.42617669	0.671673147	-1.33008899	0.863746025
Mkt-RF	0.770521163	0.152946105	5.037860652	5.60478E-06	0.463882685	1.07715964
SMB	-0.83109871	0.283592047	-2.93061362	0.004949727	-1.39966653	-0.26253089
HML	0.568276504	0.37078306	1.532638802	0.131203091	-0.17509877	1.311651781
RMW	-0.05799868	0.390219891	-0.14863076	0.882398656	-0.84034245	0.724345097
CMA	-0.14254331	0.533712012	-0.26707908	0.790425635	-1.21257147	0.927484842

### 2.2.1.5.3 Regression Results - Kinder Morgan

The regression of Kinder Morgan's monthly excess continuous returns yields a beta coefficient of approximately 0.72 (see table 93).

Monthly excess returns was used instead of weekly excess returns because weekly factors are not available. The sample size for Kinder Morgan is smaller than Enbridge and Kinder Morgan because the data on Kinder Morgan is only available post February 2011. This value is smaller than the original FFM, which should be a combined effect of using data with different periodicity and adding additional factors.

The beta associated with the size risk premium is around -0.45, which is expected because Kinder Morgan has a large market capitalization. Hence it should be relatively less risky than companies with smaller market capitalization, thus requiring a lower return on equity.

The beta associated with the value risk premium is around 0.02, which is not expected because Kinder Morgan is a value stock (i.e. relatively high book to market ratio). Historically, growth stocks have generated higher returns than value stocks, thus lowering the required return on shareholder equity. The beta associated with RMW is roughly -0.18, and the beta associated with CMA is roughly 0.40.

The  $R^2$  is low (22%), which means that 22% of the variation of Kinder Morgan's stock return can be explained by the market premium, size risk premium, value risk premium, operating profit risk premium, and investment style risk premium. The significance F is around 6.8% which implies that the model is not significant, meaning that the factors are jointly poor explanatory variable for explaining Kinder Morgan's stock returns. Out of all of the factors only the market premium is significant.

**Table 93: KMI 5 Factor FFM**

<i>Regression Statistics</i>						
Multiple R	0.463890185					
R Square	0.215194103					
Adjusted R Square	0.119486067					
Standard Error	4.70919273					
Observations	47					

<i>ANOVA</i>						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	5	249.3129837	49.86259674	2.248443413	0.067519609	
Residual	41	909.2363431	22.17649617			
Total	46	1158.549327				

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-0.18959580	0.767539971	-0.24701749	0.806127421	-1.73967422	1.360482615
Mkt-RF	0.724379741	0.235361602	3.077731183	0.003709987	0.249057343	1.199702138
SMB	-0.45285412	0.457338969	-0.99019360	0.327887525	-1.37646890	0.470760665
HML	0.022842097	0.569340385	0.040120282	0.968191966	-1.12696413	1.17264833
RMW	-0.17631283	0.57656265	-0.30579995	0.761304316	-1.34070472	0.988079064
CMA	0.396416741	0.81252886	0.487880198	0.628233639	-1.24451858	2.037352063

## 2.2.2 Equity Valuation

In this section, I estimate the intrinsic values of the companies by synthesizing the analysis that I've completed in the previous sections.

I value Enbridge, TransCanada, and Kinder Morgan's stocks by estimating the financials of each company for the next 10 years using time series analysis, historical growth rates relative to sales/assets, and industry analysis, while taking into account the plans of managements publicly disclosed in the MD&A. I then use a multi-stage residual income model with persistence to estimate the intrinsic value.

Residual income is basically a measure of economic profits that is the excess profits that is left over after paying for costs and allowing shareholders to earn a reasonable rate of return. I use the persistence factor because economic profits are typically not sustainable over a long time horizon, since competitors will enter and extract the economic profits. However, I will argue that this is not the case for pipeline companies.

### 2.2.2.1 Enbridge<sup>19</sup>

Using the multi-stage residual income model with persistence I find, that the valuation for Enbridge's stock price is quite sensitive to the persistence factor and the cost of equity assumptions.

That is why I developed a sensitivity table to evaluate how changes in assumptions will affect the valuation. Highlighted in yellow are the cost of equities that I determined using the CAPM and Fama-French models. Highlighted in green are my predictions for the stock prices, the darker the green the closer to my prediction.

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<sup>19</sup> See tables 94-104 for following analysis.

It is important to note that my valuation using the residual income model estimates the intrinsic value of Enbridge's stock price on December 31<sup>st</sup> 2014. The reason for this is because companies are only required to publish financial statements quarterly, and the most recent financial statements are only applicable up to December 31<sup>st</sup> 2014. If management decides to change their strategies and objectives post December 31<sup>st</sup> 2014, or/and substantial changes in the economic environment will have an impact on the valuation.

The cost of equity should reflect shareholder's expectations on the required rate of return they should earn if they decide to invest in Enbridge, given the current economic conditions. The most common method for estimating the cost of equity is the CAPM model, so naturally the expectation on the required rate of return for shareholders should be derived from the estimates of CAPM.

In the previous sections I used 3 methods for determining the market premium used to derive the required rate of return. The implied market premium is not a good reflection of stock market data, so I ruled this option out. I also ruled out the estimate used in the Richard Brealey and Steward Myers' corporate finance book because the book was published in 2003, which does not consist of recent market data, and should be a poor indication of the current economic conditions.

The third method estimates the historical equity premium from 1926 - 2013, which seems to be the best choice. The required return generate using the third method is 9.83%. However, even the third method does not account for the recent economic events (i.e. substantial reduction in the oil prices). Canadian and US oil producers will suffer from the recent events hence reducing returns to shareholders. Cyclical firms will also suffer, because their performance is closely tied to the current economic conditions.



In aggregate this will lower shareholders expectation of required rate of returns. That is why I believe the required rate of return should be closer to 9.33%, or perhaps even lower.

The persistency factor is used to determine how sustainable a company's economic profits are. I argue that in the case of Enbridge economic profits are extremely sustainable.

Commodity sales, liquid and natural gas pipelines deliveries, gas distribution, gas processing and energy services, are Enbridge's main lines of business. Commodity sales (i.e. trading crude and natural gas) is not affected by new entrants. Liquid and natural gas pipelines requires substantial fixed investments, and go through extremely careful and long regulatory processes before they can be built.

Even if a competitor were to build a new pipeline the incumbent is regulated under COS or performance based regulated regime, which offers them protection from small to mediocre reduction in volumes. Natural gas pipelines are typically largely contracted over long-term horizons, which offers further protection. Particular deliveries via liquid pipelines are also contracted over long-term horizons. Gas distribution is currently regulated under a performance based regulated regime, which offers Enbridge protection. It is important to note that severe reduction in volumes will still create problems for Enbridge. For these reasons I believe the relevant persistence factor should be fairly close to 1.

My estimate of Enbridge's stock price as of December 31st, 2014 is \$53.41, which is consistent with my estimates using time series analysis in which I obtained an estimate of \$54. The estimated stock price using the AR(2) model is \$57.55. This is further away from the other two estimates, which I don't find too surprising because the

autoregressive approach is highly sensitive to short-run fluctuations in prices. In addition, the model appears to follow a random walk process. For these reasons, I believe it should only be used as a sanity check, and I feel in this case the estimates are sufficiently close to pass the sanity check. Furthermore, my estimate of the intrinsic value of Enbridge's stock price using time series analysis as of March 19th, 2015 is \$56.42.

**Table 94: Income Statement for Enbridge****Millions of Dollars**

	Year Ending Dec. 31.		
	2012	2013	2014
Sales	\$24,660	\$32,918	<b>\$37,641</b>
Cost of Sales	\$19,179	\$26,807	<b>\$29,483</b>
Gross Profit	\$5,481	\$6,111	<b>\$8,158</b>
Operating & Admin. Expenses	\$2,739	\$3,014	<b>\$3,281</b>
Depreciation & Amortization	\$1,236	\$1,370	<b>\$1,577</b>
Other net (Income)/Expenses	(\$88)	\$362	<b>\$100</b>
EBIT	\$1,594	\$1,365	<b>\$3,200</b>
Income from Equity Investments	\$195	\$330	<b>\$368</b>
Interest Expense	(\$841)	(\$947)	<b>(\$1,129)</b>
Other Income/(Expense)	\$238	(\$135)	<b>(\$266)</b>
Pre-Tax Income	\$1,186	\$613	<b>\$2,173</b>
Income Taxes	(\$171)	(\$123)	<b>(\$611)</b>
Earnings from Continued Operations	\$1,015	\$490	<b>\$1,562</b>
Earnings/(Loss) from Discontinued Operations	(\$79)	\$4	<b>\$46</b>
Earnings	\$936	\$494	<b>\$1,608</b>
Earnings/(Loss) attributed to noncontrolling interest	(\$229)	\$135	<b>(\$203)</b>
<b>Earnings attributed to Enbridge</b>	<b>\$707</b>	<b>\$629</b>	<b>\$1,405</b>
Dividends	(\$105)	(\$183)	<b>(\$251)</b>
Additions to Retained Earnings	\$602	\$446	<b>\$1,154</b>

**Table 95: Balance Sheet for Enbridge**

Millions of Dollars

	Year Ending Dec. 31			
	2011	2012	2013	2014
<b>Assets</b>				
Cash and cash equivalents	\$723	\$1,776	\$756	<b>\$1,261</b>
Account Receivable and other	\$4,029	\$4,014	\$4,956	<b>\$5,504</b>
Inventories	\$823	\$779	\$1,115	<b>\$1,148</b>
Other	\$72	\$31	\$123	<b>\$288</b>
<b>Total Current Assets</b>	<b>\$5,647</b>	<b>\$6,600</b>	<b>\$6,950</b>	<b>\$8,201</b>
Net PPE	\$29,074	\$33,318	\$42,279	<b>\$53,830</b>
Other assets	\$6,773	\$6,882	\$8,339	<b>\$10,826</b>
<b>Total Assets</b>	<b>\$41,494</b>	<b>\$46,800</b>	<b>\$57,568</b>	<b>\$72,857</b>
<b>Liabilities and Shareholder's Equity</b>				
Short-term borrowings	\$548	\$583	\$374	<b>\$1,041</b>
Accounts payable and other	\$4,753	\$5,052	\$6,664	<b>\$6,444</b>
Interest payable	\$185	\$196	\$228	<b>\$264</b>
Current portion of long-term debt	\$354	\$652	\$2,811	<b>\$1,004</b>
Other current liabilities	\$325	\$586	\$651	<b>\$748</b>
<b>Total Current Liabilities</b>	<b>\$6,165</b>	<b>\$7,069</b>	<b>\$10,728</b>	<b>\$9,501</b>
Long-Term Debt	\$19,251	\$20,203	\$22,357	<b>\$33,423</b>
Deferred Income Taxes	\$2,615	\$2,483	\$2,925	<b>\$4,842</b>
Other Non-current Liabilities	\$2,208	\$2,541	\$2,995	<b>\$4,041</b>
<b>Total Liabilities</b>	<b>\$30,239</b>	<b>\$32,296</b>	<b>\$39,005</b>	<b>\$51,807</b>
Additional Paid in Capital	\$242	\$522	\$746	<b>\$2,549</b>
Retained Earnings	\$3,926	\$3,173	\$2,550	<b>\$1,571</b>
<b>Total Shareholders' Equity</b>	<b>\$11,255</b>	<b>\$14,504</b>	<b>\$18,563</b>	<b>\$21,050</b>

**Table 96: Statements of Cash Flows for Enbridge****Millions of Dollars**

	Year Ending Dec. 31		
	2012	2013	2014
<b>Operating activities</b>			
Earnings	\$936	\$494	\$1,608
(Earnings)/loss from discontinued operations	\$79	(\$4)	(\$46)
Depreciation and amortization	\$1,236	\$1,370	\$1,577
Deferred income taxes	\$3	\$131	\$587
Changes in unrealized (gains)/loss on derivative instruments, net	\$665	\$1,262	(\$96)
Cash distributions in excess of equity earnings	\$439	\$355	\$196
Impairment	\$39	\$6	\$18
Gain on disposition	\$0	(\$18)	(\$38)
Hedge ineffectiveness	\$20	\$48	\$210
Inventory revaluation allowance	\$10	\$4	\$174
Other	\$79	(\$43)	\$115
Changes in regulatory assets and liabilities	\$44	(\$11)	\$22
Changes in environmental liabilities, net of recoveries	(\$26)	\$148	(\$78)
Changes in operating assets and liabilities	(\$660)	(\$409)	(\$1,721)
Cash provided by continued operations	\$2,864	\$3,333	\$2,528
Cash provided by discontinued operations	\$10	\$8	\$19
<b>Total Cash Flows from Operations</b>	<b>\$2,874</b>	<b>\$3,341</b>	<b>\$2,547</b>
<b>Investing activities</b>			
Additions to PPE	(\$5,194)	(\$8,235)	(\$10,525)
Long-term investments	(\$531)	(\$1,018)	(\$854)
Additions to intangible assets	(\$163)	(\$212)	(\$208)
Acquisitions	(\$340)	\$0	(\$394)
Proceeds from disposition	\$18	\$41	\$85
Affiliate loans, net	\$8	\$8	\$13
Changes in restricted cash	(\$2)	(\$15)	(\$13)
Cash used in continuing operations	(\$6,204)	(\$9,431)	(\$11,896)
Cash provided by discontinued operations	\$4	\$0	\$0

<b>Total Cash Flows From Investing</b>	<b>(\$6,200)</b>	<b>(\$9,431)</b>	<b>(\$11,896)</b>
<b>Financing activities</b>			
Net change in bank indebtedness and short-term borrowings	\$412	(\$350)	\$734
Net changes in commercial paper and credit facility draws	(\$294)	\$1,562	\$4,212
Southern Lights project financing repayments	(\$13)	(\$5)	(\$1,519)
Debenture and term note issues - Southern Lights	\$0	\$0	\$1,507
Debenture and term note issues	\$2,199	\$2,845	\$5,414
Debenture and term note repayments	(\$349)	(\$660)	(\$1,348)
Repayment of acquired debt	(\$160)	\$0	\$0
Contributions from non-controlling interests	\$448	\$922	\$212
Distributions to non-controlling interest	(\$421)	(\$468)	(\$535)
Contributions from redeemable non-controlling interests	\$213	\$92	\$323
Distributions to redeemable non-controlling interests	(\$49)	(\$72)	(\$79)
Preference shares issued	\$2,634	\$1,428	\$1,365
Common shares issued	\$465	\$628	\$478
Preference share dividends	(\$93)	(\$178)	(\$245)
Common share dividends	(\$597)	(\$674)	(\$749)
<b>Total Cash Flows From Financing</b>	<b>\$4,395</b>	<b>\$5,070</b>	<b>\$9,770</b>

**Table 97: Model for Forecasting Enbridge's Pro-forma Financial Statements**

<b>Income Statement</b>	<b>Assumptions</b>
Sales	Time series forecast
Cost of Sales	78.45% based on historical average
Operating and Other Expense	Time series forecast
Depreciation and Amortization	Time series forecast
Interest income and other	.336% of sales based on historical average
Interest Expense	3.35% of sales based on average
Equity (Income)/Expense	0.995% of sales based on average
Income Tax Expense	22.22% of EBT based on average
Earnings/(Loss) from Discontinued Operations	Nil
(Earnings)/Loss attributed to non-controlling interest	Based on historical events while reducing volatility of line items because of equity restructuring of EEP
<b>Balance Sheet</b>	
<b>Assets</b>	
Cash and cash equivalents	3.93% of sales based on historical average
Account Receivable	15.47% of sales based on historical average
Inventories	3.21% of sales based on historical average
Other	0.39% of sales based on historical average
Property, Plant and Equipment net	135.52% of sales based on historical average
Other assets	27% of sales based on historical average
<b>Liabilities and Shareholder's Equity</b>	
Short-term borrowings	Increase borrowing by 660 million per annum for capital growth program until 3.3 billion is reached then grow at historical average
Accounts payable and other	19.16% of sales based on historical average
Interest payable	0.73% of sales based on historical average

Current portion of long-term debt	Enbridge's long-term debt structure remains unchanged over the next 10 years, and the CAD to USD exchange rate is 1.28 (current rate)
Other current liabilities	1.91% of sales based on historical average
Long-Term Debt	Increase borrowing by 10 billion in each of the next 3 years. Long-term debt will then be reduced by the current debt and grow at a historical average of 7.42%
Deferred Income Taxes	10.54% of sales based on historical average
Other Non-current Liabilities	9.72% of sales based on historical average

### Other Information

Dividend Payout Ratio	Approved payout policy ranges from 75% to 85%, I assume a payout of 80%
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**Table 98: Balance Sheet Forecast for Enbridge**

Millions of Dollars	Forecast Period									
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
<b>Assets</b>										
C&E	\$1,261	\$1,568	\$1,713	\$1,858	\$2,003	\$2,148	\$2,294	\$2,439	\$2,584	\$2,729
AR and other	\$5,504	\$6,171	\$6,743	\$7,314	\$7,886	\$8,457	\$9,028	\$9,600	\$10,171	\$10,742
Inventories	\$1,148	\$1,281	\$1,399	\$1,518	\$1,636	\$1,755	\$1,873	\$1,992	\$2,110	\$2,229
Other	\$288	\$156	\$170	\$184	\$199	\$213	\$228	\$242	\$256	\$271
<b>Current Assets</b>	\$8,201	\$9,175	\$10,025	\$10,874	\$11,724	\$12,573	\$13,423	\$14,272	\$15,122	\$15,971
Net PPE	\$53,830	\$54,063	\$59,068	\$64,073	\$69,079	\$74,084	\$79,089	\$84,095	\$89,100	\$94,106
Other assets	\$10,826	\$10,675	\$11,664	\$12,652	\$13,640	\$14,629	\$15,617	\$16,605	\$17,594	\$18,582
<b>Total Assets</b>	<b>\$72,857</b>	<b>\$73,913</b>	<b>\$80,756</b>	<b>\$87,600</b>	<b>\$94,443</b>	<b>\$101,286</b>	<b>\$108,129</b>	<b>\$114,973</b>	<b>\$121,816</b>	<b>\$128,659</b>
<b>Liabilities</b>										
Short-term borrowings	\$1,041	\$1,701	\$2,361	\$3,021	\$3,681	\$4,341	\$4,384	\$4,175	\$4,218	\$4,009
AP and other	\$6,444	\$7,643	\$8,351	\$9,059	\$9,766	\$10,474	\$11,182	\$11,889	\$12,597	\$13,305
Interest payable	\$264	\$291	\$318	\$345	\$372	\$399	\$426	\$453	\$480	\$507
Current LTD	\$1,004	\$700	\$1,198	\$2,151	\$300	\$700	\$850	\$775	\$500	\$1,600
Other	\$748	\$762	\$832	\$903	\$974	\$1,044	\$1,115	\$1,185	\$1,256	\$1,326
<b>Current Liabilities</b>	\$9,501	\$11,098	\$13,061	\$15,479	\$15,093	\$16,958	\$17,956	\$18,478	\$19,051	\$20,747
Long-Term Debt	\$33,423	\$43,723	\$53,525	\$62,374	\$66,733	\$71,018	\$75,473	\$80,336	\$85,837	\$90,649
DIT	\$4,842	\$4,205	\$4,594	\$4,983	\$5,373	\$5,762	\$6,151	\$6,540	\$6,930	\$7,319
Other Liabilities	\$4,041	\$3,878	\$4,237	\$4,596	\$4,955	\$5,314	\$5,673	\$6,032	\$6,391	\$6,750
<b>Liabilities</b>	<b>\$51,807</b>	<b>\$62,903</b>	<b>\$75,416</b>	<b>\$87,432</b>	<b>\$92,154</b>	<b>\$99,052</b>	<b>\$105,254</b>	<b>\$111,386</b>	<b>\$118,208</b>	<b>\$125,465</b>
<b>Equity</b>	<b>\$21,050</b>	<b>\$11,010</b>	<b>\$5,340</b>	<b>\$168</b>	<b>\$2,289</b>	<b>\$2,234</b>	<b>\$2,876</b>	<b>\$3,587</b>	<b>\$3,607</b>	<b>\$3,194</b>

**Table 99: Income Statement Forecasts for Enbridge**

Millions (CAD)

	Forecast Period									
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
Sales	\$37,641	\$39,893	\$43,586	\$47,280	\$50,973	\$54,666	\$58,360	\$62,053	\$65,747	\$69,440
Cost of Sales	\$29,483	\$31,294	\$34,191	\$37,089	\$39,986	\$42,883	\$45,781	\$48,678	\$51,576	\$54,473
<b>Gross Profit</b>	\$8,158	\$8,599	\$9,395	\$10,191	\$10,987	\$11,783	\$12,579	\$13,375	\$14,171	\$14,967
OPEX	\$3,281	\$3,708	\$4,060	\$4,411	\$4,763	\$5,114	\$5,466	\$5,818	\$6,169	\$6,521
Depreciation & Amortization	\$1,577	\$1,708	\$1,862	\$2,015	\$2,169	\$2,323	\$2,477	\$2,630	\$2,784	\$2,938
Other net (Income)/Expenses	\$100	\$134	\$146	\$158	\$171	\$183	\$196	\$208	\$220	\$233
<b>EBIT</b>	\$3,200	\$3,049	\$3,327	\$3,606	\$3,884	\$4,163	\$4,441	\$4,719	\$4,998	\$5,276
Income from Equity Investments	\$368	\$397	\$434	\$470	\$507	\$544	\$581	\$617	\$654	\$691
Interest Expense	(\$1,129)	(\$1,336)	(\$1,460)	(\$1,584)	(\$1,708)	(\$1,831)	(\$1,955)	(\$2,079)	(\$2,203)	(\$2,326)
Other Income/(Expense)	(\$266)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Pre-Tax Income</b>	\$2,173	\$2,110	\$2,301	\$2,492	\$2,684	\$2,875	\$3,067	\$3,258	\$3,449	\$3,641
Income Taxes	(\$611)	(\$469)	(\$511)	(\$554)	(\$596)	(\$639)	(\$681)	(\$724)	(\$766)	(\$809)
Earnings from Continued Operations	\$1,562	\$1,641	\$1,790	\$1,939	\$2,087	\$2,236	\$2,385	\$2,534	\$2,683	\$2,832
Earnings/(Loss) from Discontinued Operations	\$46	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Earnings	\$1,608	\$1,641	\$1,790	\$1,939	\$2,087	\$2,236	\$2,385	\$2,534	\$2,683	\$2,832
Earnings/(Loss) attributed to non-controlling interest	(\$203)	\$298	(\$498)	(\$396)	\$476	(\$236)	\$434	(\$705)	(\$548)	\$646
<b>Earnings</b>	<b>\$1,405</b>	<b>\$1,939</b>	<b>\$1,292</b>	<b>\$1,543</b>	<b>\$2,564</b>	<b>\$2,001</b>	<b>\$2,819</b>	<b>\$1,829</b>	<b>\$2,135</b>	<b>\$3,478</b>

**Table 100: Enbridge Equity Valuation - Multistage Residual Income w/ persistence method (Sample Calculation)**

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Time	0	1	2	3	4	5	6	7	8	9	10	11
Earnings	\$1,405	\$1,939	\$1,292	\$1,543	\$2,564	\$2,001	\$2,819	\$1,829	\$2,135	\$3,478	\$2,666	\$3,698
Shares	\$852	\$852	\$852	\$852	\$852	\$852	\$852	\$852	\$852	\$852	\$852	\$852
BV per share	\$25	\$13	\$6	\$0	\$3	\$3	\$3	\$4	\$4	\$4	\$4	\$3
Earnings per share	\$2	\$2	\$2	\$2	\$3	\$2	\$3	\$2	\$3	\$4	\$3	\$4
Residual Income		(\$0)	\$0	\$1	\$3	\$2	\$3	\$2	\$2	\$4	\$3	\$4
Discounted RI		(\$0)	\$0	\$1	\$2	\$1	\$2	\$1	\$1	\$2	\$1	\$17
PF			1									
COE			9.33%									
Value in \$CDN on Dec 31st, 2014												<b>\$53.41</b>

**Table 101: Sensitivity Analysis on Equity Valuation for Enbridge on December 31, 2014**

Table 101: Sensitivity Analysis on Equity Valuation for Enbridge on December 31, 2014												
Persistence Factor												
	0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1	
Cost of Equity	6.50%	\$41.49	\$41.71	\$41.97	\$42.30	\$42.72	\$43.30	\$44.13	\$45.42	\$47.67	\$52.66	\$72.98
	6.70%	\$41.18	\$41.38	\$41.64	\$41.96	\$42.38	\$42.94	\$43.75	\$44.99	\$47.17	\$51.96	\$71.04
	6.90%	\$40.86	\$41.06	\$41.31	\$41.63	\$42.03	\$42.58	\$43.37	\$44.57	\$46.68	\$51.28	\$69.22
	7.10%	\$40.55	\$40.75	\$40.99	\$41.30	\$41.70	\$42.23	\$42.99	\$44.16	\$46.20	\$50.62	\$67.50
	7.30%	\$40.25	\$40.44	\$40.68	\$40.98	\$41.36	\$41.88	\$42.62	\$43.76	\$45.73	\$49.98	\$65.88
	7.50%	\$39.95	\$40.14	\$40.37	\$40.66	\$41.04	\$41.54	\$42.26	\$43.37	\$45.27	\$49.36	\$64.34
	7.70%	\$39.66	\$39.84	\$40.06	\$40.35	\$40.71	\$41.21	\$41.91	\$42.98	\$44.82	\$48.75	\$62.89
	7.90%	\$39.37	\$39.55	\$39.76	\$40.04	\$40.40	\$40.88	\$41.56	\$42.60	\$44.38	\$48.16	\$61.51
	8.10%	\$39.08	\$39.25	\$39.47	\$39.74	\$40.09	\$40.55	\$41.21	\$42.22	\$43.95	\$47.59	\$60.20
	8.30%	\$38.80	\$38.97	\$39.18	\$39.44	\$39.78	\$40.23	\$40.88	\$41.86	\$43.53	\$47.03	\$58.96
	8.50%	\$38.52	\$38.69	\$38.89	\$39.15	\$39.48	\$39.92	\$40.55	\$41.50	\$43.11	\$46.48	\$57.77
	8.70%	\$38.25	\$38.41	\$38.61	\$38.86	\$39.18	\$39.61	\$40.22	\$41.14	\$42.71	\$45.95	\$56.65
	8.90%	\$37.98	\$38.14	\$38.33	\$38.57	\$38.89	\$39.31	\$39.90	\$40.79	\$42.31	\$45.43	\$55.57
	9.10%	\$37.71	\$37.87	\$38.05	\$38.29	\$38.60	\$39.01	\$39.58	\$40.45	\$41.92	\$44.93	\$54.54
	9.30%	\$37.45	\$37.60	\$37.78	\$38.02	\$38.31	\$38.71	\$39.27	\$40.12	\$41.54	\$44.43	\$53.56
	9.50%	\$37.19	\$37.34	\$37.52	\$37.74	\$38.03	\$38.42	\$38.97	\$39.79	\$41.16	\$43.95	\$52.61
	9.70%	\$36.94	\$37.08	\$37.25	\$37.47	\$37.76	\$38.14	\$38.67	\$39.46	\$40.80	\$43.48	\$51.71
	9.90%	\$36.68	\$36.82	\$37.00	\$37.21	\$37.49	\$37.85	\$38.37	\$39.14	\$40.44	\$43.03	\$50.85
	10.10%	\$36.44	\$36.57	\$36.74	\$36.95	\$37.22	\$37.58	\$38.08	\$38.83	\$40.08	\$42.58	\$50.02
	10.30%	\$36.19	\$36.33	\$36.49	\$36.69	\$36.96	\$37.30	\$37.79	\$38.52	\$39.74	\$42.14	\$49.22
10.50%	\$35.95	\$36.08	\$36.24	\$36.44	\$36.70	\$37.04	\$37.51	\$38.22	\$39.39	\$41.72	\$48.46	
10.70%	\$35.71	\$35.84	\$36.00	\$36.19	\$36.44	\$36.77	\$37.23	\$37.92	\$39.06	\$41.30	\$47.72	
10.90%	\$35.48	\$35.60	\$35.76	\$35.94	\$36.19	\$36.51	\$36.96	\$37.63	\$38.73	\$40.89	\$47.01	
11.10%	\$35.25	\$35.37	\$35.52	\$35.70	\$35.94	\$36.25	\$36.69	\$37.34	\$38.41	\$40.49	\$46.33	
11.30%	\$35.02	\$35.14	\$35.28	\$35.46	\$35.69	\$36.00	\$36.43	\$37.06	\$38.10	\$40.10	\$45.67	
11.50%	\$34.79	\$34.91	\$35.05	\$35.23	\$35.45	\$35.75	\$36.17	\$36.78	\$37.79	\$39.72	\$45.03	
11.70%	\$34.57	\$34.69	\$34.82	\$35.00	\$35.22	\$35.51	\$35.91	\$36.51	\$37.48	\$39.35	\$44.42	
11.90%	\$34.35	\$34.46	\$34.60	\$34.77	\$34.98	\$35.26	\$35.66	\$36.24	\$37.18	\$38.99	\$43.83	
12.10%	\$34.14	\$34.25	\$34.38	\$34.54	\$34.75	\$35.03	\$35.41	\$35.97	\$36.89	\$38.63	\$43.26	

**Table 102: Enbridge Inc (TSX) Data from December 31st 2009 to 2014**

<i>Regression Statistics</i>	
Multiple R	0.986194351
R Square	0.972579298
Adjusted R Square	0.972473834
Standard Error	1.730118806
Observations	262

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	27603.97677	27603.97677	9221.887074	4.4693E-205
Residual	260	778.2608812	2.993311082		
Total	261	28382.23765			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	18.44358895	0.2131637	86.52312275	1.1642E-193	18.02384191	18.86333598
Regressor	0.135714945	0.001413246	96.03065695	4.4693E-205	0.13293208	0.138497811

**Enbridge's Forecasted Price on December 31st 2014: \$54.00**

**Table 103: Enbridge AR(2) Closing Price from December 31<sup>st</sup> 2009 to 2014**

<i>Regression Statistics</i>	
Multiple R	0.99973
R Square	0.99945
Adjusted R Square	0.99945
Standard Error	0.87899
Observations	260

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	2.	364,288.69096	182,144.34548	235,745.7428	0.E+0
Residual	258.	199.33866	0.77263		
Total	260.	364,488.02962			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0					
Lag Last Price	0.80483	0.06101	13.19129	0.E+0	0.66201	0.94765
Lag-2 Last Price	0.19998	0.06126	3.26434	0.00125	0.05657	0.34338

**Enbridge's Forecasted Price on December 31st 2014: \$57.55**

**Table 104: Enbridge Inc (TSX) Data from March 19, 2010 to 2015**

<i>Regression Statistics</i>	
Multiple R	0.9831874
R Square	0.9666575
Adjusted R Square	0.9665287
Standard Error	1.9882297
Observations	261

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	29682.93381	29682.93	7508.855	2.695E-193
Residual	259	1023.841813	3.953057		
Total	260	30706.77562			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	19.47386	0.245431052	79.34554	9.6E-184	18.9905654	19.95715416
Regressor	0.1415424	0.001633427	86.65365	2.7E-193	0.13832588	0.144758857

**Enbridge's Forecasted Price on March 19th 2015: \$56.42**

### 2.2.2.2 TransCanada<sup>20</sup>

Highlighted in yellow in the sensitivity table are the cost of equities that I determined using the CAPM and Fama-French models. Highlighted in green are my predictions for the stock prices, the darker the green the closer to my prediction. It is important to note that my valuation using the residual income model estimates the intrinsic value of TransCanada's stock price on December 31<sup>st</sup> 2014. The reason for this is because companies are only required to publish financial statements quarterly, and the most recent financial statements are only applicable up to December 31<sup>st</sup> 2014. If management decides to change their strategies and objectives post December 31<sup>st</sup> 2014, or/and substantial changes in the economic environment will have an impact on the valuation.

The cost of equity should reflect shareholder's expectations on the required rate of return they should be able to earn if they decide to invest in TransCanada, given the current economic conditions. The most common method for estimating the cost of equity is the CAPM model, so naturally the expectation on the required rate of return for shareholders should be derived from the estimates of CAPM. In the previous sections I used 3 methods for determining the market premium used to derive the required rate of return. The implied market premium is not a good reflection of stock market data, so I ruled this option out. I also ruled out the estimate used in the Richard Brealey and Steward Myers' corporate finance book because the book was published in 2003, which does not consist of recent market data, and should be a poor indication of the current economic conditions.

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<sup>20</sup> See tables 105-115 for the following analysis.



The third method estimates the historical equity premium from 1926 - 2013, which seems to be the best choice. The required return generated using the third method is 10.11%. However, even the third method does not account for the recent economic events (i.e. substantial reduction in the oil prices). Canadian and US oil producers will suffer from the recent events hence reducing returns to shareholders. Cyclical firms will also suffer, because their performance is closely tied to the current economic conditions. In aggregate this will lower shareholders' expectation of required rate of returns. That is why I believe the required rate of return should be closer to 9.60%, or perhaps even lower.

The persistency factor is used because economic profits are usually not sustainable, because economic profits attract new entrants, and once they enter will extract most or in theory all of the economic profits.

I argue that in the case of TransCanada economic profits are extremely sustainable. Natural Gas pipeline, liquid pipeline, and Energy generation services are TransCanada's main lines of business. Energy generation requires substantial up front investments, takes a long time to build, faces regulatory restrictions, and land related restrictions that prevent entrants from entering the energy generation business. Liquid and natural gas pipelines require substantial fixed investments, and go through extremely careful and long regulatory processes before they can be built. Even if a competitor were to build a new pipeline the incumbent is regulated under COS or performance based regulated regime, which offers them protection from small to mediocre reduction in volumes. Natural gas pipelines are typically largely contracted over long-term horizons, which offers further protection. It is important to note that severe reduction in volumes will still create problems for TransCanada.

For these reasons I believe the relevant persistence factor should be fairly close to 1.

My estimate of TransCanada's stock price as of December 31st, 2014 is \$53.80, which is consistent with my estimates using time series analysis in which I obtained an estimate of \$53.46. Furthermore, my estimate of the intrinsic value of TransCanada's stock price using time series analysis as of March 19th, 2015 is \$54.89.

**Table 105: Income Statement for TransCanada****Millions of Dollars**

	Year Ending Dec. 31		
	2012	2013	2014
Sales	\$8,007	\$8,797	<b>\$10,185</b>
Cost of Sales	\$1,049	\$1,317	<b>\$1,836</b>
Gross Revenue	\$6,958	\$7,480	<b>\$8,349</b>
Operating and Other Expense			
Depreciation and Amortization	\$1,375	\$1,485	<b>\$1,611</b>
Other net (Income)/Expense	\$3,011	\$3,119	<b>\$3,446</b>
EBIT	\$2,572	\$2,876	<b>\$3,292</b>
Interest income and other	<b>(\$85)</b>	<b>(\$34)</b>	<b>(\$91)</b>
Interest Expense	\$976	\$985	<b>\$1,198</b>
(Gains)/Loss on sales of Assets	\$0	\$0	<b>(\$117)</b>
Equity (Income)/Expense	<b>(\$257)</b>	<b>(\$597)</b>	<b>(\$522)</b>
EBT	\$1,938	\$2,522	<b>\$2,824</b>
Income Tax Expense	\$466	\$611	<b>\$831</b>
<b>Net Income</b>	<b>\$1,472</b>	<b>\$1,911</b>	<b>\$1,993</b>
Preferred Dividends	\$55	\$74	<b>\$97</b>
Additions to Retained Earnings	\$1,299	\$1,712	<b>\$1,743</b>

**Table 106: Balance Sheet for TransCanada**

Millions of Dollars	Year Ending Dec. 31			
	2011	2012	2013	2014
<b>Assets</b>				
Cash and cash equivalents	\$654	\$551	\$927	<b>\$489</b>
Account Receivable	\$1,094	\$1,052	\$1,122	<b>\$1,313</b>
Inventories	\$248	\$224	\$251	<b>\$292</b>
Other	\$1,114	\$997	\$847	<b>\$1,446</b>
<b>Total Current Assets</b>	<b>\$3,110</b>	<b>\$2,824</b>	<b>\$3,147</b>	<b>\$3,540</b>
Net PPE	\$32,467	\$33,713	\$37,606	<b>\$41,774</b>
Other assets	\$11,761	\$11,859	\$13,145	<b>\$13,633</b>
<b>Total Assets</b>	<b>\$47,338</b>	<b>\$48,396</b>	<b>\$53,898</b>	<b>\$58,947</b>
<b>Liabilities and Shareholder's Equity</b>				
Notes payable	\$1,863	\$2,275	\$1,842	<b>\$2,467</b>
Accounts payable and other	\$2,359	\$2,344	\$2,155	<b>\$2,896</b>
Accrued interest	\$365	\$368	\$388	<b>\$424</b>
Current portion of long-term debt	\$935	\$894	\$973	<b>\$1,797</b>
<b>Total Current Liabilities</b>	<b>\$5,522</b>	<b>\$5,881</b>	<b>\$5,358</b>	<b>\$7,584</b>
Long-Term Debt	\$17,724	\$18,019	\$21,892	<b>\$22,960</b>
Deferred Income Tax Liabilities	\$3,591	\$4,016	\$4,564	<b>\$5,275</b>
Other Non-current Liabilities	\$2,242	\$2,144	\$1,948	<b>\$2,475</b>
<b>Total Liabilities</b>	<b>\$29,079</b>	<b>\$30,060</b>	<b>\$33,762</b>	<b>\$38,294</b>
Additional Paid in Capital	\$380	\$379	\$401	<b>\$370</b>
Retained Earnings	\$4,628	\$4,687	\$5,096	<b>\$5,478</b>
<b>Total Shareholders' Equity</b>	<b>\$18,259</b>	<b>\$18,336</b>	<b>\$20,136</b>	<b>\$20,653</b>

**Table 107: Cash Flows for TransCanada****Millions of Dollars**

	Year Ending Dec 31.		
	2012	2013	2014
Cash Generated from Operations			
Net Income	\$1,472	\$1,911	\$1,993
Depreciation and amortization	\$1,375	\$1,485	\$1,611
Deferred income taxes	\$285	\$568	\$686
Income from equity investments	(\$257)	(\$597)	(\$522)
Distributed earnings received from equity investments	\$376	\$605	\$579
Employee post-retirement benefits expense, net of funding	\$9	\$50	\$37
Gain on sale of assets	\$0	\$0	(\$117)
Equity AFUDC	(\$15)	(\$19)	(\$95)
Unrealized losses/(gains) on financial instruments	\$22	(\$35)	\$74
Other	\$17	\$32	\$22
(Increase)/decrease in operating working capital	\$287	(\$326)	(\$189)
<b>CFO</b>	<b>\$3,571</b>	<b>\$3,674</b>	<b>\$4,079</b>
Investing Activities			
Capital expenditures	(\$2,595)	(\$4,264)	(\$3,550)
Capital projects under development	(\$3)	(\$488)	(\$807)
Equity investments	(\$652)	(\$163)	(\$256)
Acquisitions, net of cash acquired	(\$214)	(\$216)	(\$241)
Proceeds from sale of assets, net of transaction cost	\$0	\$0	\$196
Deferred amounts and other	\$208	\$11	\$514
<b>CFI</b>	<b>(\$3,256)</b>	<b>(\$5,120)</b>	<b>(\$4,144)</b>
Dividends on common	(\$1,226)	(\$1,285)	(\$1,345)
Dividends on preferred shares	(\$55)	(\$71)	(\$94)
Distributions paid to non-controlling interests	(\$135)	(\$166)	(\$178)
Notes payable issued/(repaid), net	\$449	(\$492)	\$544
Long-term debt issued, net of issue costs	\$1,491	\$4,253	\$1,403
Repayment of long-term debt	(\$980)	(\$1,286)	(\$1,069)
Common shares issued, net of issue costs	\$53	\$72	\$47
Preferred shares issued, net of issue costs	\$0	\$585	\$440
Partnership units issued, net of issue costs	\$0	\$384	\$79
Preferred shares of subsidiary redeemed	\$0	(\$200)	(\$200)
<b>CFF</b>	<b>(\$403)</b>	<b>\$1,794</b>	<b>(\$373)</b>

**Table 108: Model for Forecasting TransCanada's Pro-forma Financial Statements**

<b>Income Statement</b>	<b>Assumptions</b>
Sales	Time series forecast
Cost of Sales	15.36% of sales based on historical average
Operating and Other Expense	Time series forecast
Depreciation and Amortization	Time series forecast
(Gains)/Loss on sales of Assets	This line item is assumed to be zero, no logical method to forecast
Interest income and other	0.78% of sales based on historical average
Interest Expense	11.72% of sales based on historical average
(Gains)/Loss on sales of Assets	This line item is assumed to be zero, no logical method to forecast
Equity (Income)/Expense	5.04% of sales based on historical average
Income Tax Expense	Effective tax rate of 25.9% of EBT based on historical average
Non-controlling interest Income	7.41% of Earnings
<b>Balance Sheet</b>	
<b>Assets</b>	
Cash and cash equivalents	7.41% of sales based on historical average
Account Receivable	12.93% of sales based on historical average
Inventories	2.84% of sales based on historical average
Other	12.09% of sales based on historical average
Property, Plant and Equipment net	419.56% of sales based on historical average
Other assets	144.8% of sales based on historical average
<b>Liabilities</b>	
Accounts payable and other	27.4% of sales based on historical average
Accrued Interest	4.39% of sales based on historical average

Current portion of long-term debt      TransCanada's long-term debt structure remains unchanged over the next 10 years, and the CAD to USD exchange rate is 1.28 (current rate)

Regulatory Liabilities      2.84% of sales based on historical average

**Other current liabilities**

Long-Term Debt      Increase by 36 billion over the next 10 years. Long-term debt will then be reduced by the current debt

Deferred Income Taxes      45.1% of sales based on historical average

Other Long-Term Liabilities      24.4% of sales based on historical average

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**Table 109: Balance Sheet for TransCanada**

Millions of Dollars

	Forecast Period									
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
<b>Assets</b>										
Cash and cash equivalents	\$489	\$736	\$762	\$787	\$812	\$837	\$863	\$888	\$913	\$939
Account Receivable and other	\$1,313	\$1,285	\$1,329	\$1,373	\$1,417	\$1,461	\$1,505	\$1,549	\$1,594	\$1,638
Inventories	\$292	\$282	\$292	\$302	\$311	\$321	\$331	\$340	\$350	\$360
Other	\$1,446	\$1,201	\$1,243	\$1,284	\$1,325	\$1,366	\$1,408	\$1,449	\$1,490	\$1,531
<b>Total Current Assets</b>	\$3,540	\$3,505	\$3,625	\$3,746	\$3,866	\$3,986	\$4,106	\$4,227	\$4,347	\$4,467
Net PPE	\$41,774	\$41,694	\$43,124	\$44,555	\$45,986	\$47,417	\$48,848	\$50,279	\$51,710	\$53,141
Other assets	\$13,633	\$14,389	\$14,883	\$15,377	\$15,871	\$16,365	\$16,859	\$17,352	\$17,846	\$18,340
<b>Total Assets</b>	\$58,947	\$59,588	\$61,633	\$63,678	\$65,723	\$67,768	\$69,813	\$71,858	\$73,903	\$75,948
<b>Liabilities and Shareholder's Equity</b>										
Notes payable	\$2,467	\$2,437	\$2,520	\$2,604	\$2,688	\$2,771	\$2,855	\$2,938	\$3,022	\$3,106
Accounts payable and other	\$2,896	\$2,723	\$2,816	\$2,910	\$3,003	\$3,097	\$3,190	\$3,284	\$3,377	\$3,470
Accrued Interest	\$424	\$436	\$451	\$466	\$481	\$496	\$511	\$526	\$541	\$556
Current portion of long-term debt	\$1,797	\$790	\$2,353	\$400	\$2,198	\$973	\$1,530	\$1,498	\$1,305	\$1,506
<b>Total Current Liabilities</b>	\$7,584	\$6,386	\$8,141	\$6,380	\$8,370	\$7,336	\$8,086	\$8,246	\$8,245	\$8,638
Long-Term Debt	\$22,960	\$25,770	\$27,017	\$30,217	\$31,619	\$34,247	\$36,317	\$38,418	\$40,713	\$42,807
Deferred Income Taxes	\$5,275	\$4,482	\$4,636	\$4,789	\$4,943	\$5,097	\$5,251	\$5,405	\$5,558	\$5,712
Other Non-current Liabilities	\$2,475	\$2,425	\$2,508	\$2,591	\$2,674	\$2,758	\$2,841	\$2,924	\$3,007	\$3,090
<b>Total Liabilities</b>	\$38,294	\$39,062	\$42,301	\$43,977	\$47,607	\$49,438	\$52,494	\$54,994	\$57,524	\$60,248



**Table 110: Income Statement Forecasts for TransCanada**

Millions of Dollars

	Forecast Period									
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
Sales	\$10,185	\$9,937	\$10,278	\$10,620	\$10,961	\$11,302	\$11,643	\$11,984	\$12,325	\$12,666
Cost of Sales	\$1,836	\$1,509	\$1,561	\$1,613	\$1,665	\$1,717	\$1,769	\$1,820	\$1,872	\$1,924
<b>Gross Profit</b>	<b>\$8,349</b>	<b>\$8,428</b>	<b>\$8,717</b>	<b>\$9,006</b>	<b>\$9,296</b>	<b>\$9,585</b>	<b>\$9,874</b>	<b>\$10,163</b>	<b>\$10,453</b>	<b>\$10,742</b>
Operating & Other Expense										
Depreciation & Amortization	\$1,611	\$1,625	\$1,685	\$1,744	\$1,804	\$1,863	\$1,923	\$1,982	\$2,042	\$2,101
Other net (Income)/Expenses	\$3,446	\$4,001	\$4,151	\$4,300	\$4,450	\$4,600	\$4,750	\$4,899	\$5,049	\$5,199
<b>EBIT</b>	<b>\$3,292</b>	<b>\$2,801</b>	<b>\$2,882</b>	<b>\$2,962</b>	<b>\$3,042</b>	<b>\$3,122</b>	<b>\$3,202</b>	<b>\$3,282</b>	<b>\$3,362</b>	<b>\$3,442</b>
Interest income and other	(\$91)	(\$78)	(\$80)	(\$83)	(\$86)	(\$88)	(\$91)	(\$94)	(\$96)	(\$99)
Interest Expense	\$1,198	\$1,165	\$1,205	\$1,245	\$1,285	\$1,325	\$1,365	\$1,404	\$1,444	\$1,484
(Gains)/Loss on sales of Assets	(\$117)	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Equity (Income)/Expense	(\$522)	(\$501)	(\$518)	(\$535)	(\$552)	(\$570)	(\$587)	(\$604)	(\$621)	(\$638)
<b>EBT</b>	<b>\$2,824</b>	<b>\$2,215</b>	<b>\$3,488</b>	<b>\$3,588</b>	<b>\$3,688</b>	<b>\$3,788</b>	<b>\$3,888</b>	<b>\$3,989</b>	<b>\$4,089</b>	<b>\$4,189</b>
Income Taxes Expense	\$831	\$574	\$903	\$929	\$955	\$981	\$1,007	\$1,033	\$1,059	\$1,085
Earnings	\$1,993	\$1,642	\$2,584	\$2,659	\$2,733	\$2,807	\$2,881	\$2,956	\$3,030	\$3,104
Earnings/(Loss) attributed to noncontrolling interest	\$153	\$122	\$192	\$197	\$203	\$208	\$214	\$219	\$225	\$230
<b>Earnings</b>	<b>\$1,993</b>	<b>\$1,642</b>	<b>\$2,584</b>	<b>\$2,659</b>	<b>\$2,733</b>	<b>\$2,807</b>	<b>\$2,881</b>	<b>\$2,956</b>	<b>\$3,030</b>	<b>\$3,104</b>

**Table 111: TransCanada Equity Valuation - Multistage Residual Income w/ persistency method (Sample Calculation)**

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Time	0	1	2	3	4	5	6	7	8	9	10	11
Earnings	\$1,993	\$1,642	\$2,584	\$2,659	\$2,733	\$2,807	\$2,881	\$2,956	\$3,030	\$3,104	\$3,178	\$3,252
Shares	\$709	\$709	\$709	\$709	\$709	\$709	\$709	\$709	\$709	\$709	\$709	\$709
BV per share	\$29	\$29	\$27	\$28	\$26	\$26	\$24	\$24	\$23	\$22	\$21	\$19
Earnings per share	\$3	\$2	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$4	\$5
Residual Income PV		(\$0)	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$3
Residual Income		(\$0)	\$1	\$1	\$1	\$2	\$2	\$2	\$2	\$2	\$2	\$11
PF			1									
Cost of Equity			9.60%									
<b>Value in \$CDN on Dec 31, 2014</b>	<b>\$53.80</b>											

<b>Table 112: Sensitivity Analysis on Valuation for TransCanada on December 31st, 2014</b>												
	<b>Persistence Factor</b>											
	<b>0</b>	<b>0.1</b>	<b>0.2</b>	<b>0.3</b>	<b>0.4</b>	<b>0.5</b>	<b>0.6</b>	<b>0.7</b>	<b>0.8</b>	<b>0.9</b>	<b>1</b>	
<b>Cost of Equity</b>	<b>6.50%</b>	\$52.87	\$53.04	\$53.24	\$53.50	\$53.83	\$54.29	\$54.93	\$55.94	\$57.69	\$61.58	\$77.45
	<b>6.70%</b>	\$52.30	\$52.46	\$52.66	\$52.91	\$53.23	\$53.66	\$54.29	\$55.25	\$56.93	\$60.62	\$75.34
	<b>6.90%</b>	\$51.73	\$51.89	\$52.08	\$52.32	\$52.63	\$53.04	\$53.64	\$54.56	\$56.17	\$59.68	\$73.35
	<b>7.10%</b>	\$51.17	\$51.32	\$51.50	\$51.73	\$52.03	\$52.43	\$53.00	\$53.89	\$55.42	\$58.75	\$71.46
	<b>7.30%</b>	\$50.60	\$50.74	\$50.92	\$51.14	\$51.43	\$51.82	\$52.37	\$53.21	\$54.68	\$57.84	\$69.67
	<b>7.50%</b>	\$50.04	\$50.18	\$50.35	\$50.56	\$50.83	\$51.21	\$51.74	\$52.55	\$53.95	\$56.95	\$67.96
	<b>7.70%</b>	\$49.48	\$49.61	\$49.77	\$49.98	\$50.24	\$50.60	\$51.11	\$51.89	\$53.22	\$56.08	\$66.33
	<b>7.90%</b>	\$48.91	\$49.04	\$49.20	\$49.40	\$49.65	\$50.00	\$50.48	\$51.23	\$52.51	\$55.22	\$64.78
	<b>8.10%</b>	\$48.35	\$48.48	\$48.63	\$48.82	\$49.07	\$49.40	\$49.86	\$50.58	\$51.80	\$54.37	\$63.29
	<b>8.30%</b>	\$47.80	\$47.92	\$48.06	\$48.24	\$48.48	\$48.80	\$49.25	\$49.93	\$51.10	\$53.54	\$61.86
	<b>8.50%</b>	\$47.24	\$47.35	\$47.49	\$47.67	\$47.90	\$48.20	\$48.63	\$49.29	\$50.40	\$52.72	\$60.49
	<b>8.70%</b>	\$46.68	\$46.79	\$46.93	\$47.10	\$47.32	\$47.61	\$48.02	\$48.65	\$49.71	\$51.91	\$59.18
	<b>8.90%</b>	\$46.13	\$46.23	\$46.36	\$46.53	\$46.74	\$47.02	\$47.41	\$48.01	\$49.03	\$51.12	\$57.91
	<b>9.10%</b>	\$45.57	\$45.68	\$45.80	\$45.96	\$46.16	\$46.43	\$46.81	\$47.38	\$48.35	\$50.34	\$56.68
	<b>9.30%</b>	\$45.02	\$45.12	\$45.24	\$45.39	\$45.58	\$45.84	\$46.21	\$46.76	\$47.68	\$49.57	\$55.50
	<b>9.50%</b>	\$44.47	\$44.57	\$44.68	\$44.83	\$45.01	\$45.26	\$45.61	\$46.14	\$47.02	\$48.81	\$54.36
	<b>9.70%</b>	\$43.92	\$44.01	\$44.12	\$44.26	\$44.44	\$44.68	\$45.01	\$45.52	\$46.36	\$48.06	\$53.25
	<b>9.90%</b>	\$43.37	\$43.46	\$43.56	\$43.70	\$43.87	\$44.10	\$44.42	\$44.90	\$45.70	\$47.31	\$52.18
	<b>10.10%</b>	\$42.82	\$42.91	\$43.01	\$43.14	\$43.30	\$43.52	\$43.83	\$44.29	\$45.05	\$46.58	\$51.14
	<b>10.30%</b>	\$42.27	\$42.36	\$42.45	\$42.58	\$42.73	\$42.95	\$43.24	\$43.68	\$44.41	\$45.86	\$50.12
	<b>10.50%</b>	\$41.73	\$41.81	\$41.90	\$42.02	\$42.17	\$42.37	\$42.65	\$43.07	\$43.77	\$45.15	\$49.14
	<b>10.70%</b>	\$41.18	\$41.26	\$41.35	\$41.46	\$41.61	\$41.80	\$42.07	\$42.47	\$43.13	\$44.44	\$48.18
<b>10.90%</b>	\$40.64	\$40.71	\$40.80	\$40.91	\$41.04	\$41.23	\$41.49	\$41.87	\$42.50	\$43.74	\$47.25	
<b>11.10%</b>	\$40.09	\$40.16	\$40.25	\$40.35	\$40.48	\$40.66	\$40.91	\$41.27	\$41.88	\$43.05	\$46.34	
<b>11.30%</b>	\$39.55	\$39.62	\$39.70	\$39.80	\$39.92	\$40.09	\$40.33	\$40.68	\$41.25	\$42.37	\$45.44	
<b>11.50%</b>	\$39.01	\$39.07	\$39.15	\$39.24	\$39.37	\$39.53	\$39.75	\$40.09	\$40.63	\$41.69	\$44.57	
<b>11.70%</b>	\$38.47	\$38.53	\$38.60	\$38.69	\$38.81	\$38.97	\$39.18	\$39.50	\$40.02	\$41.02	\$43.72	
<b>11.90%</b>	\$37.93	\$37.98	\$38.06	\$38.14	\$38.26	\$38.40	\$38.61	\$38.91	\$39.41	\$40.35	\$42.89	
<b>12.10%</b>	\$37.39	\$37.44	\$37.51	\$37.59	\$37.70	\$37.84	\$38.04	\$38.33	\$38.80	\$39.69	\$42.07	

**Table 113: TransCanada Corp (TSX) Data from December 31, 2009 to 2014**

<i>Regression Statistics</i>	
Multiple R	0.971858392
R Square	0.944508735
Adjusted R Square	0.944295307
Standard Error	1.822416976
Observations	262

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	14697.72802	14697.72802	4425.422115	2.8545E-165
Residual	260	863.5129453	3.321203636		
Total	261	15561.24096			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	27.51730502	0.224535531	122.5521185	5.1505E-232	27.07516537	27.95944468
Regressor	0.09903004	0.00148864	66.52384621	2.8545E-165	0.096098714	0.101961365

**TransCanada's Forecasted Price on December 31, 2014: \$53.46**

**Table 114: TransCanada AR(1) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99978
R Square	0.99956
Adjusted R Square	0.99956
Standard Error	0.85421
Observations	261

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	426,260.22933	426,260.22933	584,171.96804	0.E+0
Residual	260.	189.71752	0.72968		
Total	261.	426,449.94686			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0					
Lag Last Price	1.00247	0.00131	764.31143	0.E+0	0.9994	1.00554

**TransCanada's Forecasted Price on December 31, 2014: \$55.32**

**Table 115: TransCanada Corp (TSX) Data from March 20, 2010 to 2015**

<i>Regression Statistics</i>	
Multiple R	0.971855375
R Square	0.94450287
Adjusted R Square	0.944288596
Standard Error	1.858993034
Observations	261

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	15233.09143	15233.09143	4407.908026	1.2308E-164
Residual	259	895.0664706	3.455855099		
Total	260	16128.1579			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	28.42488199	0.229477824	123.8676641	1.5968E-232	27.97300216	28.87676181
Regressor	0.10139746	0.001527252	66.39207803	1.2308E-164	0.098390047	0.104404872

**TransCanada's Forecasted Price on March 20, 2015:**

**\$54.89**

### 2.2.2.3 Kinder Morgan<sup>21</sup>

Highlighted in yellow are the cost of equities determined using the CAPM and Fama-French models. Highlighted in green are my predictions for the stock prices, the darker the green the closer to my prediction.

It is important to note that my valuation using the residual income model estimates the intrinsic value of Kinder Morgan's stock price on December 31<sup>st</sup> 2014. The reason for this is because companies are only required to publish financial statements quarterly, and the most recent financial statements are only applicable up to December 31<sup>st</sup> 2014. If management decides to change their strategies and objectives post December 31<sup>st</sup> 2014, or/and substantial changes in the economic environment will have an impact on the valuation.

The cost of equity should reflect shareholder's expectations on the required rate of return they should be able to earn if they decide to invest in Kinder Morgan, given the current economic conditions. The most common method for estimating the cost of equity is the CAPM model, so naturally the expectation on the required rate of return for shareholders should be derived from the estimates of CAPM. In the previous sections I used three methods for determining the market premium used to derive the required rate of return. The implied market premium is not a good reflection of stock market data, so I ruled this option out.

I also ruled out the estimate used in the Richard Brealey and Steward Myers' corporate finance book because the book was published in 2003, which does not consist of recent market data, and should be a poor indication of the current economic

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<sup>21</sup> See tables 116-124 for the following analysis.

conditions. The third method estimates the historical equity premium from 1926 - 2013, which seems to be the best choice. The required return generated using the third method is 10.94%.

However, even the third method does not account for the recent economic events (i.e. substantial reduction in the oil prices). Canadian and US oil producers will suffer from the recent events hence reducing returns to shareholders. Cyclical firms will also suffer, because their performance is closely tied to the current economic conditions. In aggregate this will lower shareholders' expectation of required rate of returns. That is why I believe the required rate of return should be closer to 10.44%, or perhaps even lower.

The persistency factor is used because economic profits are usually not sustainable, because economic profits attract new entrants, and once they enter will extract most or in theory all of the economic profits.

I argue that in the case of Kinder Morgan economic profits are fairly sustainable. Liquid and natural gas pipelines deliveries, and gas storage are Kinder Morgan's main lines of business. Liquid and natural gas pipelines require substantial fixed investments, and go through extremely careful and long regulatory processes before they can be built. Particular deliveries via liquid pipelines are also contracted over long-term horizons. Gas distribution is currently regulated under a performance based regulated regime, which offers Kinder Morgan protection. It is important to note that severe reduction in volumes will still create problems for Kinder Morgan. For these reasons I believe the relevant persistence factor should be fairly close to 1.

My estimate of Kinder Morgan's stock price as of December 31st, 2014 is \$38.95, which is consistent with my estimates using time series trend analysis which I obtained



an estimate of \$38.32, and using autoregressive time series analysis, which I obtained an estimate of \$41.18.

Estimates using the autoregressive approach is highly sensitive to short-term price fluctuations and appears to follow a random walk process, hence I believe it should only be used as a sanity check, and in this application I feel that my estimates has passed the sanity check. Furthermore, my estimate of the intrinsic value of Kinder Morgan's stock price using time series analysis as of March 19th, 2015 is \$39.64.

**Table 116: Income Statement for Kinder Morgan**

Millions of Dollars

	Year Ending Dec 31.		
	2012	2013	2014
Sales	\$9,973	\$14,070	\$16,226
Cost of Sales	\$3,057	\$5,253	\$6,278
<b>Gross Profit</b>	\$6,916	\$8,817	\$9,948
Operating & Admin. Expenses	\$2,917	\$3,120	\$3,185
Depreciation & Amortization	\$1,419	\$1,806	\$2,040
Other net (Income)/Expenses	(\$13)	(\$99)	\$275
<b>EBIT</b>	\$2,593	\$3,990	\$4,448
Income from Equity Investments	\$153	\$327	\$406
Interest Expense net	(\$1,399)	(\$1,675)	(\$1,798)
Other Income/(Expense)	(\$4)	\$796	\$35
<b>Total Other Income (Expense)</b>	(\$1,250)	(\$552)	(\$1,357)
Income Taxes	(\$139)	(\$742)	(\$648)
Earnings from Continued Operations	\$1,204	\$2,696	\$2,443
Earnings/(Loss) from Discontinued Operations	(\$777)	(\$4)	\$0
Earnings	\$427	\$2,692	\$2,443
Earnings/(Loss) attributed to non-controlling interest	(\$112)	(\$1,499)	(\$1,417)
<b>Earnings attributed to Kinder Morgan</b>	<b>\$315</b>	<b>\$1,193</b>	<b>\$1,026</b>

**Table 117: Balance Sheet for Kinder Morgan**

Millions of Dollars

	Year Ending Dec. 31			
	2011	2012	2013	2014
<b>Assets</b>				
Cash and cash equivalents	\$411	\$714	\$598	\$315
Account Receivable, net	\$914	\$1,333	\$1,721	\$1,641
Inventories	\$172	\$374	\$430	\$459
Other	\$166	\$955	\$1,119	\$1,337
<b>Total Current Assets</b>	<b>\$1,663</b>	<b>\$3,376</b>	<b>\$3,868</b>	<b>\$3,752</b>
Net PPE	\$17,926	\$30,996	\$35,847	\$38,564
Other assets	\$11,128	\$33,575	\$35,470	\$40,882
<b>Total Assets</b>	<b>\$30,717</b>	<b>\$67,947</b>	<b>\$75,185</b>	<b>\$83,198</b>
<b>Liabilities and Shareholder's Equity</b>				
Accrued Interest	\$330	\$513	\$565	\$637
Accounts payable and other	\$728	\$1,248	\$1,676	\$1,588
Accrued contingencies	\$428	\$114	\$584	\$383
Current portion of long-term debt	\$2,899	\$2,402	\$2,306	\$2,717
Other current liabilities	\$144	\$952	\$944	\$1,037
<b>Total Current Liabilities</b>	<b>\$4,529</b>	<b>\$5,229</b>	<b>\$6,075</b>	<b>\$6,362</b>
Long-Term Debt	\$14,356	\$32,000	\$33,887	\$40,246
Deferred Income Taxes	\$2,199	\$4,071	\$4,651	\$0
Other Non-current Liabilities	\$1,065	\$2,846	\$2,287	\$2,164
<b>Total Liabilities</b>	<b>\$22,149</b>	<b>\$44,146</b>	<b>\$46,900</b>	<b>\$48,772</b>
<b>Total Shareholders' Equity</b>	<b>\$8,568</b>	<b>\$23,801</b>	<b>\$28,285</b>	<b>\$34,426</b>

**Table 118: Model for Forecasting Kinder Morgan's Pro-forma Financial Statements**

<b>Income Statement</b>	<b>Assumptions</b>
Sales	Time series forecast
Cost of Sales	38.01% of sales based on historical average
Operating and Other Expense	15.12% of sales based on historical average
Depreciation and Amortization	13.21% of sales based on historical average
Interest income and other	.336% of sales based on historical average
Interest Expense	12.34% of sales based on historical average
Equity (Income)/Expense	2.12% of sales based on historical average
Income Tax Expense	3.55% of sales based on historical average
(Earnings)/Loss attributed to noncontrolling interest	Based on historical events
<b>Balance Sheet</b>	
<b>Assets</b>	
Cash and cash equivalents	3.93% of sales based on historical average
Account Receivable	11.90% of sales based on historical average
Inventories	3.21% of sales based on historical average
Other	8.59% of sales based on historical average
Property, Plant and Equipment net	267.75% of sales based on historical three year arithmetic average
Other assets	280.24% of sales based on historical four year arithmetic average
<b>Liabilities and Shareholder's Equity</b>	
Accrued Interest	4.36% of sales based on historical average
Accounts payable and other	11.40% of sales based on historical average
Accrued contingencies	2.55% of sales based on historical average
Current portion of long-term debt	19.07% of sales based on historical average
Other current liabilities	7.55% of sales based on historical three year arithmetic average
Long-Term Debt	269.92% of sales based on historical four year arithmetic average
Deferred Income Taxes	24.63% of sales based on historical average
Other Non-current Liabilities	11.90% of sales based on historical average

**Table 119: Balance Sheet Forecast for Kinder Morgan**

Millions of Dollars	Forecast Period								
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E
<b>Assets</b>									
Cash and cash equivalents	\$315	\$774	\$882	\$990	\$1,098	\$1,206	\$1,314	\$1,422	\$1,530
Account Receivable, net	\$1,641	\$2,345	\$2,672	\$2,999	\$3,326	\$3,653	\$3,980	\$4,307	\$4,634
Inventories	\$459	\$633	\$721	\$809	\$897	\$985	\$1,074	\$1,162	\$1,250
Other	\$1,337	\$1,693	\$1,929	\$2,165	\$2,401	\$2,637	\$2,873	\$3,109	\$3,345
<b>Total Current Assets</b>	<b>\$3,752</b>	<b>\$5,445</b>	<b>\$6,204</b>	<b>\$6,963</b>	<b>\$7,723</b>	<b>\$8,482</b>	<b>\$9,241</b>	<b>\$10,001</b>	<b>\$10,760</b>
Net PPE	\$38,564	\$52,760	\$60,119	\$67,478	\$74,836	\$82,195	\$89,553	\$96,912	\$104,271
Other assets	\$40,882	\$55,222	\$62,923	\$70,625	\$78,327	\$86,029	\$93,731	\$101,433	\$109,135
<b>Total Assets</b>	<b>\$83,198</b>	<b>\$113,427</b>	<b>\$129,246</b>	<b>\$145,066</b>	<b>\$160,886</b>	<b>\$176,706</b>	<b>\$192,526</b>	<b>\$208,345</b>	<b>\$224,165</b>
<b>Liabilities and Shareholder's Equity</b>									
Accrued Interest	\$637	\$859	\$979	\$1,099	\$1,219	\$1,338	\$1,458	\$1,578	\$1,698
Accounts payable and other	\$1,588	\$2,246	\$2,560	\$2,873	\$3,186	\$3,500	\$3,813	\$4,126	\$4,440
Accrued contingencies	\$383	\$502	\$573	\$643	\$713	\$783	\$853	\$923	\$993
Current portion of long-term debt	\$2,717	\$715	\$1,667	\$3,041	\$2,284	\$2,800	\$2,934	\$3,032	\$2,610
Other current liabilities	\$1,037	\$1,488	\$1,695	\$1,903	\$2,110	\$2,318	\$2,525	\$2,733	\$2,940
<b>Total Current Liabilities</b>	<b>\$6,362</b>	<b>\$5,811</b>	<b>\$7,474</b>	<b>\$9,558</b>	<b>\$9,512</b>	<b>\$10,738</b>	<b>\$11,583</b>	<b>\$12,392</b>	<b>\$12,681</b>
Long-Term Debt	\$40,246	\$53,188	\$60,606	\$68,025	\$75,443	\$82,861	\$90,279	\$97,697	\$105,116
Deferred Income Taxes	\$0	\$4,853	\$5,530	\$6,207	\$6,884	\$7,561	\$8,238	\$8,915	\$9,592
Other Non-current Liabilities	\$2,164	\$2,164	\$2,164	\$2,164	\$2,164	\$2,164	\$2,164	\$2,164	\$2,164
<b>Total Liabilities</b>	<b>\$48,772</b>	<b>\$66,016</b>	<b>\$75,774</b>	<b>\$85,954</b>	<b>\$94,003</b>	<b>\$103,324</b>	<b>\$112,264</b>	<b>\$121,168</b>	<b>\$129,552</b>
<b>Equity</b>	<b>\$34,426</b>	<b>\$47,410</b>	<b>\$53,472</b>	<b>\$59,112</b>	<b>\$66,883</b>	<b>\$73,381</b>	<b>\$80,262</b>	<b>\$87,178</b>	<b>\$94,613</b>

**Table 120: Income Statement Forecasts for Kinder Morgan**

Millions of Dollars

	Forecast Period									
	2014	2015E	2016E	2017E	2018E	2019E	2020E	2021E	2022E	2023E
Sales	\$16,226	\$19,705	\$22,453	\$25,202	\$27,950	\$30,698	\$33,447	\$36,195	\$38,943	\$41,692
Cost of Sales	\$6,278	\$7,490	\$8,535	\$9,579	\$10,624	\$11,668	\$12,713	\$13,758	\$14,802	\$15,847
<b>Gross Profit</b>	<b>\$9,948</b>	<b>\$12,215</b>	<b>\$13,919</b>	<b>\$15,623</b>	<b>\$17,326</b>	<b>\$19,030</b>	<b>\$20,734</b>	<b>\$22,437</b>	<b>\$24,141</b>	<b>\$25,845</b>
Operating & Admin. Expenses	\$3,185	\$2,979	\$3,395	\$3,811	\$4,226	\$4,642	\$5,057	\$5,473	\$5,888	\$6,304
Depreciation & Amortization	\$2,040	\$2,603	\$2,966	\$3,329	\$3,692	\$4,055	\$4,418	\$4,781	\$5,144	\$5,507
Other net (Income)/Expenses	\$275	\$66	\$75	\$85	\$94	\$103	\$112	\$122	\$131	\$140
<b>EBIT</b>	<b>\$4,448</b>	<b>\$6,567</b>	<b>\$7,482</b>	<b>\$8,398</b>	<b>\$9,314</b>	<b>\$10,230</b>	<b>\$11,146</b>	<b>\$12,062</b>	<b>\$12,977</b>	<b>\$13,893</b>
Income from Equity Investments	\$406	\$418	\$476	\$534	\$593	\$651	\$709	\$767	\$826	\$884
Interest Expense net	(\$1,798)	(\$2,432)	(\$2,771)	(\$3,110)	(\$3,449)	(\$3,788)	(\$4,127)	(\$4,466)	(\$4,806)	(\$5,145)
Other Income/(Expense)	\$35	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
<b>Total Other Income (Expense)</b>	<b>(\$1,357)</b>	<b>(\$2,014)</b>	<b>(\$2,295)</b>	<b>(\$2,576)</b>	<b>(\$2,856)</b>	<b>(\$3,137)</b>	<b>(\$3,418)</b>	<b>(\$3,699)</b>	<b>(\$3,980)</b>	<b>(\$4,261)</b>
Income Taxes	(\$648)	(\$1,593)	(\$1,816)	(\$2,038)	(\$2,260)	(\$2,482)	(\$2,705)	(\$2,927)	(\$3,149)	(\$3,371)
Earnings from Continued Operations	\$2,443	\$2,959	\$3,372	\$3,785	\$4,197	\$4,610	\$5,023	\$5,436	\$5,848	\$6,261
Earnings/(Loss) from Discontinued Operations	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0	\$0
Earnings attributed to noncontrolling interest	(\$1,417)	(\$856)	(\$187)	(\$283)	(\$2,978)	(\$2,681)	(\$1,453)	(\$301)	(\$437)	(\$4,442)
<b>Earnings attributed to Kinder Morgan</b>	<b>\$1,026</b>	<b>\$2,103</b>	<b>\$3,185</b>	<b>\$3,502</b>	<b>\$1,220</b>	<b>\$1,929</b>	<b>\$3,570</b>	<b>\$5,135</b>	<b>\$5,411</b>	<b>\$1,819</b>

**Table 121: KMI Equity Valuation - Multistage Residual Income w/ persistency method (Sample Calculation)**

Year	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025
Time	0	1	2	3	4	5	6	7	8	9	10	11
Earnings	\$1,026	\$2,103	\$3,185	\$3,502	\$1,220	\$1,929	\$3,570	\$5,135	\$5,411	\$1,819	\$2,793	\$5,037
Shares	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130	\$2,130
BV per share	\$16	\$22	\$25	\$28	\$31	\$34	\$38	\$41	\$44	\$48	\$51	\$55
Earnings per share	\$0	\$1	\$1	\$2	\$1	\$1	\$2	\$2	\$3	\$1	\$1	\$2
Residual Income		\$1	\$1	\$2	\$1	\$1	\$2	\$2	\$3	\$1	\$1	\$2
PV RI		\$1	\$1	\$2	\$1	\$1	\$2	\$2	\$3	\$1	\$1	\$8
PF			1									
Cost of Equity			10.4%									
Value in \$CDN on December 31st, 2014	<b>\$38.95</b>											

Table 122: Sensitivity Analysis on Equity Valuation for KMI on December 31st, 2014												
		Persistence Factor										
		0	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1
Cost of Equity	3.50%	\$32.18	\$32.35	\$32.57	\$32.84	\$33.20	\$33.69	\$34.41	\$35.56	\$37.69	\$42.98	\$78.46
	4.00%	\$32.10	\$32.26	\$32.46	\$32.72	\$33.06	\$33.52	\$34.19	\$35.26	\$37.22	\$41.97	\$70.50
	5.00%	\$31.94	\$32.09	\$32.27	\$32.50	\$32.79	\$33.20	\$33.79	\$34.71	\$36.37	\$40.24	\$59.60
	6.00%	\$31.81	\$31.94	\$32.10	\$32.30	\$32.56	\$32.92	\$33.43	\$34.23	\$35.64	\$38.81	\$52.57
	7.10%	\$31.67	\$31.79	\$31.93	\$32.10	\$32.33	\$32.65	\$33.09	\$33.77	\$34.95	\$37.52	\$47.33
	7.50%	\$31.63	\$31.74	\$31.87	\$32.04	\$32.26	\$32.56	\$32.98	\$33.62	\$34.73	\$37.12	\$45.86
	7.70%	\$31.61	\$31.71	\$31.84	\$32.01	\$32.22	\$32.51	\$32.92	\$33.55	\$34.63	\$36.92	\$45.19
	7.90%	\$31.58	\$31.69	\$31.82	\$31.98	\$32.19	\$32.47	\$32.87	\$33.48	\$34.52	\$36.74	\$44.55
	8.10%	\$31.56	\$31.67	\$31.79	\$31.95	\$32.15	\$32.43	\$32.82	\$33.41	\$34.42	\$36.56	\$43.96
	8.30%	\$31.54	\$31.64	\$31.77	\$31.92	\$32.12	\$32.39	\$32.77	\$33.34	\$34.32	\$36.38	\$43.40
	8.50%	\$31.52	\$31.62	\$31.74	\$31.89	\$32.09	\$32.35	\$32.72	\$33.28	\$34.23	\$36.21	\$42.86
	8.70%	\$31.50	\$31.60	\$31.72	\$31.86	\$32.05	\$32.31	\$32.67	\$33.21	\$34.14	\$36.05	\$42.36
	8.90%	\$31.49	\$31.58	\$31.69	\$31.84	\$32.02	\$32.27	\$32.62	\$33.15	\$34.05	\$35.89	\$41.89
	9.10%	\$31.47	\$31.56	\$31.67	\$31.81	\$31.99	\$32.23	\$32.58	\$33.09	\$33.96	\$35.74	\$41.44
	9.30%	\$31.45	\$31.54	\$31.65	\$31.79	\$31.96	\$32.20	\$32.53	\$33.03	\$33.88	\$35.60	\$41.01
	9.50%	\$31.43	\$31.52	\$31.63	\$31.76	\$31.93	\$32.16	\$32.49	\$32.98	\$33.79	\$35.45	\$40.60
	9.70%	\$31.41	\$31.50	\$31.60	\$31.74	\$31.90	\$32.13	\$32.45	\$32.92	\$33.71	\$35.32	\$40.22
	9.90%	\$31.40	\$31.48	\$31.58	\$31.71	\$31.88	\$32.10	\$32.40	\$32.87	\$33.64	\$35.18	\$39.85
	10.10%	\$31.38	\$31.46	\$31.56	\$31.69	\$31.85	\$32.06	\$32.36	\$32.81	\$33.56	\$35.05	\$39.51
	10.30%	\$31.36	\$31.44	\$31.54	\$31.66	\$31.82	\$32.03	\$32.32	\$32.76	\$33.49	\$34.93	\$39.17
	10.50%	\$31.35	\$31.43	\$31.52	\$31.64	\$31.80	\$32.00	\$32.29	\$32.71	\$33.42	\$34.81	\$38.86
	10.70%	\$31.33	\$31.41	\$31.50	\$31.62	\$31.77	\$31.97	\$32.25	\$32.66	\$33.35	\$34.69	\$38.56
	10.90%	\$31.32	\$31.39	\$31.48	\$31.60	\$31.75	\$31.94	\$32.21	\$32.61	\$33.28	\$34.58	\$38.27
	11.10%	\$31.30	\$31.38	\$31.47	\$31.58	\$31.72	\$31.91	\$32.18	\$32.57	\$33.21	\$34.47	\$38.00
11.30%	\$31.29	\$31.36	\$31.45	\$31.56	\$31.70	\$31.88	\$32.14	\$32.52	\$33.15	\$34.37	\$37.73	
11.50%	\$31.27	\$31.34	\$31.43	\$31.54	\$31.67	\$31.85	\$32.11	\$32.48	\$33.09	\$34.26	\$37.48	
11.70%	\$31.26	\$31.33	\$31.41	\$31.52	\$31.65	\$31.83	\$32.07	\$32.44	\$33.03	\$34.16	\$37.24	
11.90%	\$31.25	\$31.31	\$31.40	\$31.50	\$31.63	\$31.80	\$32.04	\$32.39	\$32.97	\$34.07	\$37.02	
12.10%	\$31.23	\$31.30	\$31.38	\$31.48	\$31.61	\$31.78	\$32.01	\$32.35	\$32.91	\$33.97	\$36.80	



**Table 123: KMI Corp (NYSE) Data from February 11, 2011 to December 31, 2014**

<i>Regression Statistics</i>	
Multiple R	0.841774504
R Square	0.708584315
Adjusted R Square	0.707141663
Standard Error	2.563048051
Observations	204

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	3226.587723	3226.587723	491.1679052	5.47602E-56
Residual	202	1326.981493	6.56921531		
Total	203	4553.569216			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	24.54667384	0.35758306	68.64607581	5.7644E-142	23.84159965	25.25174803
Regressor	0.067533977	0.003047245	22.16230821	5.47602E-56	0.061525489	0.073542466

**KMI's Forecasted Price on December 31, 2014:** **\$38.32**

**Table 124: Kinder Morgan AR(1) Closing Price**

<i>Regression Statistics</i>	
Multiple R	0.99952
R Square	0.99905
Adjusted R Square	0.99905
Standard Error	0.97316
Observations	203

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1.	200,376.68311	200,376.68311	211,582.04718	0.E+0
Residual	202.	191.3021	0.94704		
Total	203.	200,567.98521			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	0					
Lag Last Price	1.00211	0.00218	459.98049	0.E+0	0.997	1.00722

**KMI's Forecasted Price on December 31, 2014: \$41.18**

**Table 125: KMI Corp (NYSE) Data from February 11, 2011 to March 23, 2015**

<i>Regression Statistics</i>	
Multiple R	0.867956756
R Square	0.75334893
Adjusted R Square	0.752196355
Standard Error	2.560840244
Observations	216

ANOVA					
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>
Regression	1	4286.392321	4286.392321	653.6224282	5.62281E-67
Residual	214	1403.391189	6.557902753		
Total	215	5689.783511			

	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	24.27601852	0.347279683	69.90336521	2.4285E-149	23.59149163	24.96054541
Regressor	0.071443152	0.002794455	25.56604053	5.62281E-67	0.065934971	0.076951334

**KMI's Forecasted Price on March 23, 2015:**

**\$39.64**

## Conclusion

After conducting a series of analyses, I find support for my hypothesis: it is possible to estimate the intrinsic value for pipeline companies with precision. I estimated the intrinsic values for three companies (Enbridge, TransCanada, and Kinder Morgan) using the multi-stage residual income with persistence approach, and compared the estimate with a momentum indicator (i.e. Time Series Trend model estimates) that has demonstrated its ability to forecast prices in the past. Furthermore, I used a second momentum indicator (i.e. Autoregressive model estimates), which, though it is recognized to have limitations, it is still appropriate to use it as a sanity check.

The estimates derived from the main valuation approaches are in close proximity of each other, for all three companies. In terms of the sanity check, I did not find any significant contradictions between the estimates from my main valuation approaches and the estimates from the sanity check.

Consequently, I am able to provide consistent estimates of the intrinsic values of equity for three major pipeline companies.

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## Appendix

The appendix is intended to act as a primer for the core of the thesis. It can be broken down into two components. In the first component, I delineate the relevant industry and identify key industry trends using Porter's 5 forces. This is essential for understanding what is happening in the industry, and will assist in identifying structural changes in the latter parts. Second, I summarize critical information about key parties within the industry. This will assist in understanding why I believe pipeline companies have pro-forma statements that can be forecasted with greater precision relative to the average company.

### A.1 Porter's<sup>22</sup> 5 Forces

Porter's 5 Forces is a framework used to delineate the relevant industry. Properly defining the industry is critical for determining a company's long-run sustainable profits (revenues), and is a key piece of analysis that is required for estimating the intrinsic value of a company. If there are reasons to believe that sustainable profits (revenues) for a company is expected to decline, then assumptions about profits (revenues) for a company increasing or staying constant should not be used.

In order to determine the relevant industry, the scope of product or services and the geographical scope must be identified. For example, is motor oil used in trucks and stationary engines in the same industry as motor oil used in cars? And, is competition state specific or countrywide? If the structure of the industry for two product or services is the same or similar in terms of the 5 forces then the products should be classified as being in the same industry. If the products differ significantly in terms of the forces, then

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<sup>22</sup> For additional information please see "The Five Competitive Forces That Shape Strategy (HBR)".

the products should be classified in separate industries. Similarly, substantial difference in the forces also indicates the geographic extent of competition.

The basic criteria is when there are significant differences in any of the forces, and where the differences stem from more than one force, separate industries may be present. The strategic objective here is to limit the amount of net income that flows to suppliers, customers, and rivals or used to prevent rivals from entering the industry. When conducting analysis several commonly made errors should be avoided: (1) defining the industry too generally or too restricted; (2) writing down casual observations instead of conducting through analysis; (3) weighing the importance of each forces equally instead of identifying the most prominent ones; (4) unable to differentiated between cause (e.g. consumer behaviors) with effect (e.g. elasticity of demand); (5) ignoring industry trends while making stationary analysis; (6) misunderstanding changes in the business cycles or temporary changes with structural changes; (7) and using the framework to identify whether an industry is attractive or unattractive instead of using it to develop strategic actions.

In this section, I will analyze each of the 5 forces then delineate the relevant industries for certain assets of each of the 3 companies. Porter's five forces consist of: (1) Barrier to Entry, (2) Threats of Substitute Products, (3) Bargaining Power of Suppliers, (4) Bargaining Power of Buyers, and (5) Current level of Competition.

#### **A.1.1. Barriers to Entry**

Barriers to entry are indications of whether existing firms in an industry can maintain their economic positions. It is a critical piece of analysis for the valuation process, in latter sections. The degree of barriers to entry is essential in determining a



company's ability to sustain economic profits, which is reflected in the persistence factor in the residual income model. In other words, I am using the level of barriers to entry to justify how sustainable each of the companies' ability to sustain its economic profits.

New entrants entering the industry will reduce the net income realized by the firm and other existing rivals. Typical attributes of an industry that limits the amount of entry include but not limited to: (1) Economies of Scale, (2) Product differentiation, (3) Switching cost, (4) Capital requirement to construct infrastructure to enter the firm, (5) Access to distribution channels, (6) Government policy, and (7) Expenditure or quality advantages of existing firms.

Building and operating a pipeline requires substantial amounts of funds usually in the form of fixed costs. It is possible for firms to realize substantial amounts of economies of scale in the pipeline business. Economies of scale means, that if a firm is able to transport more crude or natural gas then its long run cost of production on average declines. This phenomenon can be seen by comparing the Cost of good sold/Revenue or Selling General and Admin/Revenue of a company that operates at a high level of production and a firm with a relatively lower level of production.

The ratios should be smaller for the firm that is operating at the higher level of production. Note that it may be the case the firm is only able to realize economies of scale in COGS/Revenue or Selling General and Admin/Revenue.

Church and Ware (2000) describes several sources in which economies of scale can be realized in oil pipelines: (1) Long-Run Fixed Costs, (2) Setup Costs, (3) Volumetric Returns to Scale, and (4) Economies of Massed Reserves.

Long-run fixed costs occurs in the pipeline setting because there needs to be a minimum number of employees monitoring the pipeline regardless of the level of throughput.

Setup Costs consist of installation, right of way and designing and planning costs, these expenditures do not vary with output hence as throughput increases average cost declines.

Volumetric returns to scale can be realized from two channels (1) cost of steel is based on the pipeline's surface area, while capacity is based on its volume, (2) the amount of horsepower needed to push product through is determined by resistance to flow, and is inversely related to the diameter of the pipeline. By increasing the diameter by 200% doubles the cost, but results in more than a 400% increase in output.

Economies of Massed Reserves at lower levels of throughput the pipeline company may need one pump and one backup pump, but for higher levels of throughput the pipeline company may need two pumps and still one backup pump because the probability of the two operating pumps break down simultaneously is small.

Most pipelines in North America are regulated. For instance Enbridge, TransCanada, and Kinder Morgan are pipeline companies regulated by the National Energy Board. The barriers to entry for a pipeline are very high. For instance, TransCanada needs to apply to the NEB for a recommendation to the Governor in Council that a Certificate of Public Convenience and Necessity be issued, before they can build the Energy East Pipeline.

After receiving the application the board reviews the economic and financial feasibility, and the socio-economic and environmental impact of the project<sup>23</sup>, to determine whether the pipeline is in the best interest of Canadians and whether they would recommend the project to the Governor in Council for final approval. Public hearings are hosted for construction applications of pipelines with length greater than 40 km. The process is detailed and thorough, the time it takes from application to operation of a pipeline project often takes several years. However, pipeline companies may have assets that are competing with a large variety of oil transporters, such as rail, truck, and ship where barriers to entry may be less restricted.

Barriers to entry for rail companies are also quite high unless the rail company already has a rail network in place. If this is the case, then it is quite easy for the company to expand its crude (natural gas or other products) transportation capacity.

Vessels also face high levels of barriers to entry because of their waterborne nature; many refineries and processing facilities are located far away from the borders, which makes it difficult for vessels to compete with pipelines.

After analyzing this section, I noticed that the barriers to entry are high for pipelines, rail, and vessels. I conclude this section, noting that the economic profits of pipelines are likely to be very sustainable (i.e. the persistence factor used in the residual income valuation model should be close to 1).

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<sup>23</sup> NEB website – Energy East Pipeline Project

### **A.1.2. Threat of substitutes**

Threat of substitutes will have implications on a company's ability to profitably raise price above competitive level, which in turn affects revenues. However, pipeline assets are in general regulated and have no pricing power.

Hence, analyzing the threat of substitutes will not be very meaningful for pipelines through the pricing channel. However, analyzing the threat of substitutes is still useful because the regulatory models that govern pipelines run into problems, if substantial amounts of sales are taken away. Which leads to pipeline companies not recovering their revenue requirements for a given asset (i.e. a structural change in revenue).

If this occurs, then I should not base my revenue forecasts purely on historical data. In this section. I explain how threat of substitutes arise in the pipeline setting, and identify the threat of substitutes that may take away sales from pipeline companies.

The threat of substitutes are limited by: (1) Buyer's inclination to substitute or how probable the current buyers to switch given a feasible alternative, (2) Switching Costs (3) Advances in technology.

The first point is stating that substitution away from a given pipeline is unlikely when the benefits of substitution are tiny and improbable. A stakeholder may find that shipping on pipeline B is slightly more profitable temporarily than pipeline A, but has already scheduled a spot with pipeline A. In this case the stakeholder may decide not to substitute.

Switching costs can be either tangible or intangible some examples include search costs, exit fees, learning costs, emotional costs, and financial costs. Switching costs and point 1 are interconnected because the reason why stakeholders may decide not to substitute is because of financial and relational costs. In some certain cases,

stakeholders have signed yearly agreements with a given pipeline company, typically for cheaper tolls this further limits the threat of substitution.

I argue that there needs to be a separate concept for short-run and long-run threats of substitutability. Refineries are typically the end-users for pipelines. The end-users for refineries are typically petroleum product consumers. If consumers of petroleum products can easily and willingly substitute to other products to fulfill the petroleum product's purpose, then refineries' ability and willingness to substitute away from pipelines also increase. Maybe in the long-run technology permits consumers to purchase cars that no longer run on gasoline or diesel, and other advancement that allow consumers to substitute away from petroleum products. For the purpose of investments, focus should be placed on short-run substitutability, because fund managers, analyst and sophisticated investors generally place greater weight on the performance of an investment in the near future as opposed to the distant future, when conducting investment analysis, making investment recommendations, and taking investment actions. End-users in the short-run have few options when it comes to substituting away from petroleum products, which in turn results in refineries inability to substitute away from pipelines.

However, refineries ability to substitute away from pipelines is not only contingent on how easy and willing they are to substitute to other factors of production. Marshall (1890) identifies four rules that increase substitutability of a factor of production (e.g. pipelines): (1) substitutability of the final product (e.g. petroleum products), (2) firms (e.g. refineries) ability to substitute to other factors of production, (3) ability of suppliers of other factors of production to ramp up (down) production of their respective inputs (e.g.

crude oil and catalyst) quickly, when prices of their inputs increases (decreases), (4) the cost of the factor of production is a large share of the total cost of production.

The first point has been discussed previously.

Hence, I will start with my second point. Instead of getting crude from point A to point B from a given pipeline, a refinery may obtain it through competing pipelines, or other forms of transportations such as rail, truck and ship. Transportation of crude through pipelines is generally the most cost effective because pipelines are able to transport large amounts of volumes across long distance, and this allows the pipeline company to realize economies of scale. As a result, they are able to achieve lower long run average transportation cost. This reduces the relative attractiveness of other transportation methods.

Over the recent years, transportation of crude through rail has become popular. For instance, rail capacity for transporting crude in areas between southern Alberta and the northern US Great Plains has grown to approximately one third of the Keystone XL capacity. At the current trend rate rail capacity will grow to the Keystone XL capacity within a few years.<sup>24</sup> The estimated cost of transporting crude through railroad in 2014, is roughly \$10 to \$15 per barrel whereas it is \$5 per barrel for pipeline.<sup>25</sup> A large portion of this price difference is likely due to economies of scale.

A typical tank trailer can hold approximately 200 barrels, which is about a third of the capacity of rail. The total available capacity of trucks will only be able to satisfy approximately 4% of the crude demands.

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<sup>24</sup> See Forbes – Pick your Poison for Crude Pipeline Rail Truck or Boat

<sup>25</sup> See Congressional Research Service – Rail Transportation of Crude Oil: Background and Issues for Congress

Shipping crude through boat is another option; this approach for transportation is used for many foreign imports to Canada.

The main threats of substitutions that a given pipeline faces are competing pipelines and rail. Tank trailers can only satisfy a very small proportion of the crude demands, and the majority of oil refineries in Canada are located in the interior of North America in accessible by ships by itself. For these reasons, both boats and tank trailers should not be considered substitutes for pipelines, and should not be included in the relevant industry.

The oil industry is sometimes abstracted using a dominant firm with competitive fringe model. Church and Ware (2000) describes two characteristics that create a dominant firm: (1) the dominant firm is more productive than its competitors and is more cost effective. Organization of the Petroleum Exporting Countries (OPEC) is able to produce at a much lower long-run average cost because of its size. (2) The dominant firm's product is of higher quality. The Saudi's possess onshore oil sites that are much easier to access relative to the rest of the world.

In this model there is one dominant firm, and a collection of small producers, referred to as a competitive fringe. The dominant firm in oil is OPEC and the rest of the producing entities are the small producers. These small producers are just price takers, if the price offered is above their average avoidable costs then they will produce. The ability of the dominant firm to raise price above competitive levels is determined by: (1) The ability and willingness of refineries to substitute away from crude, (2) The ability of the fringe to quickly ramp up production from an increase in price, (3) the market share of the dominant firm, (4) the market share of the fringe competitors, and (5) the cost advantage the dominant firm has over the competitive fringe. If the dominant firm is

significantly more cost efficient than the competitive fringe, the dominant firm can expand its quantity and effectively lower market prices below the average avoidable cost of the fringe firms and pushing them out of them market. Recent crude events have shown the dominant power of OPEC, specifically the Saudi's power to drive down world oil prices. The breakeven cost of producing a barrel of Brent crude oil in the Middle East is estimated to be about \$27, whereas the oil sand and North American Shale production is approximately \$70 and \$65 respectively. The Middle East has the ability to reduce price and could potentially drive out some of the more expensive producing entities. The Middle East possesses this power because the smaller producers cannot ramp up production quickly enough and in a cost effective manner to make up the reduction in supplies of the Middle East.

Point 3 of Marshall's four rules emphasizes the importance of suppliers' of competing factors of production ability to ramp up production quickly in determining refineries ability and willingness to substitute away from pipelines. The lower the ability for refineries to substitute away from crude, the lower their ability to substitute away from pipelines.

Point 4 states that the larger the proportion of the cost of the factor of production to the total cost of production, the greater, the ability to substitute away from the factor of production. Pipeline tolls are generally a small proportion of the cost of producing refined products. However, recent events have caused the price of crude to drop significantly and have, also increased the proportion of pipelines tolls in the cost of producing refined products. This results in an increased ability of refineries to substitute away from pipelines. Hicks (1932) argued that point 4 of Marshall's four rules only holds under the case where ability and willingness of end-users of the final product (e.g.



petroleum product) is greater than the firm that is using the factor of production's (e.g. refineries) ability and willingness to substitute from the current factor of production for another factor of production.

The threat of substitution for a given pipeline is often small this provides pipelines a substantial amount of power to profitably raise their price above competitive levels. Regulators are established to control this power. Cost of service regulation is a common method used by regulators to control the pricing power of pipeline companies. The concept of COS regulation is to get a given pipeline company to charge its tolls equal to average total cost. This allows the pipeline company to break even. Break even is the point where the company earns zero economic profits.

Charging tolls at average total cost means that the pipeline company is able to recover its fixed costs. Embedded in the fixed costs is a reasonable return on shareholder equity, an expenditure that does not vary with throughput, which reflects equity holders' opportunity costs. That is, if shareholders were to invest their funds in the market they would get the same non-diversifiable risk adjusted return on their investment.

Under COS regulation a given pipeline company has little flexibility to change its tolls, when it wants to change its tolls it is required to file an application to the regulator. The regulator's expert staffs would then carefully examine the content of the application along with other relevant material to determine the new rates. Sometimes rate reviews are scheduled ahead of time, for instance there may be a rate review each year.

In most circumstances pipelines are a stable investment because the COS model would allow the regulated company to make up for any short falls in the current period, in the next rate review. In extreme situations where a pipeline is serving inadequate

demand or alternative forms of acceptable forms of transportation of crude is high, the COS service models per se would fail.

Suppose a pipeline is transporting crude in a region where there is inadequate demand, and as a result the pipeline company under collects. Under the COS model the pipeline is able to recover that amount. The short fall in the current year is reflected in the revenue requirement the next year. As a result the pipeline toll increases. This is a problem because the demand was low to begin with and higher prices makes, the situation even worse. These extreme situations should not occur because the threat of substitution is low, and the barrier to entry for pipelines is high. However, the rapidly expanding crude railway capacity may warrant some concern. New competing pipelines may also warrant concern in the future. Overall pipelines regulated under COS should be relatively stable investment.

There are pipelines that are regulated but are not governed by the COS model.<sup>26</sup> Instead the performance-based regulatory models are used. PBR models are used to address the lack of incentives for regulated companies using COS to reduce costs. Suppose the regulated company were able to make more sales because it has become more cost efficient. The company would be over-collecting, and the excess amount would be reflected in the form of true ups (i.e. passing on higher prices in the next period) in the next rate review.<sup>27</sup> This eliminates the company's incentives to become more cost efficient. The PBR regime<sup>28</sup> is designed to sever the relationship between

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<sup>26</sup> The Enbridge Mainline is an example of a pipeline that is not regulated under the COS model. Please see the Enbridge Competitive Tolling Settlement Appendix (2011) for more information.

<sup>27</sup> See Public Utilities & Rate Regulation: Cost of Service Regulation (Part 1). Lecture can be viewed here: <https://www.youtube.com/watch?v=b8zLyazNpxk>

<sup>28</sup> See Public Utilities & Rate Regulation: Performance Based Ratemaking and Decoupling. Lecture can be viewed here: <https://www.youtube.com/watch?v=HX3A9M38ynI>

sales and revenue (i.e. decoupling) in the COS model. One of the basic forms of PBR is to fix prices over a period of time (e.g. 10 years), while adjusting for inflation, and a productivity factor. The productivity factor is the amount that the regulated company must surpass in term of productivity to earn additional profits relative to the COS regime.

In summary, threat of substitutes only affect pipelines' ability to generate revenue, if the threats are substantial enough such that the regulatory models that govern pipeline assets are rendered useless.

#### **A.1.3. The Bargaining Power of Buyers**

Bargaining power of customers is typically not relevant in the pipeline setting. This is because pipeline assets are in general regulated. Regardless of the amount of bargaining power of customers the tolls charged would be unaffected.

#### **A.1.4. The Bargaining Power of Suppliers**

Bargaining power of suppliers would affect the price of factor of productions. If there are substantial changes in the bargaining power of suppliers then historical relationships about cost of goods sold per unit of revenue, will likely not hold for companies that have major assets regulated under PBR (not applicable for COS). In this section, I examine the bargaining power of suppliers in the pipeline setting.

The greater the bargaining power of suppliers the higher the price of inputs, this in turn translates to a higher price on the final product. Factors that affect the bargaining power of suppliers include: (1) Differences in characteristics of inputs that are capable of fulfilling the duties of the current input, (2) Supplier concentration, (3) Threat of forward integration, (4) Switching Cost, and (6) Importance of volume to the supplier. Factors of productions that contribute to pipeline services include: (1) Steel, (2) Pump Stations, (3)

Pipe Coating, (4) Motors, (5) Blowers, (6) Electricity, (7) Other Capital Costs, (8) Labor, (9) Land, (10) etc.

In summary, this section is only important if the pipeline companies have major assets that are regulated under PBR. In my valuation process, I make two assumptions: First, costs of the factors of production remain roughly constant over time. Second, increasing revenues by a dollar leads to a roughly constant increase in cost of good sold, in absence of price changes in the factors of production. Since, I do not have reason to believe why costs of the factor of production would increase substantially over time, if I observe that the historical COGS/Revenue relationship is fairly constant over time, then that relationship should be a good predictor of the future.

#### **A.1.5. Level of competition among existing firms**

The level of competition among existing firms greatly affects a company's profitability. Unlike companies that are not regulated, pipeline companies do not experience downward pressure in price instead they experience reduction in volume. A pipeline company experiences reduction in volume because competitors are taking volume away from them.

Several factors influence the level of competition among existing firms: (1) Number of firms and the size of the firms competing in the industry, (2) Level of operating or financial leverage, (3) Incumbents commitment to business, (4) Product differences, (5) Product shelf life, (6) Exit barrier, and (7) Degree of informational complexity.

Of those factors the only relevant factor in the pipeline setting is the number of firms competing and size of the firms competing in the industry. Assuming all firms in the

industry are of the same size, the tolls they charge are the same, and the pipelines transport from and to the same places, then more firms in the industry means less sales for each firm.

If the number of firms is constant, but one of the firms increase in size, which means it can realize greater levels of economies of scale from spreading fixed costs. Hence, they can charge lower tolls, then the remaining firms then remaining companies will suffer a reduction in sales.

However, if the reduction in sales is not substantial, then assets regulated under cost of service would be able to recover the amounts through true ups, and there would be no revenue impact over the long-run (i.e. no structural change).

## **A.2 Delineating the relevant industry**

Delineating the relevant industry for pipelines is complicated because it is not possible to just put two pipeline companies in the same industry, because it could be that just one particular asset of one company is competing with another asset of another company.

If both companies only own one asset it wouldn't be a problem, but Enbridge, TransCanada, and Kinder Morgan all own a diverse set of pipelines and are engaged in other lines of business. It is also not possible to classify the industry as including only pipelines, because there are other modes of transportation that bring crude and refined products to the same set of refineries.

The relevant industry should be determined on an asset by asset basis and including only industry participants that transport crude, liquid or natural gas to the same markets.

## A.2.1. Enbridge

### A.2.1.1. Mainline

The relevant industry for the Enbridge Mainline should include only competing pipelines. Defining the relevant industry is typically used to determine the ability of a company to raise prices above competitive levels. However, Enbridge is a regulated utility, and thus has little to no pricing power. Although defining the industry is not useful in determining the Enbridge Mainline's pricing power, it is important in determining how Enbridge Mainline's sales would be affected in the present time and in the future. Both the COS and PBR regulatory regime only protects pipelines from small to mediocre reduction in sales. In the COS model if pipeline companies under collect (i.e. ship less than they needed to recover their revenue requirement) they can recover the loss the next period by passing the loss on the next period's revenue requirement. The Enbridge Mainline

In terms of refineries the Enbridge Mainline's primary competitors are CP and CN. However, I argue that CP and CN are poor substitutes for pipelines because of their substantially higher prices. Refineries should be thought of as Enbridge Mainline's infra marginal customers, that is, they are customers that would not be able to substitute away from pipelines from small, mediocre or even large price advantages.<sup>29</sup> Even though I defined competing pipelines as part of the relevant industry, refineries would not substitute to them because they do not deliver to their refineries. Even substantial price advantages from competing pipelines would not sway the infra marginal customers (i.e. refineries) from transporting on their pipelines. In terms of producers, which I refer

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<sup>29</sup> In previous sections I conducted more comprehensive analysis on refineries ability to substitute away from pipelines

to them as marginal customers can substitute away from the Enbridge mainline, if they can receive small price advantages. Because what producers really care about is where they can transport crude to, to get the highest price. The proposed Energy East Project should be included into the industry, given that it can pass a range of regulatory hurdles.

#### **A.2.1.2. Regional Oil Sands System**

The Enbridge's Regional Oil Sands System is in the same industry as CN for the transportation of crude from the Alberta Oil Sands to Edmonton.

#### **A.2.1.3. Alliance Pipeline**

The Alliance pipeline is in the same industry as the NOVA, Foothills, and Northern Border Pipeline, owned by TransCanada, and Westcoast Energy owned by Spectra Energy. There are currently no other alternative transportations that compete in the same industry as Alliance, and the aforementioned group of Kinder Morgan pipelines, and the Westcoast Energy Pipeline. However, there has been discussion about transporting natural gas via rail<sup>30</sup> in North America.

#### **A.2.1.4. Anadarko Pipeline**

The Anadarko Pipeline is in the same industry as the Transwestern, Panhandle Eastern Pipe Line<sup>31</sup>, CenterPoint Gas Transmission, and Ozark Transmission system<sup>32</sup>.

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<sup>30</sup> See Reuters Article – USA Railway Natgas Insight (2014)

<sup>31</sup> See Energy Transfer website

<sup>32</sup> See EIA website – Natural Gas

## **A.2.2. TransCanada**

### **A.2.2.1. Nova Gas Transmission Line**

The NOVA system is in the same industry as ATCO, Alliance, Spectra Energy, and Suncor Pipelines. ATCO and the NOVA systems has a contractual agreement that combines both of their assets using a single rate and service structure. Both ATCO and TransCanada are responsible for maintaining and operating their own respective assets. The combination of the NOVA and ATCO pipeline<sup>33</sup> is known as the Alberta System.

### **A.2.2.2. Canadian Mainline**

The Canadian Mainline is in the same industry as Alliance, Fortis BC, TransGas, and Northern Border pipeline. Natural gas shippers have the tendency to ship to destination points that have large price differentials, so they can capitalize on the difference. Shippers that have long-term contracts with specific pipelines have much less ability and willingness to substitute.

## **A.2.3. Kinder Morgan**

### **A.2.3.1. Trans Mountain Pipeline**

The Trans Mountain Pipeline is the sole pipeline that provides to the Burnaby refinery (52,000 bpd), it is also the only pipeline that links the WCSB oil to Asia Pacific markets. Demand for shipping on Trans Mountain has exceeded the Trans Mountain capacity of 300,000 bpd. This is the primary reason why Kinder Morgan wants to expand Trans Mountain's capacity to 890,000 bpd, as seen in their December 2013 application. CN is the only main alternative mode of transportation that brings crude from WCSB

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<sup>33</sup> See ATCO website – Alberta System



directly to Asia Pacific markets. The Northern Gateway Pipeline, which has already been issued a Certificate of Public Convenience and Necessity, will be a competitor once Enbridge has satisfied all the necessary regulatory requirements. However, the Trans Mountain pipeline is also in the same industry as the Enbridge Mainline and the Base Keystone Pipeline, because producers would ship their crude based on the place they could sell it for the highest price.

### **A.3 Key Parties and Facts Related to Pipelines**

In this section, I examine the key parties and facts related to pipelines. This is useful in understanding why I believe it is possible to forecast the pro-formas of pipeline companies with precision, and assists in justifying my assumptions in the equity valuation process of the thesis.

#### **A.3.1. National Energy Board**

The NEB regulates interprovincial and international pipelines, power lines, import and export of energy, and conducts research into energy matters in the Canadian public's interests.

There are several acts and subsections of acts that are particularly important to pipeline companies. These acts constrain pipeline companies' ability to expand. This restrictive nature is one of the reasons I believe that the pro-forma statements of pipeline companies can be forecasted with greater precision. Below I summarized some of the most acts that constrain pipeline companies' behaviors.

#### **A.3.1.1. Section 52 of the NEB Act**

If the Board is of the opinion that an application for a certificate in respect of a pipeline is complete, it shall prepare and submit to the Minister, and make public, a report setting out:

- (a) Its recommendation as to whether or not the certificate should be issued for all or any portion of the pipeline, taking into account whether the pipeline is and will be required by the present and future public convenience and necessity, and the reasons for that recommendation; and
- (b) Regardless of the recommendation that the Board makes, all the terms and conditions that it considers necessary or desirable in the public interest to which the certificate will be subject if the Governor in Council were to direct the Board to issue the certificate, including terms or conditions relating to when the certificate or portions or provisions of it are to come into force.

For smaller pipeline projects a regulated pipeline company may apply to the NEB pursuant to Section 58, to avoid restrictions and comprehensive disclosures required for larger projects.

#### **A.3.1.2. Section 29 of the NEB Act**

No person, other than a company, shall construct or operate a pipeline.

#### **A.3.1.3. Section 33 of the NEB Act**

When the Board has issued a certificate, the company shall prepare and submit to the Board a plan, profile and book of reference of the pipeline.

**A.3.1.4. Section 47 of the NEB Act**

No pipeline and no section of a pipeline shall be opened for the transmission of hydrocarbons or any other commodity by a company until leave to do so has been obtained from the Board.

**A.3.1.5. Section 30 of the NEB Act**

No company shall operate a pipeline unless:

- (a) There is a certificate in force with respect to that pipeline
- (b) Leave has been given under this Part to the company to open the pipeline.

**A.3.1.6. Section 31 of the NEB Act**

Except as otherwise provided in this Act, no company shall begin the construction of a section or part of a pipeline unless

- (a) The Board has by the issue of a certificate granted the company leave to construct the line;
- (b) The company has complied with all applicable terms and conditions to which the certificate is subject;
- (c) The plan, profile and book of reference of the section or part of the proposed line have been approved by the Board; and
- (d) Copies of the plan, profile and book of reference so approved, duly certified as such by the Secretary, have been deposited in the offices of the registrars of deeds for the districts or counties through which the section or part of the pipeline is to pass.

### A.3.1.7. Other Important NEB and COGOA Acts

Sections 59, 60, 65, 66, 67, 71, and 72 of the NEB act (these sections cover the same issues as 13.02, 13.03, 13.05, 13.08, 13.1, 13.14, and 13.15 of the Canada Oil and Gas Operations Act respectively) are some of the key sections that governs traffic, tolls and tariff of a regulated pipeline company:

- a) The Board may make orders with respect to all matters relating to traffic, tolls or tariffs.
- b) A company shall not charge any tolls except tolls that are (i) specified in a tariff that has been filed with the Board and is in effect; or (ii) approved by an order of the Board.
- c) All tolls shall be just and reasonable, and shall always, under substantially similar circumstances and conditions with respect to all traffic of the same description carried over the same route, be charged equally to all persons at the same rate.
- d) The Board may disallow any tariff or any portion thereof that it considers to be contrary to any of the provisions of this Act or to any order of the Board, and may require a company, within a prescribed time, to substitute a tariff satisfactory to the Board in lieu thereof, or may prescribe other tariffs in lieu of the tariff or portion thereof so disallowed.
- e) The Board may suspend any tariff or any portion thereof before or after the tariff goes into effect.
- f) A company shall not make any unjust discrimination in tolls, service or facilities against any person or locality.
- g) Subject to such exemptions, conditions or regulations as the Board may

prescribe, a company operating a pipeline for the transmission of oil shall, according to its powers, without delay and with due care and diligence, receive, transport and deliver all oil offered for transmission by means of its pipeline.

- h) Where the Board finds such action necessary or desirable in the public interest, it may direct a company operating a pipeline for the transmission of gas to extend or improve its transmission facilities to provide facilities for the junction of its pipeline with any facilities of, and sell gas to, any person or municipality engaged or legally authorized to engage in the local distribution of gas to the public, and for those purposes to construct branch lines to communities immediately adjacent to its pipeline, if the Board finds that no undue burden will be placed on the company thereby.

In summary, there are vast amount of acts that restrict the construction and operation of pipelines. It takes a long time for new pipelines to go from the idea stage to the operational stage, sometimes even more than 10 years. The majority of the time is allocated to planning, regulatory (government) approvals, and construction. It is true that a pipeline company could expand by acquiring and merging with another pipeline company, but an acquisition or merger large enough to affect revenue enough such that it no longer follows it's current trend line is unlikely.

For competitors to come into a given pipeline industry is also very difficult. Hence, adverse structural changes on revenue are unlikely to occur.

For those reasons, I believe equity researchers can confidently use historical data and relationships to forecast pro-forma statements.

### **A.3.2. Enbridge**

Enbridge owns a portfolio of natural gas pipelines<sup>34</sup> including: (1) Anadarko System, with capacity of 1150 MMcf/d, and located in the Anadarko Basin; (2) East Texas System, with capacity of 885 MMcf/d, and located in the Bossier Sands and Haynesville shale resource plays; (3) Alliance System (Canada), 1.325 bcf/d, and runs from Northeast British Columbia to southern Saskatchewan; (4) Alliance System (U.S.), with capacity of 1.466 bcf/d, and runs from North Dakota to Channahon, Illinois; and (5) Vector Pipeline, with capacity 1.3 bcf/d, and run from Chicago, Illinois to Sarnia, Ontario.

Enbridge owns a diverse set of crude and liquid pipelines<sup>35</sup> (see figure 16) including: (1) Enbridge Regional Oil Sands System, with capacity of 1.1 million bpd, and runs from Fort McMurray to Hardisty and Edmonton; (2) Enbridge System Canadian Mainline, with capacity of 2.62 million bpd, and runs from Edmonton to Montreal; (3) U.S. Mainline Lakehead, with capacity of 2.62 million bpd, and runs from North Dakota to Chicago; and (4) Enbridge Pipelines (Saskatchewan), with 364,500 bpd, and runs from Southeastern Saskatchewan and Southwestern Manitoba. Those pipelines are the larger liquid transportation systems owned by Enbridge, and a percentage change in sales from those pipelines will affect Enbridge's profitability the most.

#### **A.3.2.1. Enbridge's Regional Oil Sands System**

Enbridge's Regional Oil Sands Systems consists of several operating pipelines

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<sup>34</sup> See Enbridge Website – Natural Gas Pipelines

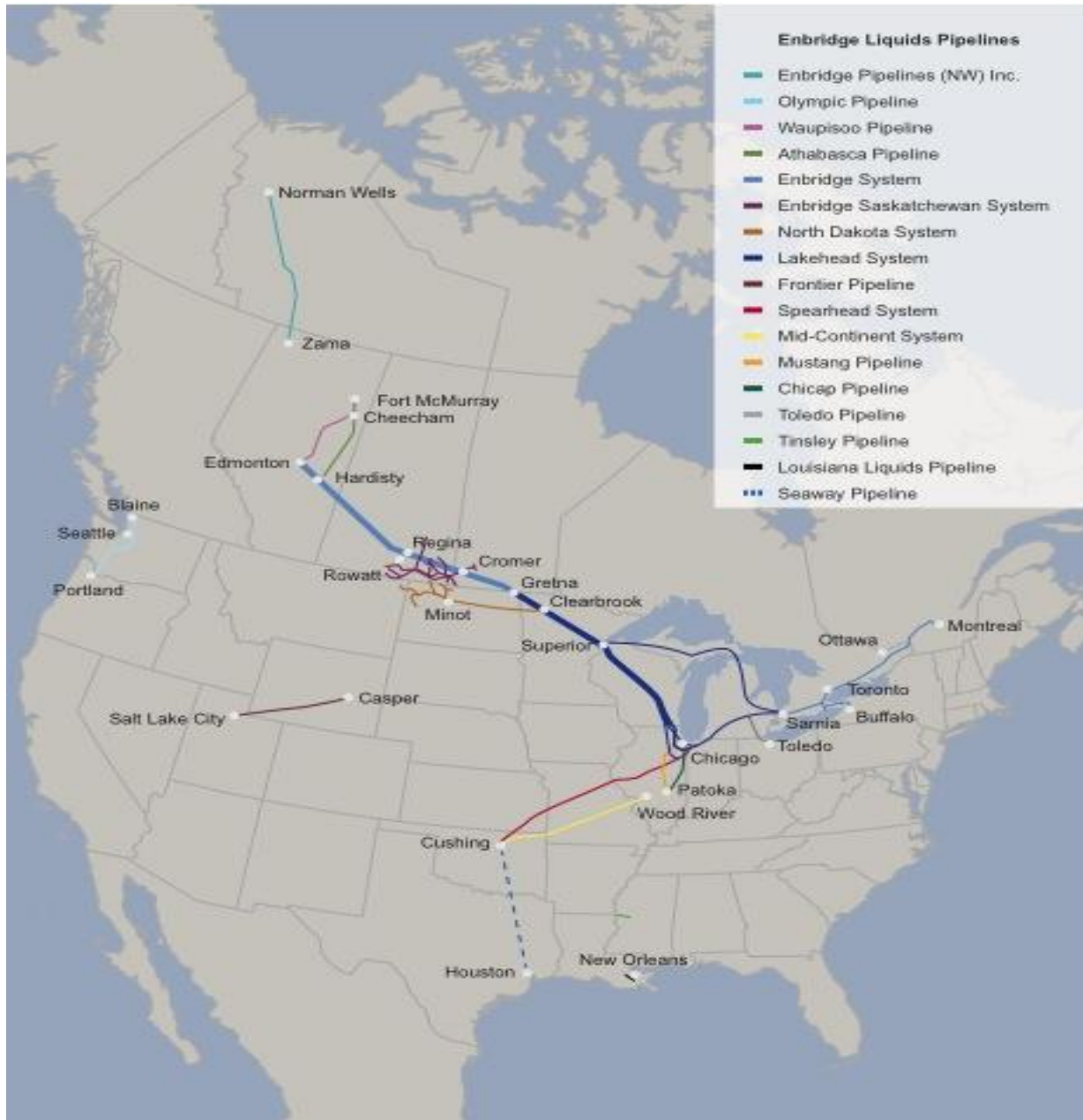
<sup>35</sup> See Enbridge Website – Liquid Pipelines

Athabasca Pipeline (Line 19), Waupisoo Pipeline (Line 18), Woodland Pipeline (Line 49), Wood Buffalo Pipeline, and several pipelines under development, Athabasca Twin Pipeline (Line 45), Woodland Pipeline Extension (Line 70), Norealis Pipeline (Line 50), Wood Buffalo Pipeline Extension, and Norlite Diluent Pipeline. This system transports crudes for the (1) Suncor MacKay River Project, (2) Foster Creek Christina Lake Oil Sands Partnership Project, (3) Nexen Long Lake Project, (4) ConocoPhillips Surmont, (5) Statoil Leismer, and (6) Kearl Oil Sands Project.<sup>36</sup>

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<sup>36</sup> See Enbridge Website – Regional Oil Sands System

Figure 16: Enbridge Liquid Pipelines<sup>37</sup>



<sup>37</sup> [Enbridge Liquid Pipelines]. Retrieved from [http://www.cicsimmigration.com/wp-content/uploads/2012/08/ENB\\_Liquids\\_map.gif](http://www.cicsimmigration.com/wp-content/uploads/2012/08/ENB_Liquids_map.gif)



### **A.3.2.2. Enbridge Mainline Tolling Methodology (CTS)**

The Competitive Tolling Settlement<sup>38</sup> was created because the Canadian Association of Petroleum Producers (CAPP) and shippers wanted a tolling program that was competitive and was more economically aligned with the risk and rewards of shippers.<sup>39</sup> The CTS<sup>40</sup> encompasses tolls for both the Canadian and US portion of crude transports originating in Western Canada. This consists of lines 1, 2a, 2b, 3, 4, 5, 6a, 6b, 7, 10, 11, 14, 61, 65, and 67. CTS is a 10 year tolling program that took into effect on July 1, 2011 and effectively replacing the incentive tolling structure (ITS).

The mainline toll accounts for costs associated with operation of the Enbridge mainline (including all related facilities). The tolling methodology is a variant of performance-based regulation. It preserves the relationship between the pipeline company's costs and tolls, found in the former cost of service regimes presented in the ITS, but also creates additional incentive for the company to reduce its cost, resulting in lower tolls for shippers and allowing the company to earn greater profits.

For volumes transported from Western Canada to the US portion of the Enbridge mainline or to Eastern Canada is charged using an International Joint Tariff. IJT is the toll on transports of heavy crude from Hardisty to Chicago (\$3.85 per barrel). Transportation of other qualities of crude or liquid from sites originating from Hardisty and delivered in Chicago is adjusted from the IJT according to distance and quality. The tolls are adjusted by 75% of the Gross Domestic Product at Market Pricing Index at the start of July. Under the CTS Enbridge is able to collect 0.1% of the amount of

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<sup>38</sup> Please see the Enbridge Competitive Tolling Settlement Appendix (2011) for more information.

<sup>39</sup> Please see the Enbridge Competitive Tolling Settlement Application (2011) for more information.

crude or liquids delivered off the Enbridge Mainline, and allocated equal to the Canadian and US portion of the Enbridge Mainline.

Volumes transported using only the Canadian portion of the mainline, is charged using Canadian Local Toll (CLT). CLT is tolled based on the previous approved methodology found in ITS 2011. The Canadian mainline tolls established by the CTS replaces the former more complex tolling structure calculated as the sum of the base toll, terrace surcharge, and mainline expansion toll. The CLT uses heavy crude transportations from Hardisty to Gretna as a benchmark (\$1.893 per barrel). Similar to IJT the toll is adjusted for distance and quality type for crude or liquid transportation that are not heavy and transported from Hardisty to Gretna. Under the CTS Enbridge is able to collect 0.05% of the volume of liquid and crude delivered using CLT.

An Outstanding Amount (OA) surcharge is added on to the CLT and IJT to recover any revenue shortfall from 2010 ITS revenue shortfall, applicable tax loss carry forward, and 2011 ITS first quarter toll variance. The surcharge will only reflect on the IJT and CLT prior to July 1, 2015. Receipt and delivery tankage requirement fees are required to be paid for volumes transported under IJT and CLT. The tankage fees are also adjusted by 75% of GDPP. If Enbridge under collects or over collects the tankage revenue requirements, the difference will be reflected in the next periods revenue requirement.

The CTS allows Enbridge to offer incentives to attract marginal shippers to ship on the Enbridge mainline, as long as the incentives are offered equally to all shippers.

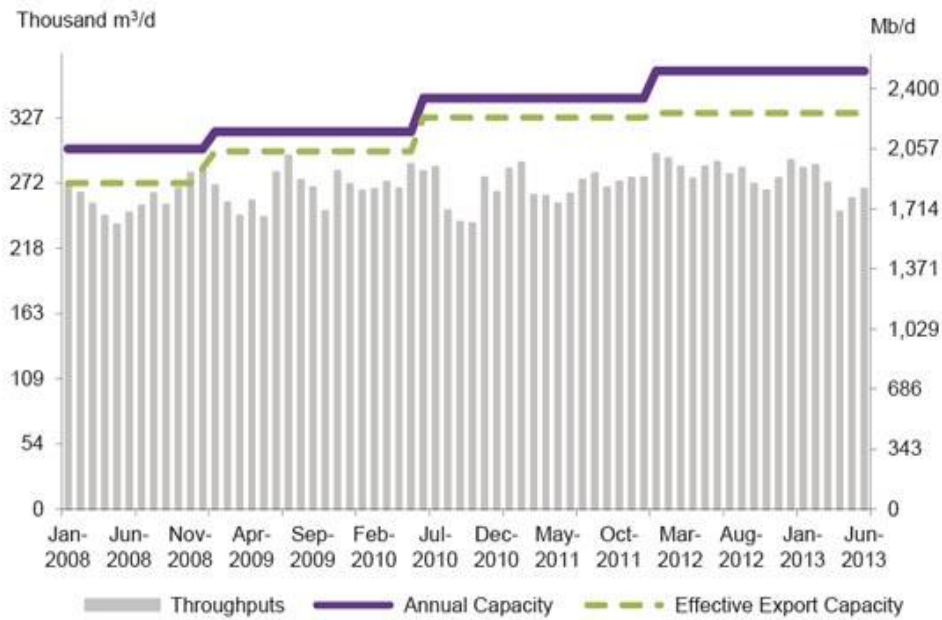
Within the CTS there is a contingent toll adjustment provision, that allow

Enbridge to adjust their tolls upon mutual agreement with the Representative Shipper Group (i.e. Shippers, CAPP) and/or increase in tolls ordered by the NEB, or any large Enbridge Mainline Expansion Capital, or any Material Change in Business Circumstances, and are all subject to approval by the NEB. In the event that the NEB does not approve of the toll adjustment that is mutually agreed by Enbridge and Representative Shippers a hearing may be requested to decide whether an adjustment would be made.

During the CTS term Enbridge will be responsible for all capital costs, and should be compensated through the IJT and CLT tolls. No additions to IJT and CLT tolls will be made to reflect capital cost spent by Enbridge unless both Enbridge and the Representative Shippers agrees on it. All capital costs greater than \$250 million must be negotiated with Representative Shippers. A renegotiation and/or termination provision is in place to relieve events that drive a 9-month moving average of volume below 1,350,000 barrels per day, effective after December 31, 2014.

Projects on the Enbridge mainline that result in costs exceeding the benefits in present value, may proceed if there is adequate financial support from supporting shippers (Shipper Supported Expansion Project). Enbridge and the supporting shipper will enter a backstopping agreement that ensures that Enbridge's annual revenue requirement is increased to account for the funds used in the project.

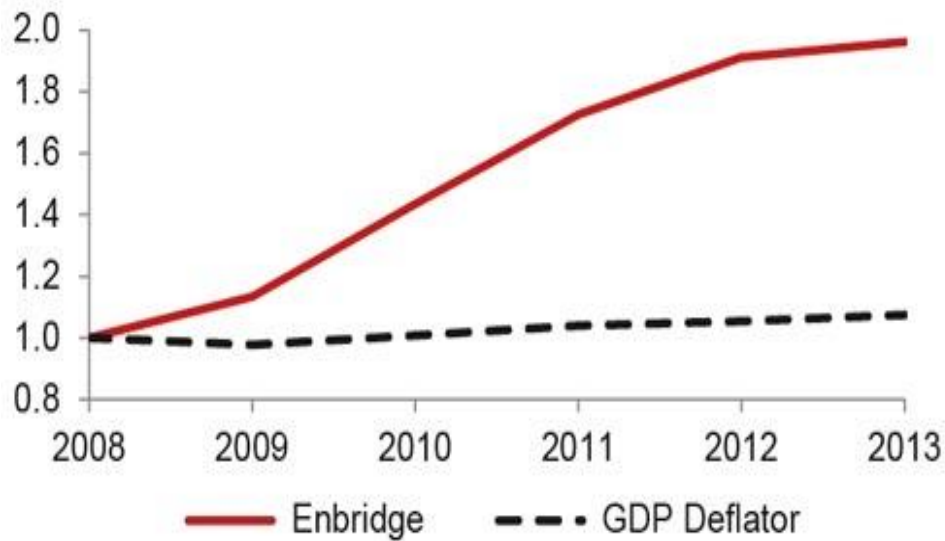
Figure 17: Throughput on the Enbridge Mainline<sup>41</sup>



As seen by Figure 17, throughput on the Enbridge Mainline has been fairly steady throughout 2008 to 2013.

<sup>41</sup> [Throughput on Enbridge Mainline]. Retrieved from <https://www.nbc-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

Figure 18: Enbridge Tolls over Time<sup>42</sup>



Enbridge's Mainline Benchmark tolls relative to the GDP Deflator, which indicates the level of inflation or deflation in Canada relative to 2008 prices is shown above (Figure 18). Enbridge's rates has grown at a quicker rate relative to the GDP deflator largely because of costs from the Southern Access, Southern Lights Replacement Capacity the Line 4 Extension, and the Alberta Clipper projects, to the revenue requirement, resulting in higher prices.

Figure 19, presents a simplified visual presentation of the Enbridge mainline system configuration.

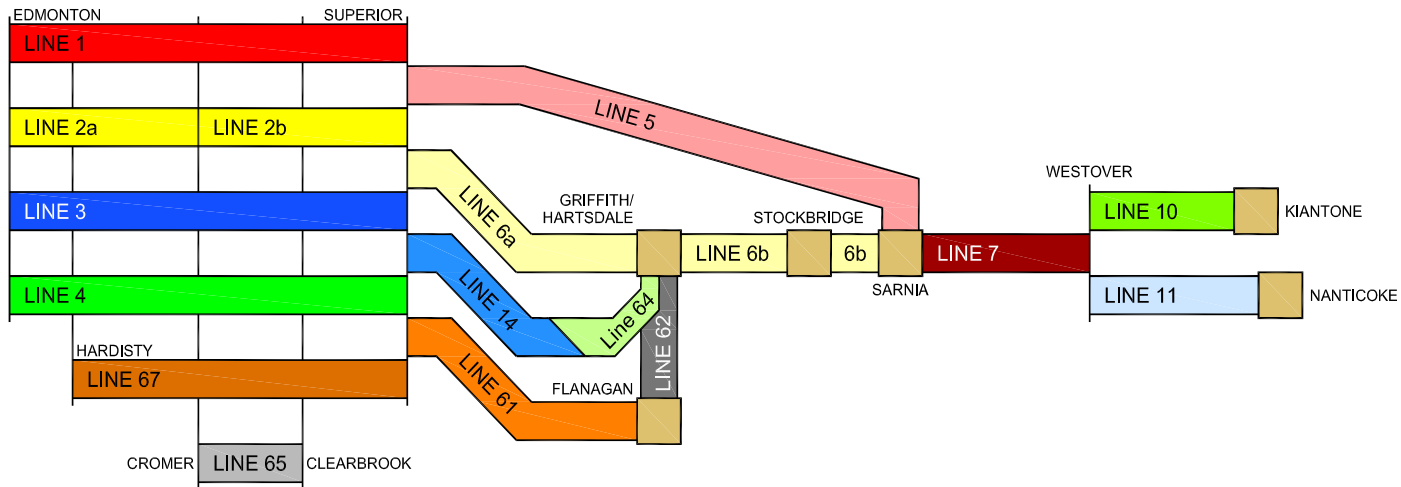
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<sup>42</sup> [Enbridge Tolls over Time]. Retrieved from <https://www.nbc-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

Figure 19: Enbridge Mainline System Configuration<sup>43</sup>

# Mainline System Configuration

Enbridge Pipelines Inc. / Enbridge Energy Partners, LP



Revised by: DRD  
Date Revised: April 27, 2011

<sup>43</sup> [Enbridge Mainline System Configuration]. Retrieved from <http://www.desmog.ca/sites/beta.desmog.ca/files/2011/04/Enbridge-pipeline-systems.jpg>

### **A.3.2.3. Enbridge Natural Gas Pipelines**

Enbridge has interests in a diverse sets of natural gas pipelines including: (1) Anadarko System, with average capacity of 1,150 MMcf/d, and transports natural gas from the Anadarko Basin; (2) East Texas System, with average capacity of 885 MMcf/d, and transports natural gas from the Bossier Sands and Haynesville Shale; (3) Canadian Alliance System, with average capacity of 1.325 bcf/d, and transports natural gas from Eastern British Columbia to Southern Saskatchewan; (4) US Alliance System, with average capacity of 1.466 bcf/d, and transports natural gas from North Dakota to Channahon, Illinois; and (5) Vector Pipeline, with average capacity of 1.3 bcf/d, and transports natural gas from Chicago, Illinois to Sarnia, Ontario.<sup>44</sup>

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<sup>44</sup> See Enbridge Website – Natural Gas Pipelines

#### **A.3.2.4. Anadarko and East Texas Systems**

The Anadarko System<sup>45</sup> and the East Texas System<sup>46</sup> are owned by Midcoast Energy Partners, L.P.<sup>47</sup>; an Enbridge company with the purpose to act as a vehicle that holds midstream natural gas and NGL assets. Special purpose vehicles (SPV) are bankruptcy remote so bankruptcy or insolvency of the parent company does not affect investor's right to the cash flows of the SPV's assets. Anadarko system consists of natural gas gathering and transportation pipelines, residue pipelines, NGL pipelines, and processing plants. The Anadarko system<sup>48</sup> is one of the largest networks in the Anadarko basin, which gathers natural gas production from the Atoka, Hogshooter, and Cleveland formations in the Granite Wash play. The Anadarko system taps into 3,600 wells in the Anadarko basin.

The East Texas System<sup>49</sup> consists of natural gas gathering and transportation pipelines, NGL pipelines, 7 natural gas processing plants, 11 natural gas treating plants, and one fractionation facility. The East Texas network taps into 5,600 wells in the East Texas basin.

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<sup>45</sup> See Figure 20 for historical performance and Figure 23 for map of asset

<sup>46</sup> See Figure 21 for historical performance

<sup>47</sup> See Figure 22 for ownership information on Midcoast Energy Partners

<sup>48</sup> See Midstream Energy Partners website – Anadarko System

<sup>49</sup> See Midstream Energy Partners website – East Texas System



Figure 20: Anadarko Pipeline Volumes (MMbtu/d in Thousands)<sup>50</sup>

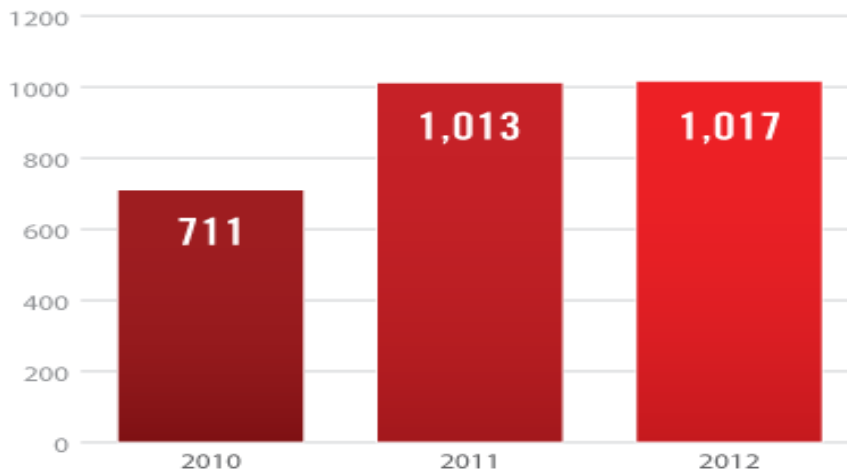
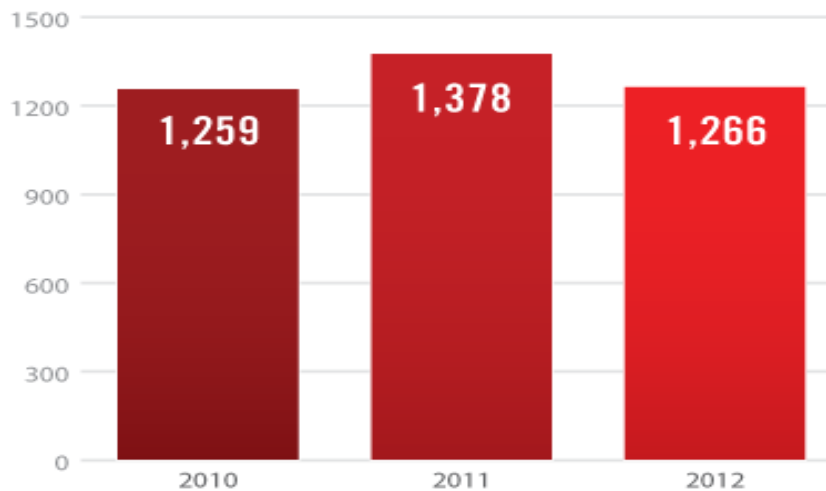


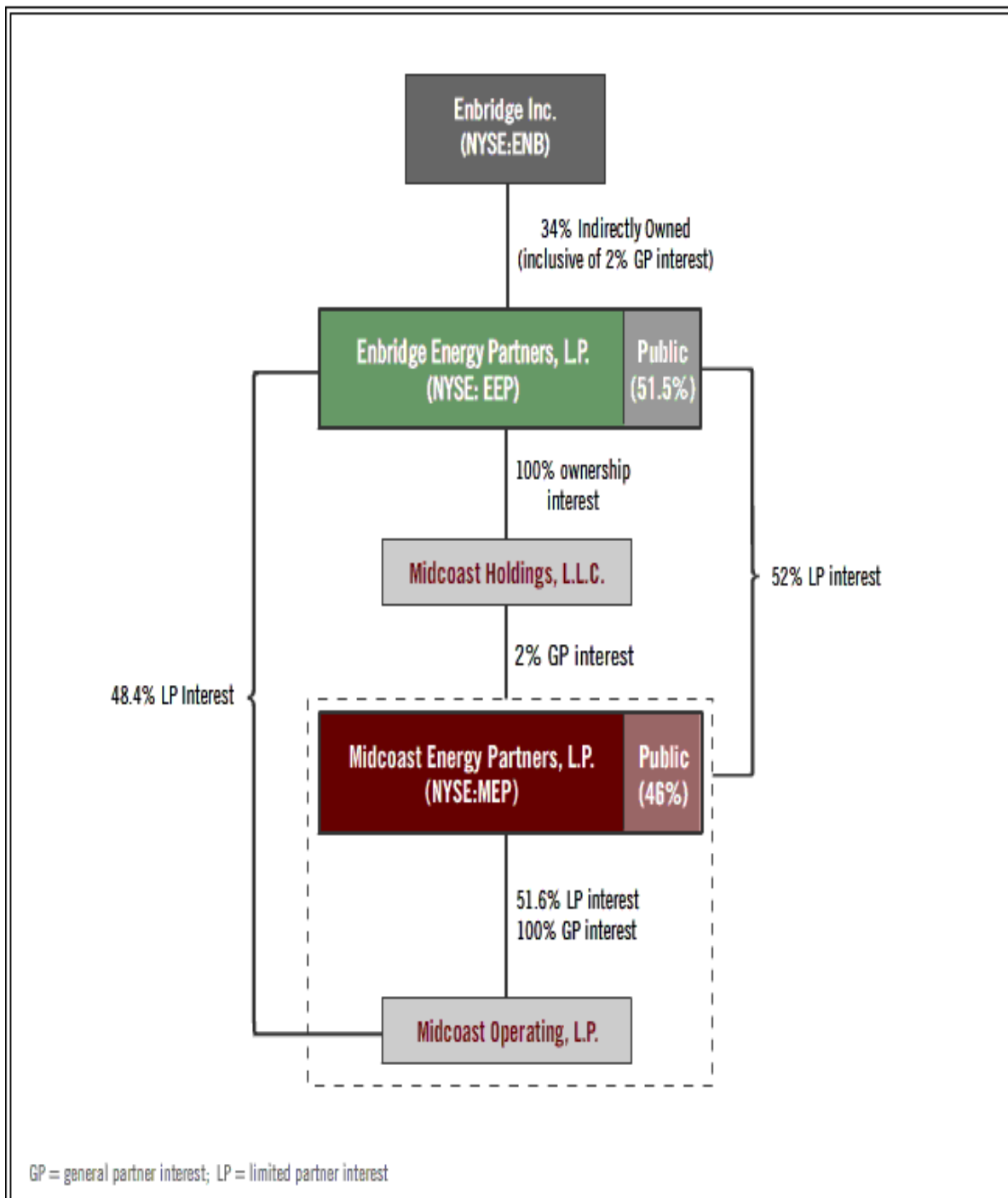
Figure 21: East Texas Pipeline Volumes (MMbtu/d in Thousands)<sup>51</sup>



<sup>50</sup> [Anadarko Pipeline Volumes]. Retrieved from <http://www.midcoastpartners.com/Delivering-Energy/Our-Systems/Anadarko.aspx>

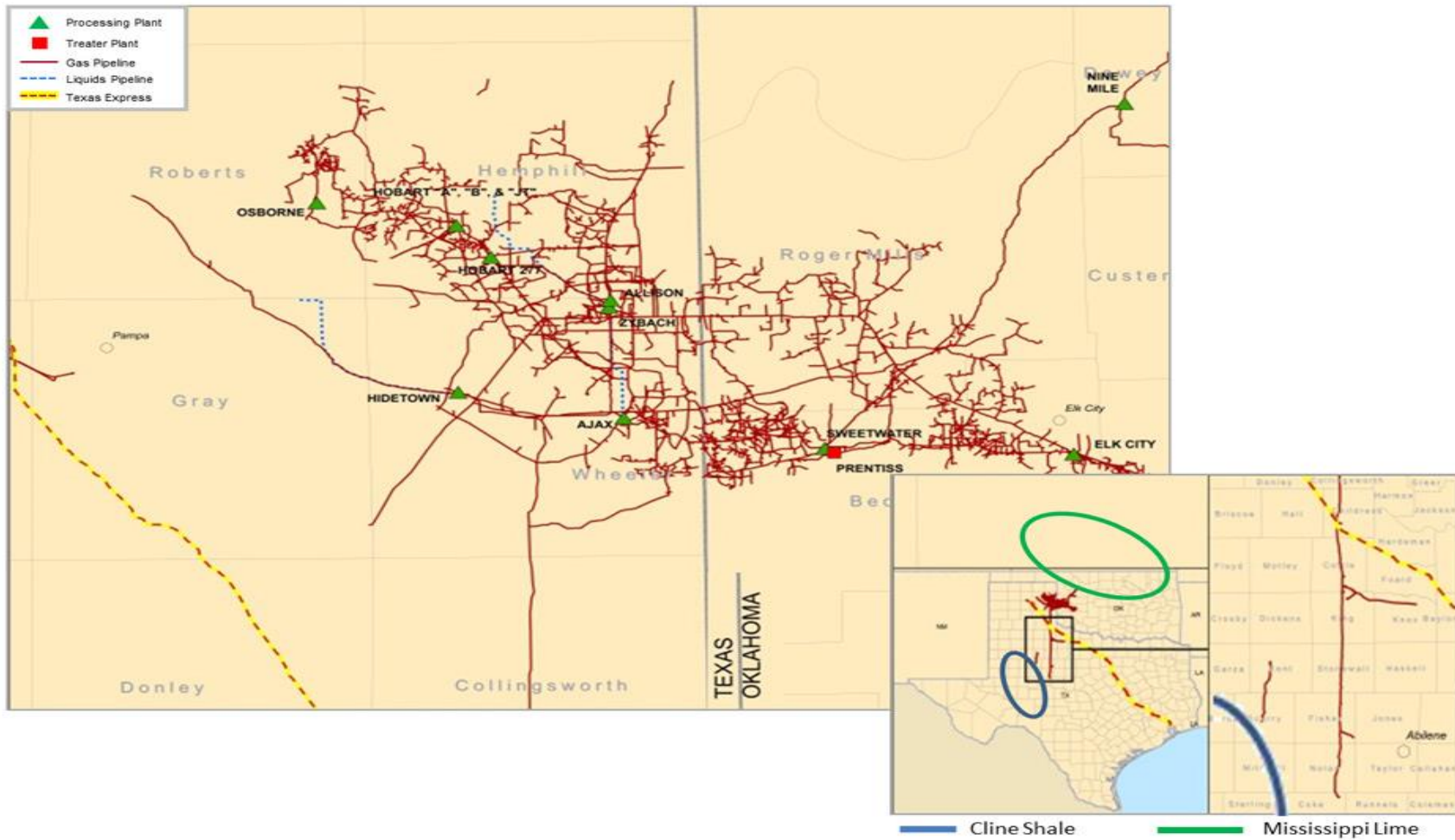
<sup>51</sup> [East Texas Pipeline Volumes]. Retrieved from <http://www.midcoastpartners.com/Delivering-Energy/Our-Systems/East-Texas.aspx>

Figure 22: Ownership of Midcoast Energy Partners L.P.<sup>52</sup>



<sup>52</sup> [East Texas Pipeline Volumes]. Retrieved from <http://www.midcoastpartners.com/Investor-Relations/Common-Unit-Information/Ownership-Structure.aspx>

Figure 23: Anadarko Pipeline Network<sup>53</sup>



<sup>53</sup> [Anadarko Pipeline Network]. Retrieved from <http://www.midcoastpartners.com/Delivering-Energy/Our-Systems/Anadarko.aspx>

### A.3.2.5. Alliance

Enbridge Income fund owns 50% of the Canadian Alliance pipeline, and Enbridge owns 50% of the US Alliance pipeline. Veresen Inc. owns the remainder of the Canadian and US Alliance pipelines.<sup>54</sup> Alliance pipeline delivers rich natural gas from WCSB and Williston Basin to the Chicago market hub. Services provided<sup>55</sup> by Alliance include: (1) Firm Receipt Service (FRS), (2) Firm Delivery Service (FDS), and Firm Full Path Service (FFPS). FRS will permit customers to transport natural gas from their contract specified receipt point(s) to the Alliance Trading Pool. Alliance distinguishes receipt point into either a “zone 1” or “zone 2” receipt point. Receipt points further down in the system than the Blueberry Hill Compressor Station in Alberta are classified as a “zone 2” receipt point. Services to zone 2 are more expensive than services to zone 1. The Alliance Trading Pool is a virtual trading site where receipt and delivery customers can trade natural gas. FDS allows customers to deliver gas from the ATP to the Canada-US border. Customers will then need to transport their natural gas to US delivery points using Alliance’s FT-1 Transportation services. Customers has the option to either pay a fixed toll for the FDS and the FT-1 transportation services or pay a variable toll (i.e. Index Based Rates) for transportation directly from ATP to Chicago. For the variable toll option customers are required to commit to a minimum five-year contract. FFPS services will allow customers directly to transport from Canadian receipt sites to Chicago at a fixed rate. Alliance provides customers using FDS and FT-1 services contracts a rich Gas credit if the mixed stream of natural gas leaving ATP surpasses 110 Btu/cf heat rate.

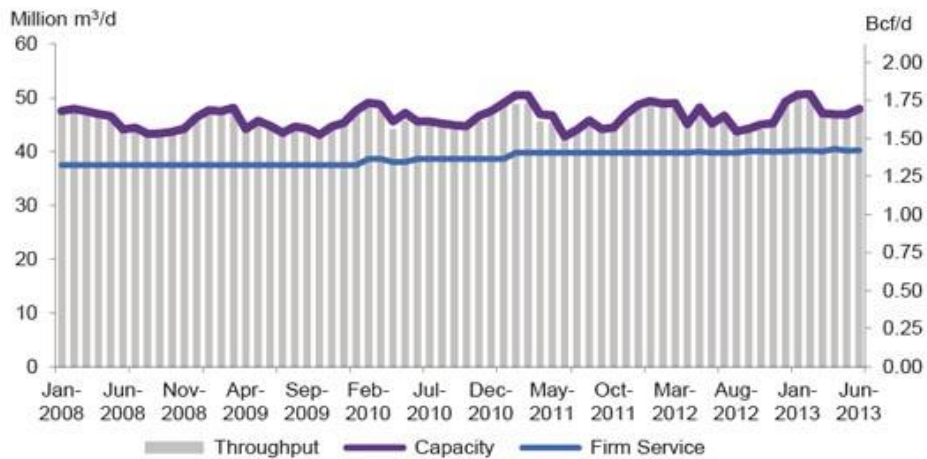
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<sup>54</sup> See Alliance website for additional information

<sup>55</sup> See Alliance website – Recontracting Alliance Brochure

On November 24, 2014<sup>56</sup>, Alliance announced that allocated capacity in Zone 1 with minimum contract length of three years has exceeded 90% of their 1 bcf/d target, and allocated capacity in Zone 2 with minimum contract length of three years has reached 60% of the lowest capacity target of 265 mmcf/d.

Figure 24: Alliance Throughput<sup>57</sup>



<sup>56</sup> See Alliance website – Capacity Update

<sup>57</sup> [Alliance Throughput]. Retrieved from <https://www.nbc-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

As seen in figure 24, the Alliance pipeline has been fully utilized since inception, largely because of long-term contracts with its customers, which are set to expire on November 30, 2015.<sup>58</sup> Figure 25 is a map of the Alliance, in addition to other natural gas pipelines.

Figure 25: Alliance Pipeline<sup>59</sup>



<sup>58</sup> See Alliance website - Recontracting

<sup>59</sup> [Alliance Pipeline]. Retrieved from <http://www.arcticgas.gov/sites/default/files/images/Alliance%20pipeline%20and%20its%20key%20competitors.png>

#### **A.3.2.6. Prospective Projects**

Some of Enbridge's major prospective projects are: (1) Northern Gateway Project, (2) Line 9B reversal and Line 9 Capacity Expansion project, and (3) Line 3 Replacement Program.

##### **A.3.2.6.1. Northern Gateway**

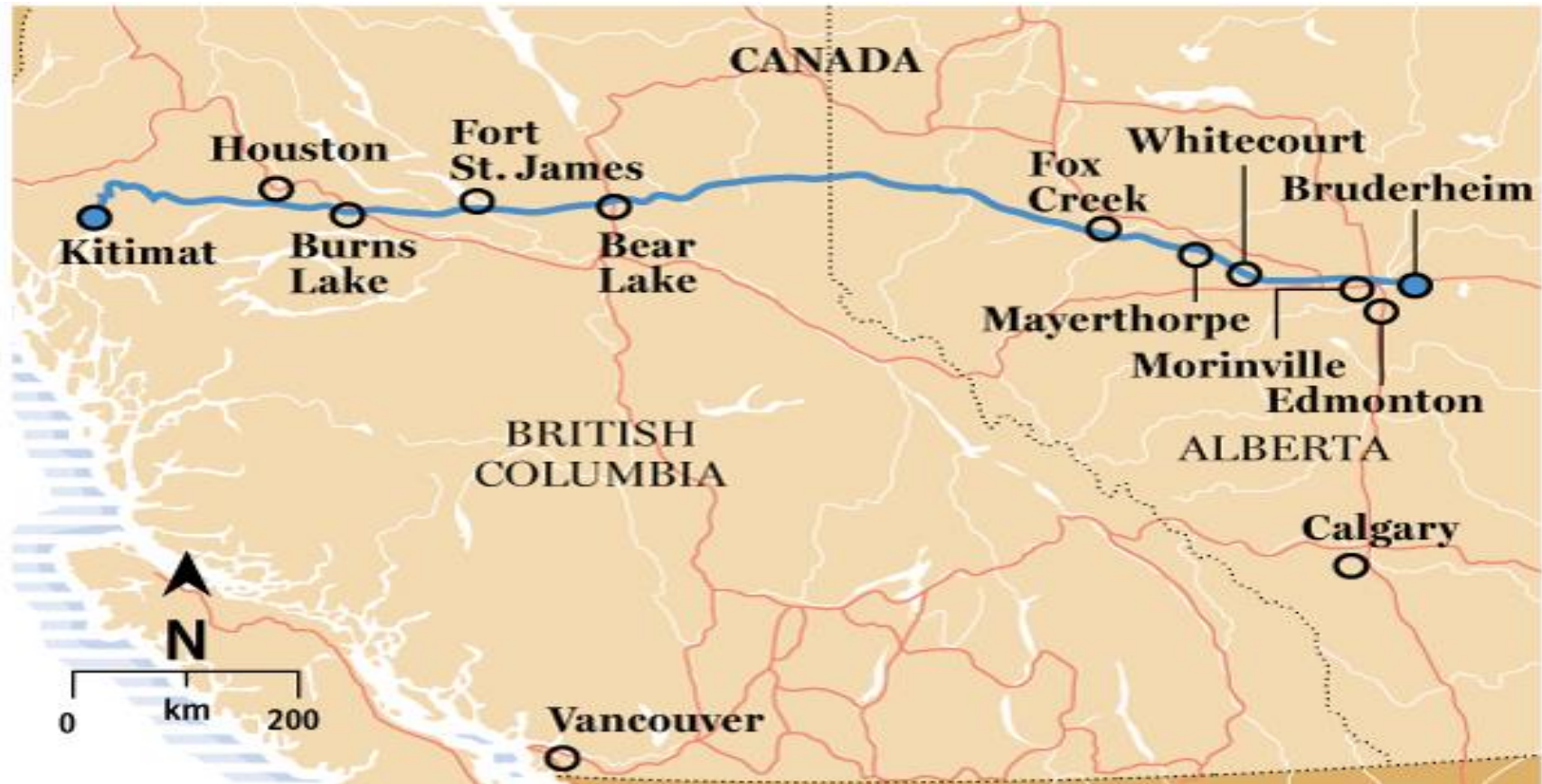
The Northern Gateway Project<sup>60</sup> is a project that consists of constructing and operating two pipelines (See Figure 26). One pipeline would be transporting approximately 525,000 bpd of petroleum products from Bruderheim, Alberta to Kitimat, BC, and the other would transport approximately 193,000 barrels of condensate per day from Kitimat, BC to Edmonton, Alberta.

On December 2013, the Joint Review Panel, an independent group, mandated by the NEB and the Minister of the Environment, to assess the environmental impacts of Northern Gateway Project, found that the project is in the public's interests given that 209 conditions are satisfied by Enbridge. The next step towards the project requires Enbridge to demonstrate to the NEB, how it will satisfy the 209 conditions.

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<sup>60</sup> See Northern Gateway website

Figure 26: Northern Gateway Pipeline<sup>61</sup>



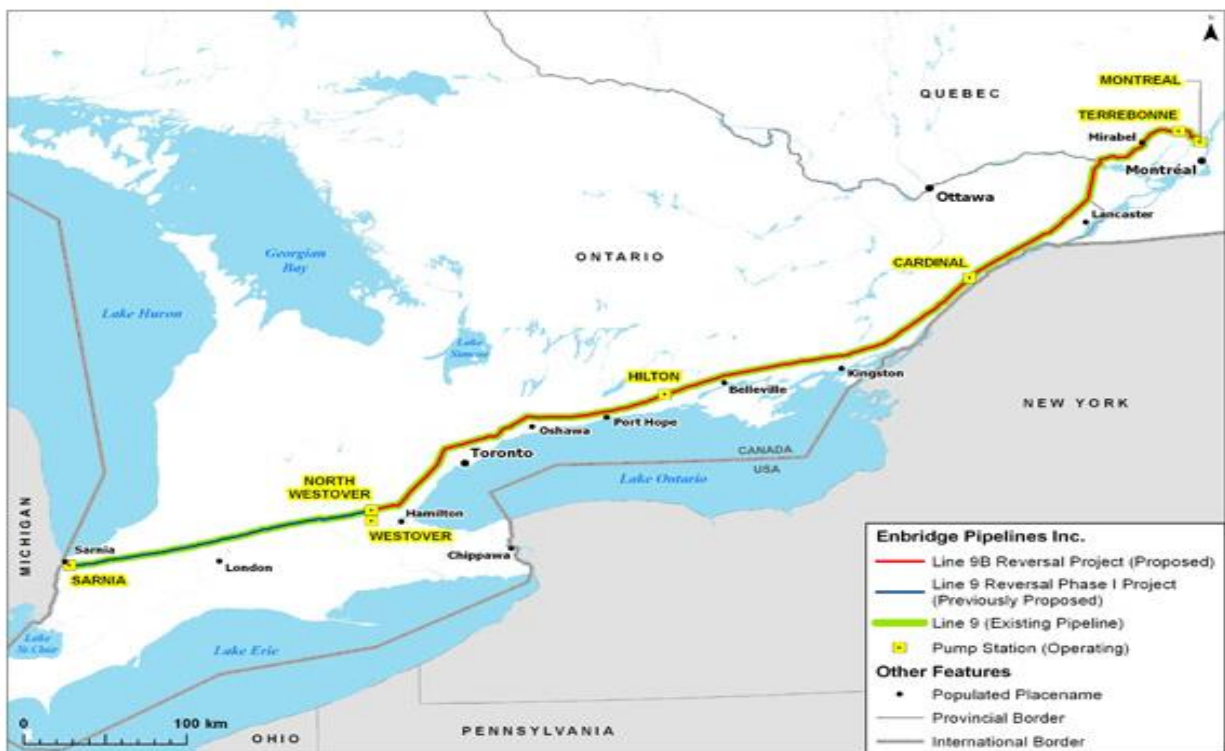
<sup>61</sup> [Northern Gateway Pipeline]. Retrieved from <http://business.financialpost.com/news/energy/science-not-emotion-behind-northern-gateway-approval>



### A.3.2.6.2. Enbridge Pipelines Line 9B Reversal and Line 9 Capacity Expansion Project

The project involves reversing Line 9B (see Figure 27) between Westover, Ontario and Montreal, Quebec, increasing the entire Line 9 capacity from Sarnia to Montreal, and altering the Tariff associated with Line 9 to allow shipment of heavy crude. The NEB found the project in the Canadian's public's interest, and approved the project in March, 2014, given that certain conditions<sup>62</sup> are satisfied.

Figure 27: Line 9B Reversal Project<sup>63</sup>



<sup>62</sup> See NEB Letter Decision – Appendix II of XO-E101-010-2012

<sup>63</sup> [Line 9B Reversal Project]. Retrieved from <https://www.neb-one.gc.ca/pplctnflng/mjrpp/ln9brvrs/ind-ex-eng.html>

### **A.3.3. TransCanada**

TransCanada<sup>64</sup> is a leading energy infrastructure in North America, its line of businesses include: (1) Natural Gas Pipelines, (2) Liquid Pipelines, (3) Power Generation, and (4) Gas Storage. TransCanada has one of the most advanced natural gas pipeline networks in the world, which transports 20% of the natural gas consumed in North America. TransCanada has invested in oil pipelines to transport the abundant reserves of oil sands to markets in North America. TransCanada has more than 11,800 megawatts of power generation capacity, with fuel sources ranging from natural gas, nuclear, coal, hydro and wind. It is a major player in natural gas storage owning more than 407 Bcf of storage capacity.

#### **A.3.3.1. Pipelines**

TransCanada's natural gas pipeline system extends for more than 68,500 km that transports natural throughout North America. Its natural gas pipeline assets include: (1) NGTL System, with length of 24,522 km, and average throughput of 9.6 Bcf/d; (2) Canadian Mainline, with 14,114 km, and average throughput of 5.2 Bcf/d; (3) Foothills System, with 1,241 km, and average throughput 3.5 Bcf/d; and (4) ANR Pipeline, with 16,121 km, and average throughput of 4.4 Bcf/d. TransCanada owns the Keystone crude pipeline, which transports crude from Hardisty to US markets in the PADD II and PADD III regions.

#### **Power**

TransCanada's portfolio of power plants include: (1) Becancour Power plant, with capacity of 550 MW; (2) TC Hydro, with capacity of 583 MW; (3) Coolidge, with capacity

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<sup>64</sup> See TransCanada website for more information

of 575 MW; (4) Halton Hills, with capacity of 683 MW; Ocean State, with capacity of 560 MW; and (5) Ravenswood, with capacity of 2,480 MW.

### **A.3.3.2. Nova Gas Transmission Line**

NGTL<sup>65</sup> delivers natural gas to Canadian and US markets. Some key delivery points on the Nova System are: (1) Empress Border which is interconnected with the TransCanada's Mainline system; (2) McNeil Border, which is interconnected with Foothills Pipelines; (3) Alberta-BC border, which is interconnected with Foothills Pipelines; (4) Unity and Cold Lake borders, which is interconnected with TransGas Limited; (5) Gordondale and Boundary Lake border, which is interconnected with Spectra Energy's Westcoast System; and (6) Alberta-Montana border, which is interconnected with North Western Energy's system.

#### **A.3.3.2.1. Tolling Methodology**

The NOVA system<sup>66</sup> offers a range of services such as: (1) Firm Transportation Receipt, (2) Firm Transportation - Receipt Non-Renewable, (3) Firm Transportation - Delivery, (4) Firm Transportation - Delivery Winter, (5) Firm Transportation - Extraction, (6) Short-Term Firm Transportation - Delivery, (7) Firm Transportation - Points to Point, (8) Interruptible Delivery and Receipt Services, and (9) Others.

The NOVA system is regulated under the Cost of Service regime. TransCanada develops annual throughput forecasts for the NOVA system, which is dependent on a set of growth assumption about Canada and United States, in combination with an analysis of the relevant industry structure, and accounting for delivery contracts of its

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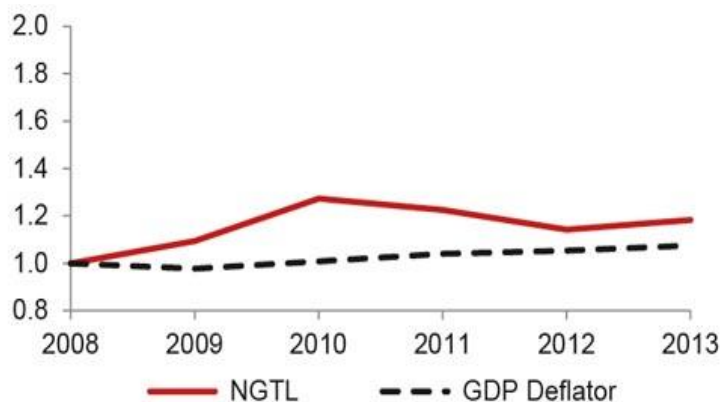
<sup>65</sup> See NGTL Application for 2010 Interim Rates

<sup>66</sup> See TransCanada website – Customer Express Alberta Regulatory Tariff

customers. The tolls for receipt and delivery services are obtained by starting with the total amount that the TransCanada needs to collect through tolls to recover its costs and allow shareholder to earn a reasonable non-diversifiable risk adjusted return on (i.e. Revenue Requirement), then deducting any components that are non-related to receipt and delivery services, and dividing it by the sum of delivery and receipt contract demand.

Tolls for TransCanada Firm Transportation - Delivery services for group 1 delivery points depend on the delivery points, group 2 delivery points are \$4.55/GJ for all delivery points (i.e. postage stamp rate), and group 3 is 20% higher than the group 3 rates. Customers are required to sign a contract to use TransCanada’s Firm Transportation - Delivery services, and the contract length ranges between 1 to 3 years depending on whether new facilities need to be built to accommodate the customer. NOVA system<sup>67</sup> also offers Short Term Firm Transportations that are biddable, but the rates are at least as high as the group 1 rates of longer term customers. Point to Point services are based on the distance between receipt and delivery points.

**Figure 28: NGTL Tolls<sup>68</sup>**

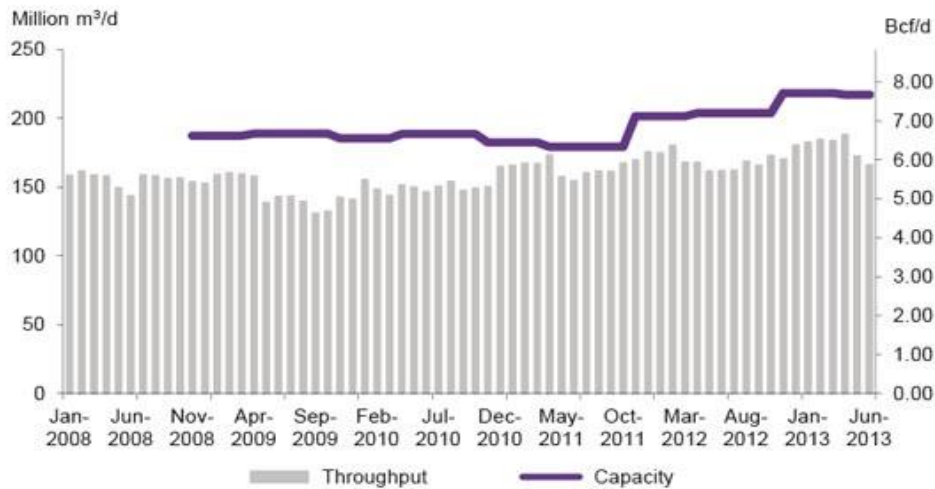


<sup>67</sup> See TransCanada website – Customer Express NGTL System Services

<sup>68</sup> [NGTL Tolls]. Retrieved from <https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

The NGTL Benchmark Toll (see Figure 28) increased relative to the GDP Deflator in 2008 and peaked in 2010, this is primarily to reduction in throughput and contract demand. Throughput and contracted demand gradually recovered in the latter years. See Figure 29 - 32 for throughput information and to see where NGTL is positioned.

**Figure 29: NGTL Upstream James River Throughput<sup>69</sup>**



<sup>69</sup> [NGTL Upstream James River Throughput] Retrieved from <https://www.nelson.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

Figure 30: NGTL North and East Flows<sup>70</sup>

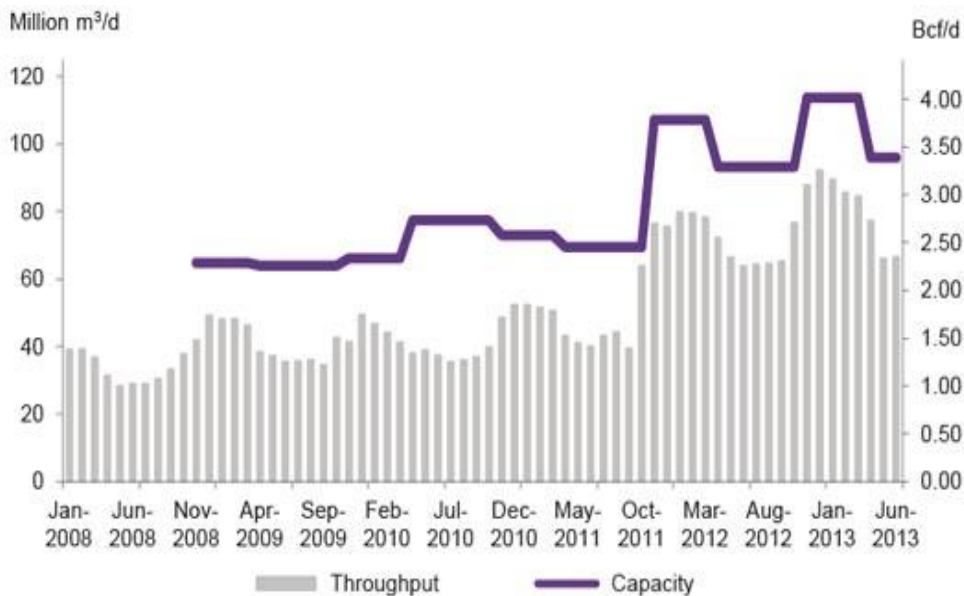
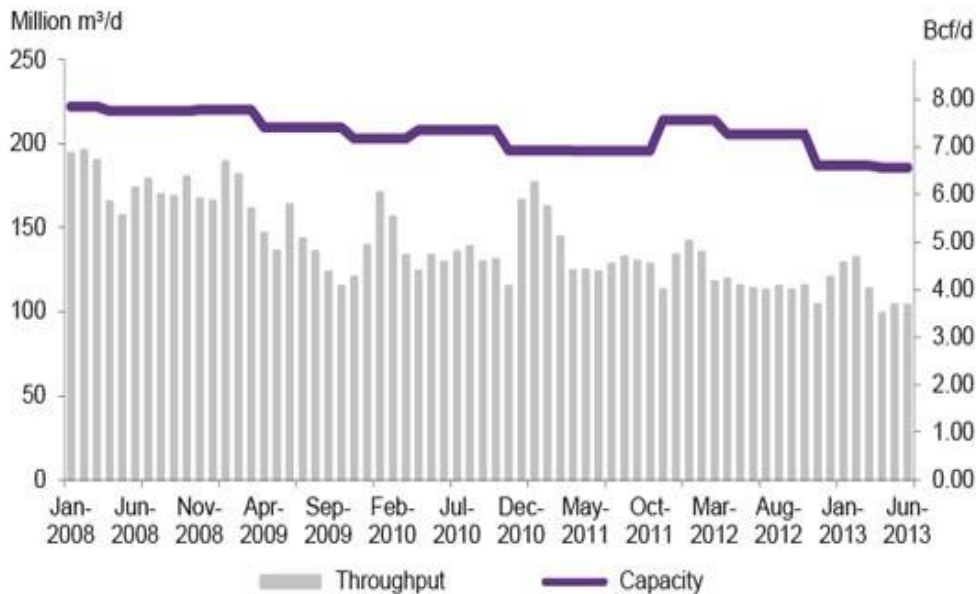


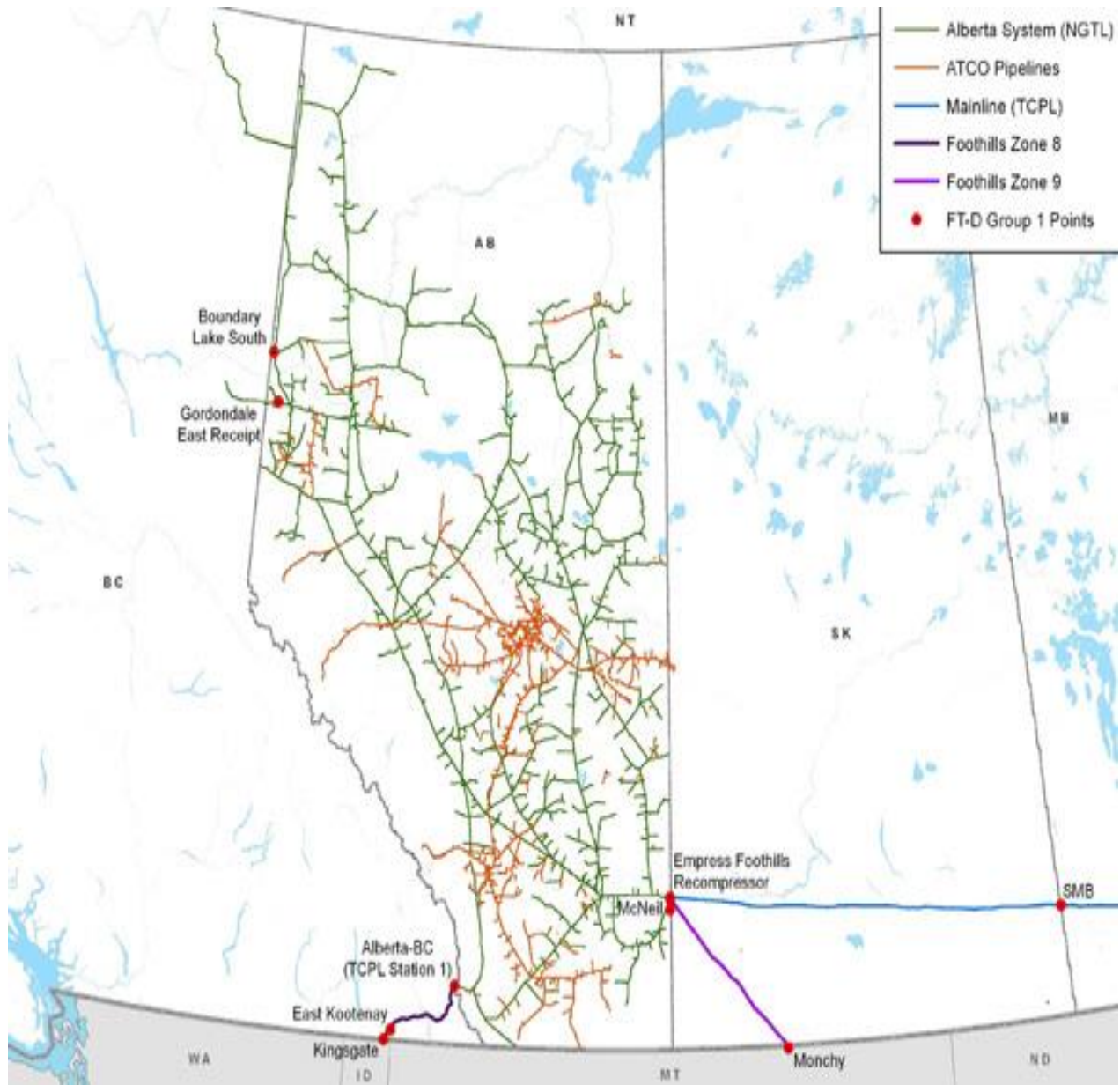
Figure 31: NGTL Eastern Gate<sup>71</sup>



<sup>70</sup> [NGTL North and East Flows]. Retrieved from <https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

<sup>71</sup> [NGTL Eastern Gate]. Retrieved from <https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

Figure 32: Alberta TransCanada Assets<sup>72</sup>



<sup>72</sup> [Alberta TransCanada Assets]. Retrieved from <https://www.nbc-one.gc.ca/sftnvrnmnt/cmplnc/dtrprt/2014trnscnd-mrgnc/mg/fg05-eng.jpg>

### **A.3.3.3. Canadian Mainline**

The Canadian Mainline runs from the eastern Alberta border to the Quebec border and is interconnected with other natural gas pipelines in North America. The Mainline is divided into 3 segments: (1) Eastern Triangle, (2) Northern Ontario Line, and (3) the Prairies segment.

The Canadian Mainline is regulated under the Cost of Service regime, and the tolls are set so TransCanada is able to recover its costs and allow shareholders to earn a reasonable rate of return. Although the business environment of the Canadian Mainline has changed over time resulting in a reduction in annual long haul contracts and increasing the short haul contracts. TransCanada has applied and received approval for restructuring of its tolls in 2014<sup>73</sup>, to adapt to the change and this has resulted in an increase of tolling levels set in 2011<sup>74</sup> by 52% for Eastern Triangle short haul, 18% for Eastern Triangle long haul, and 12% for others. The robustness of the COS regime allows the Canadian Mainline to adapt and recover its costs and allow shareholders to earn a reasonable return, given changes in business environments. Under the COS model a pipeline company that under collects in the current period (i.e. recovering less than its revenue requirement) is allowed to recover that loss in the form of true-ups the following period. It recovers this amount by passing the loss to the next periods revenue requirement, resulting in higher tolls.

The COS model becomes a problem when demand for pipeline capacity is shrinking and the pipeline company continues passing on losses to future period

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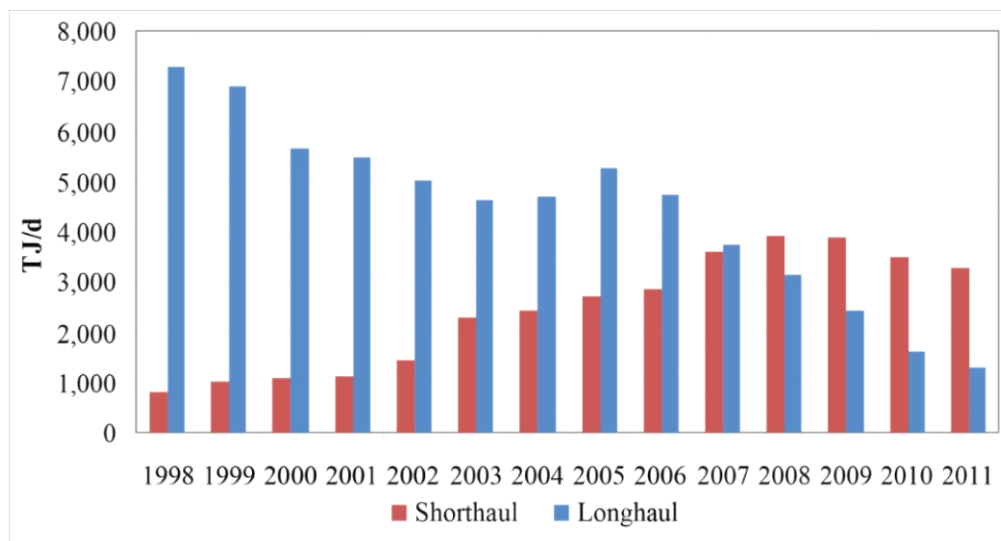
<sup>73</sup> See TransCanada Application – RH-001-2014



revenue requirements which translates to higher tolls. The COS model provides a cushion that protects pipeline companies from small to moderate reductions in sales. Imagine what would happen if there were only 1 bcf of sale shipped by 1 shipper throughout the year, then for that shipper to ship that 1 bcf, it would need to pay the entire revenue requirement for the pipeline company to recover its cost.

The current trend<sup>75</sup> that the Canadian Mainline faces warrants some concern, the annual short haul contracts seems to have leveled off after 2007, and the annual long haul contracts has declined significantly since 1998 (See Figure 33 and 34). If the current trend persists, the COS model will likely fail, and will likely reflect negatively in the company’s profitability, as the Canadian Mainline is a major source of TransCanada’s revenues and profits.

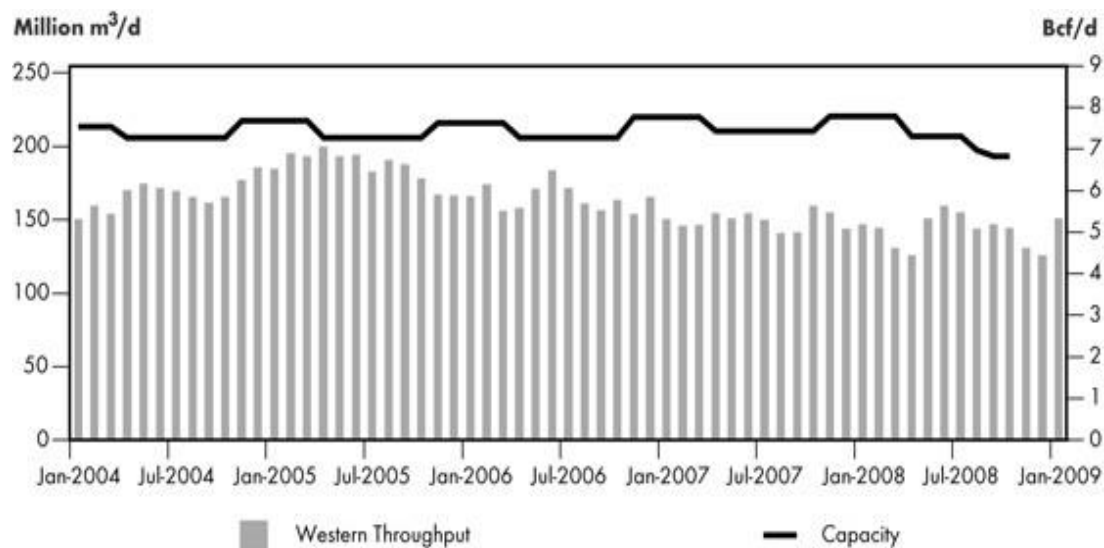
**Figure 33: Canadian Mainline Short-haul and Long-haul Volumes<sup>76</sup>**



<sup>75</sup> See TransCanada – Settlement Mainline Application (2013)

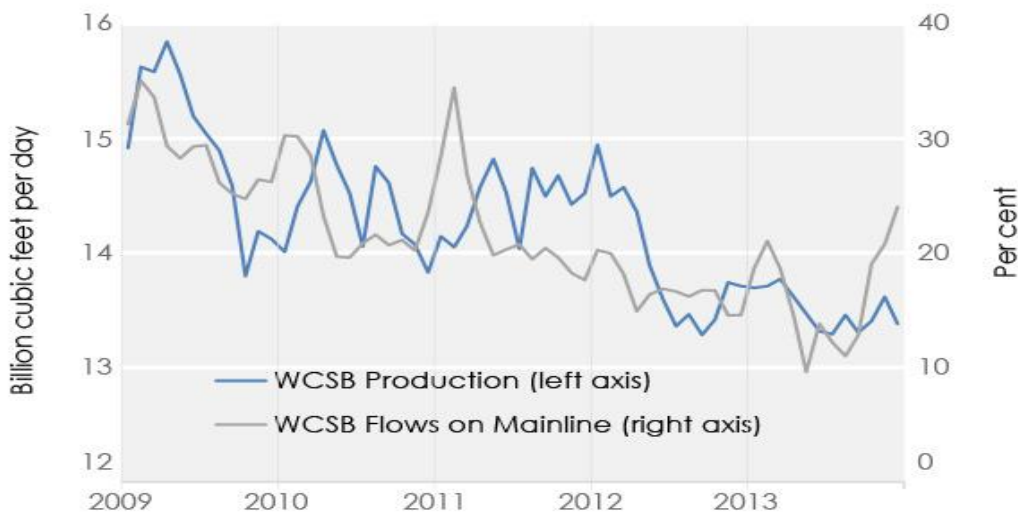
<sup>76</sup> [Canadian Mainline Short-haul and Long-haul volumes]. Retrieved from RH-003-2011 Reason for Decision

**Figure 34: Canadian Mainline Throughput<sup>77</sup>**



The table shows that the throughput on the TransCanada Mainline has drop over the years, and is largely the result of lower WCSB production of natural gas.

**Figure 35: WCSB Production and Flow on Canadian Mainline<sup>78</sup>**



<sup>77</sup> [Canadian Mainline Throughput]. Retrieved from [https://www.nbc-one.gc.ca/nrg/ntgrtd/trnsprtn/archive/2009/index-eng.html#f2\\_12](https://www.nbc-one.gc.ca/nrg/ntgrtd/trnsprtn/archive/2009/index-eng.html#f2_12)

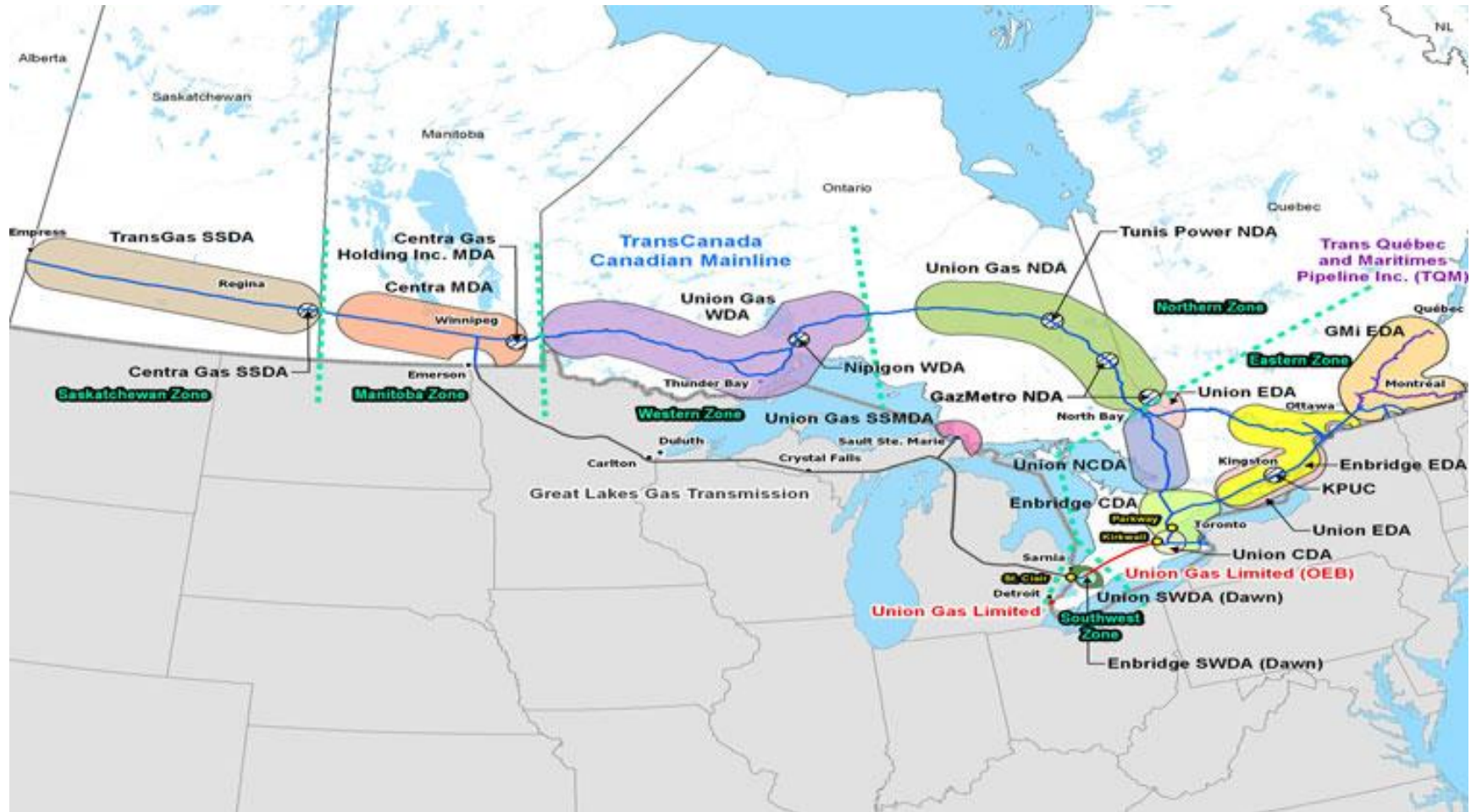
<sup>78</sup> [WCSB Production and Flow on Canadian Mainline]. Retrieved from <https://www.nbc-one.gc.ca/nrg/ntgrtd/mrkt/dnmc/2013/index-eng.html>

As seen from Figure 35, WCSB production and the flow on the Canadian Mainline (see Figure 36 for map of asset) has decline. WCSB production has declined primarily because of growth in US Shale productions, which serve demand in the US PADD I and II regions.<sup>79</sup> As a result of reduction in natural gas transportation the tolls on the Canadian Mainline has increased significantly, to recover under collected revenues. The combination of rising tolls in the Canadian Mainline and the decline in natural gas price differential post 2008 has reduced natural gas transportation on the Canadian mainline. In July 2013, a new tariff approved by the NEB reduced tolls on the Canadian Mainline from Empress, Alberta to Dawn Hub in southern Ontario significantly (\$2.02 per GJ to \$1.42 per GJ).

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<sup>79</sup> See NEB Canadian Pipeline Transportation System Energy Market Assessment (2014)

Figure 36: The Canadian Mainline<sup>80</sup>



<sup>80</sup> [The Canadian Mainline]. Retrieved from <https://www.neb-one.gc.ca/sftnvrnmnt/cmplnc/dtrprt/2014trnscnd-nvrnmnt/nx-ii-eng.html>

#### **A.3.3.3.1. Tolling Methodology**

The Canadian mainline<sup>81</sup> is regulated under COS. It offers a range of services including: (1) Firm Transportation, (2) Interruptible Transportation, (3) Short Term Firm Transportation, (4) Firm Transportation Short Notice, (5) Short Term Short Notice, (6) Non-Renewable Firm Transportation, and (7) Multi-year Fixed Price. Firm Transportation services require a minimum contract of 1 year, but usually have the lowest tolls. Short-term contracts or/and short term notices require a premium relative to Firm Transportation services. Tolls for Interruptible Transportation are determined through a bidding system, and is subject to a tolling floor specified by TransCanada.

#### **A.3.3.4. Keystone Pipeline System**

The Keystone pipeline transports crude from Alberta to markets in the PADD II. The pipeline has capacity of 435,000 bpd and about 78% of its capacity is supported by long-term contracts. In OH-1-2008, the NEB approved the Cushion expansion which added 156,000 b/d of additional capacity to the Base Keystone pipeline. The combination of the Cushion expansion and the Keystone pipeline is known as the Keystone Base Pipeline<sup>82</sup>.

The Keystone pipeline's purpose is to bring oil from the WCSB to refineries in the PADD II region. The primary reason why the pipeline was approved because the existing systems that exported oil from Western Canada was inadequate to meet the forecasted rapidly growing oil sands productions in Canada transported by: (1) Enbridge, (2) TransMountain Pipeline, (3) Express, (4) Rangeland, (5) Bow River, (6) Wascana, and (7) Enbridge's Westspur Pipeline.

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<sup>81</sup> See TransCanada website – Customer Express Canadian Mainline

<sup>82</sup> See Keystone Reasons for Decision (2009)

#### **A.3.3.4.1. Tolling Structure**

The tolls charged<sup>83</sup> by using services associated with the Keystone Base Pipeline depends on whether the customer signs a contract, the crude type, and the receipt and delivery point. Customers that do not commit to a contract will be required to pay a higher toll, and has the option to ship light or heavy crude from Hardisty to Wood River, Patoka, Cushing, or Port Arthur. Customers that do commit can sign a 10 or 20 year contract, and ship light or/and heavy crude from Hardisty to Cushing. Customers also have the option to sign a 20 year contract and ship light or/and heavy crude from Hardisty to Wood River or Patoka. Shipping light crude on a comparable basis is cheaper than heavy crude, a longer term contracts on a comparable basis is cheaper than shorter term contracts. For committed tolls, the tolls consists of a fixed and a variable portion. The fixed portion does not change throughout the contract, but the variable portion changes to account for differences in the final variable toll and the expected variable toll. If the final variable toll is less than the expected variable toll the difference will be refunded to the shipper. An abandonment surcharge is also imposed to all customers for all crude types, for each cubic metre of crude shipped.

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<sup>83</sup> See Keystone Pipeline System Tolls and Tariffs

### **A.3.3.5. Prospective Projects**

#### **A.3.3.5.1. Energy East Project**

The Energy East Project<sup>84</sup> (see figure 37 for map of asset) involves: (1) Transform a natural gas pipeline own by TransCanada to an oil pipeline; (2) Build a pipeline running from Alberta to New Brunswick and connecting with the transformed pipeline; and (3) Build facilities that are required to support the project.

The project is still in the infant stage of the regulatory process.

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<sup>84</sup> See NEB website – Energy East Project

Figure 37: The Energy East Pipeline Project<sup>85</sup>



<sup>85</sup> [Energy East Pipeline Project]. Retrieved from <https://www.neb-one.gc.ca/pplctnflng/mjrpp/nrgyst/index-eng.html>



### A.3.4. Kinder Morgan

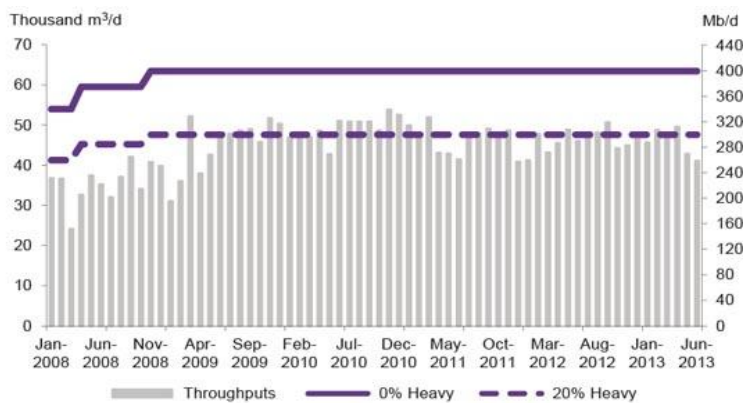
Kinder Morgan<sup>86</sup> is a pipeline company that owns assets such as, (1) Trans Mountain Pipeline, (2) Cochin Pipeline, (3) Puget Sound and the Trans Mountain Jet Fuel pipelines, (4) the Westridge marine terminal, (5) the Vancouver Wharves terminal, and (6) the North Forty terminal.

#### A.3.4.1. Trans Mountain

The Trans Mountain pipeline transports about 300,000 barrels of crude and refined products from Alberta to BC and Washington each day. TransCanada has proposed an expansion project that will increase the capacity of Trans Mountain to 890,000 bpd.

Trans Mountain ships a series of different qualities of products through its pipelines, relative to shipping homogenous qualities of products this may give rise to interfacing problems. TransCanada reduces the impact of interfacing by shipping similar batches of products in terms of quality one after another.

Figure 38: Trans Mountain Pipeline Throughput<sup>87</sup>



<sup>86</sup> See Kinder Morgan website for additional information

<sup>87</sup> [Trans Mountain Pipeline Throughput]. Retrieved from <https://www.neb-one.gc.ca/nrg/ntgrtd/trnsprtn/2014/index-eng.html#fga12>

The Trans Mountain pipeline capacity is lower if Heavy products are shipped (see figure 38). Over 2010 to 2013 TransCanada has consistently shipped roughly 20% heavy crude<sup>88</sup>, as shown on the graph Trans Mountain has been in apportionment over the past few years.

#### **A.3.4.1.1. Tolling Structure**

The tolls that the Trans Mountain charges<sup>89</sup> depends on the weight of products, the receipt and destination point, and type of service. Trans Mountain categorizes the weight of products into 5 classes, (1) Super Light, (2) Light, (3) Medium, (4) Heavy, and (5) Super Heavy. The heavier classification the product is in the more expensive. The types of services offered include: (i) Tank Metered, (ii) Tank Non Metered, (iii) Direct Injection, (iv) Metered in Direct Mainline, and (v) 3rd Party Injection. The tolls become less expensive from (i) to (v).

Customers have the option to ship from Edmonton to Edmonton, Kamloops, Sumas, Burnaby, and Westridge, or from Kamloops to Sumas, and Burnaby. All customers that ship from Edmonton are required to pay an Environmental surcharge of \$0.2919/m<sup>3</sup>. Trans Mountain uses a “Bid Premium” method to determine the amount of credit refunded to customers. Embedded in the refund credit, a refund for the Environmental surcharge is included. An additional loading charge of \$1.4048/m<sup>3</sup> is required for deliveries to Westridge.

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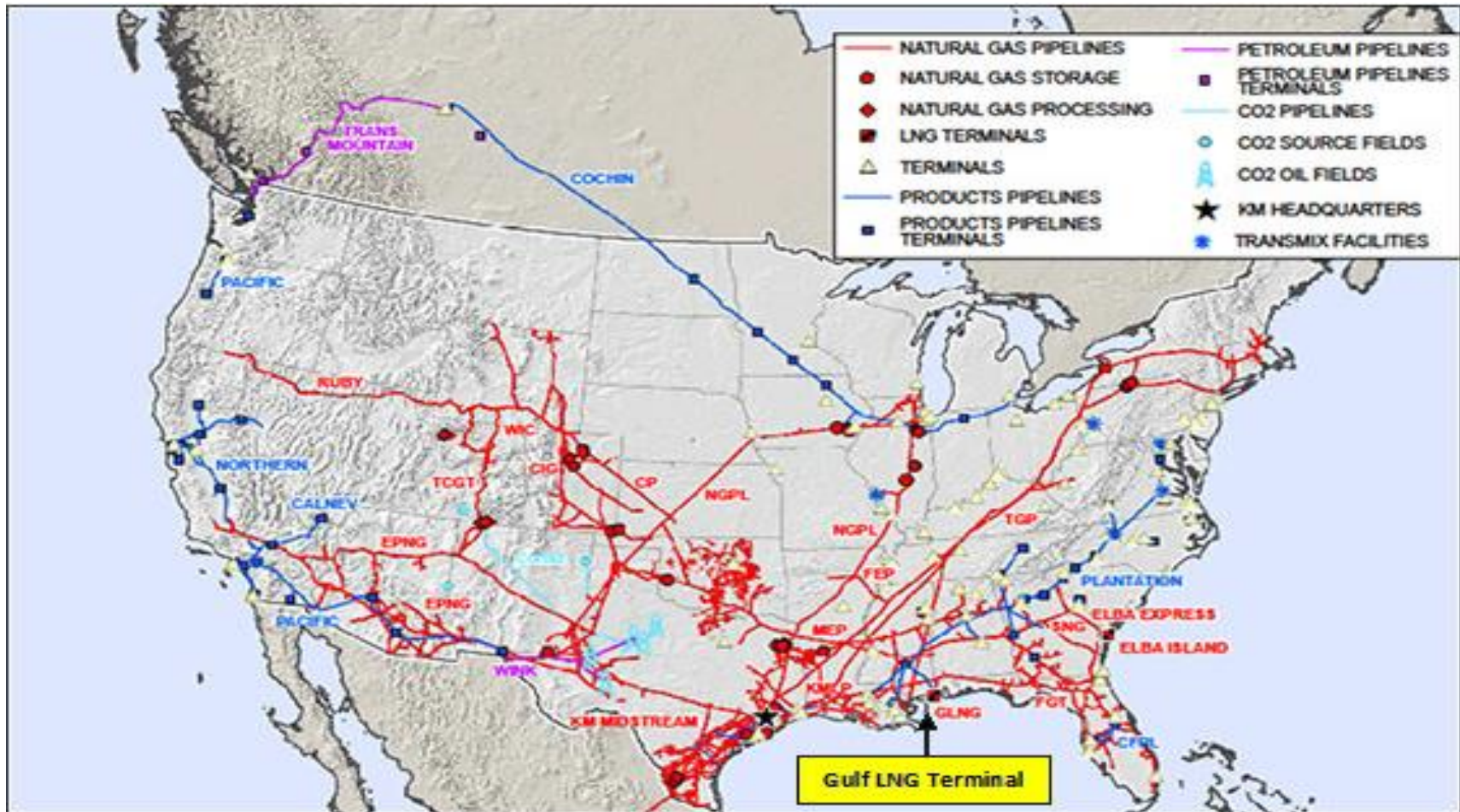
<sup>88</sup> See NEB Canadian Pipeline Transportation System Energy Market Assessment (2014)

<sup>89</sup> See Kinder Morgan website – Trans Mountain Tolls and Tariffs

#### **A.3.4.2. Kinder Morgan Natural Gas Pipelines**

Kinder Morgan owns and operates the largest natural gas pipeline network (see figure 39 for map) in North America with pipelines spanning 109,000 km, making natural gas transportation its main source of earnings. Their pipelines taps into the major resource plays in North America including: (1) Eagle Ford, (2) Marcellus, (3) Barnett, (4) Haynesville, and (5) Utica. Kinder Morgan has interests in the following companies/assets: (i) Natural Gas Pipeline Company of America, (ii) Midcontinent Express Pipeline, (iii) Florida Gas Transmission, (iv) Southern Natural Gas System, (iv) El Paso Natural Gas Pipeline System, (v) Ruby Pipeline LLC, (vi) Wyoming Interstate, (vii) Keystone Gas Storage, and (viii) Young Storage.

Figure 39: Kinder Morgan Pipeline Network<sup>90</sup>



<sup>90</sup> [Kinder Morgan Pipeline Network]. Retrieved from [http://www.kindermorgan.com/business/gas\\_pipelines/projects/gulfLNG/](http://www.kindermorgan.com/business/gas_pipelines/projects/gulfLNG/)

### **A.3.4.3. Prospective Projects**

#### **A.3.4.3.1. Trans Mountain Expansion Project**

The Trans Mountain Expansion Project (see figure 40) includes: (1) Construction of additional 987 km of pipelines; (2) Building new facilities; and (3) Restore 193 km of pipeline. The project would increase the capacity to 890,000 bpd from 300,000 bpd of Trans Mountain between Edmonton, AB and Burnaby, BC. The pipeline was applied on December 2013, and is currently undergoing hearings to determine the environmental and aboriginal impacts, and economic feasibility of the project.

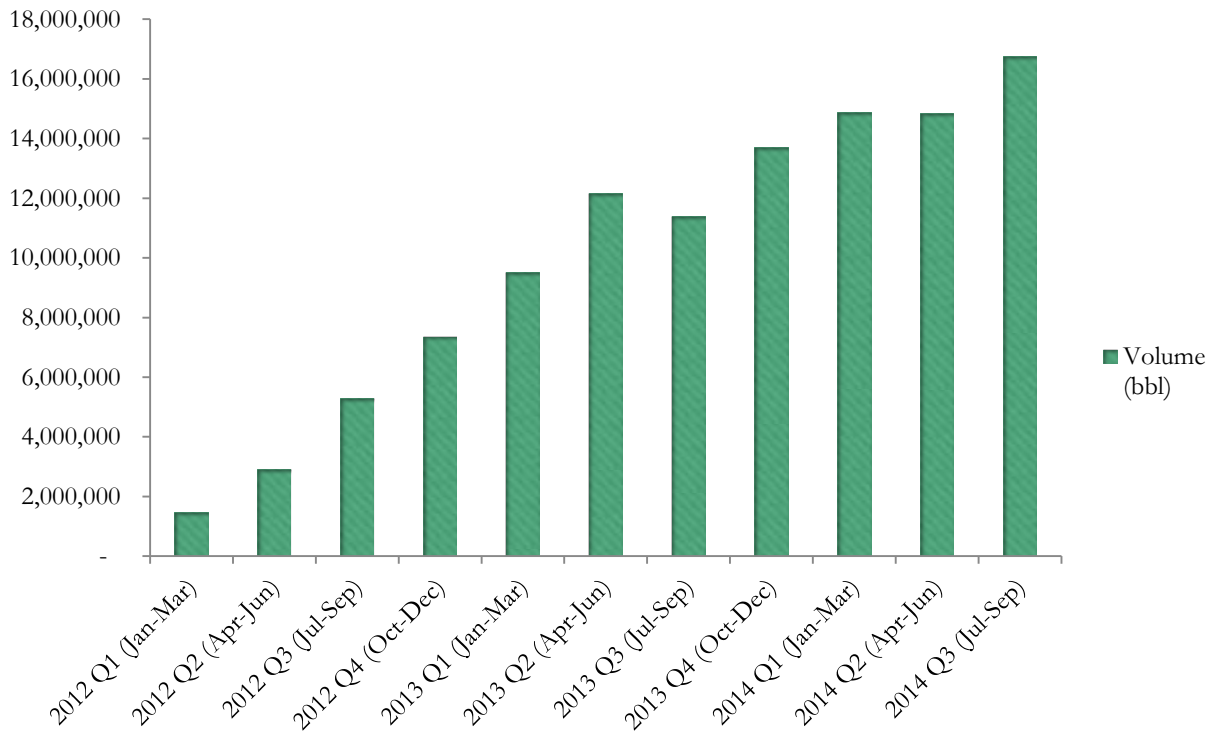
Figure 40: Trans Mountain Expansion Project<sup>91</sup>



<sup>91</sup> [Trans Mountain Expansion Project]. Retrieved from <http://www.neb-one.gc.ca/pplctnflng/mjrpp/trnsmntnxpnsn/index-eng.html>

### A.3.5. Rail

Figure 41: Canadian Crude Oil Exports By Rail



Crude Oil transported via rail<sup>92</sup> has been increasing at an extremely fast rate over the past few years. Figure 41, indicates that crude oil exports via rail has increase by roughly 9 fold over the past two years (see figure 42 for map).

<sup>92</sup> Data retrieved from NEB website – Canadian Crude Oil Exports by Rail

Figure 42: Rail Networks in North America<sup>93</sup>



<sup>93</sup> [Rail Networks in North America]. Retrieved from <http://www.aogr.com/assets/images/content/W7-1M-Figure-4.jpg>



### A.3.6. Refineries and Bitumen Upgraders

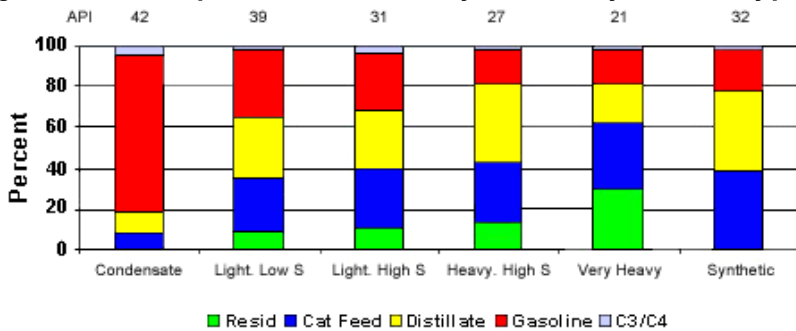
#### A.3.6.1. Economics of Refining

The economic feasibility of refining depends on 3 factors the: (1) Type of Crude, (2) Refining equipment, and (3) Collection of petroleum products produced.

Lighter crude requires less processing, and for this reason lighter crude are generally sold at a premium relative to heavier and more sour crudes.

To use heavier crude a refinery must invest in assets to upgrade crude. When deciding to invest in processing units the refinery must forecast the price differential between qualities of crude to determine whether the present value benefits exceeds the costs. The proportion and range of petroleum products that a refinery can produce is highly dependent on the natural quality of crude (see figure 43).

Figure 43: Comparison of Refinery Yields By Crude Type<sup>94</sup>



The processing units at a refinery has installed will determine a refiner's choice of crude. Refineries usually fall into one of three groups: (1) Topping Plant, (2) Cracking Refinery, and (3) Coking Refinery.

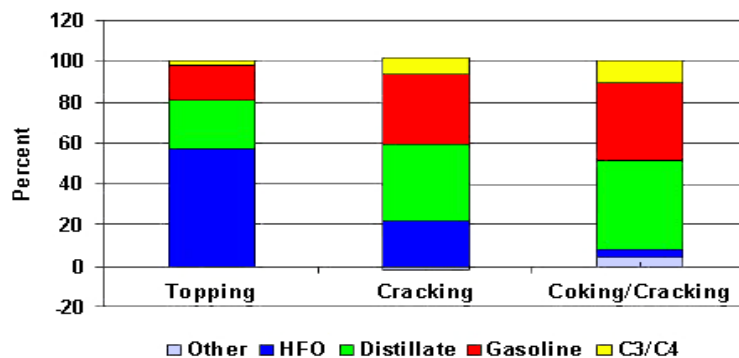
<sup>94</sup>[Comparison of Refinery Yields by Crude Type]. Retrieved from <https://www.nrcan.gc.ca/energy/crude-petroleum/4561>

A topping plant contains a distillation unit and usually a catalytic reformer to generate octane. The catalytic reformer is used to turn naphtha obtained from the distillation process of crude into reformates, a blending stock for high octane gasoline.<sup>95</sup>

Topping plants processes condensates, light sweet crude, and sometimes heavy crude. Refineries that specialize in producing asphalt are usually the only Topping plants that use heavy crude as an input. A cracking refinery, would further use the gas oil component obtained from the distillation process and break it down into distillates and gasoline using high temperature, catalyst, or pressure.

A coking refinery would take the residual obtained from the distillation unit and cracks it using heat into lighter products using a hydrocracker or coker. Including a hydro cracker or a fluid catalytic cracker will improve the yield of high value stream products (e.g. gasoline). Using more processes to treat and convert crude increases the yield of high valued products, but results in higher operating costs from higher energy usage. The higher energy costs and the initial investment of the facilities should be weighted with the lower price of relatively heavier crude oil (see figure 44).

Figure 44: Refinery Yield by Facility<sup>96</sup>



<sup>95</sup> See Wiki website – Catalytic Reforming

<sup>96</sup> [Refinery Yield by Facility]. Retrieved from <https://www.nrcan.gc.ca/energy/crude-petroleum/4561>

### A.3.6.2. Canada Refineries and Upgraders

In Canada there are currently 19 refineries, owned by 12 different companies<sup>97</sup>. Approximately 84% of the refineries, produce all types of petroleum products. The Husky facility in Lloydminster, Alberta, and the Moose Jaw Asphalt plants in Moose Jaw, Saskatchewan, specializes in asphalt production. The Nova Chemicals refinery in Sarnia, Ontario focuses on manufacturing distillate products. Some of the larger refineries in Canada are: (1) Strathcona Refinery in Edmonton, with average daily capacity of 187,000 bpd (Imperial Oil); (2) Former Petro-Canada in Edmonton (Suncor Energy), (3) Nanticoke Refinery in Nanticoke (Imperial Oil), with average daily capacity of 112,000 bpd; (4) Imperial (Imperial Oil) in Sarnia, with average daily capacity of 121,000 bpd; (5) Co-op Refinery Complex in Regina (Federated Co-operatives Limited), with average daily capacity of 135,000 bpd; (6) Valero in Quebec (Valero), with average daily capacity of 265,000; and (7) Irving in Saint John (Irving Oil), with average daily capacity of 320,000 bpd.

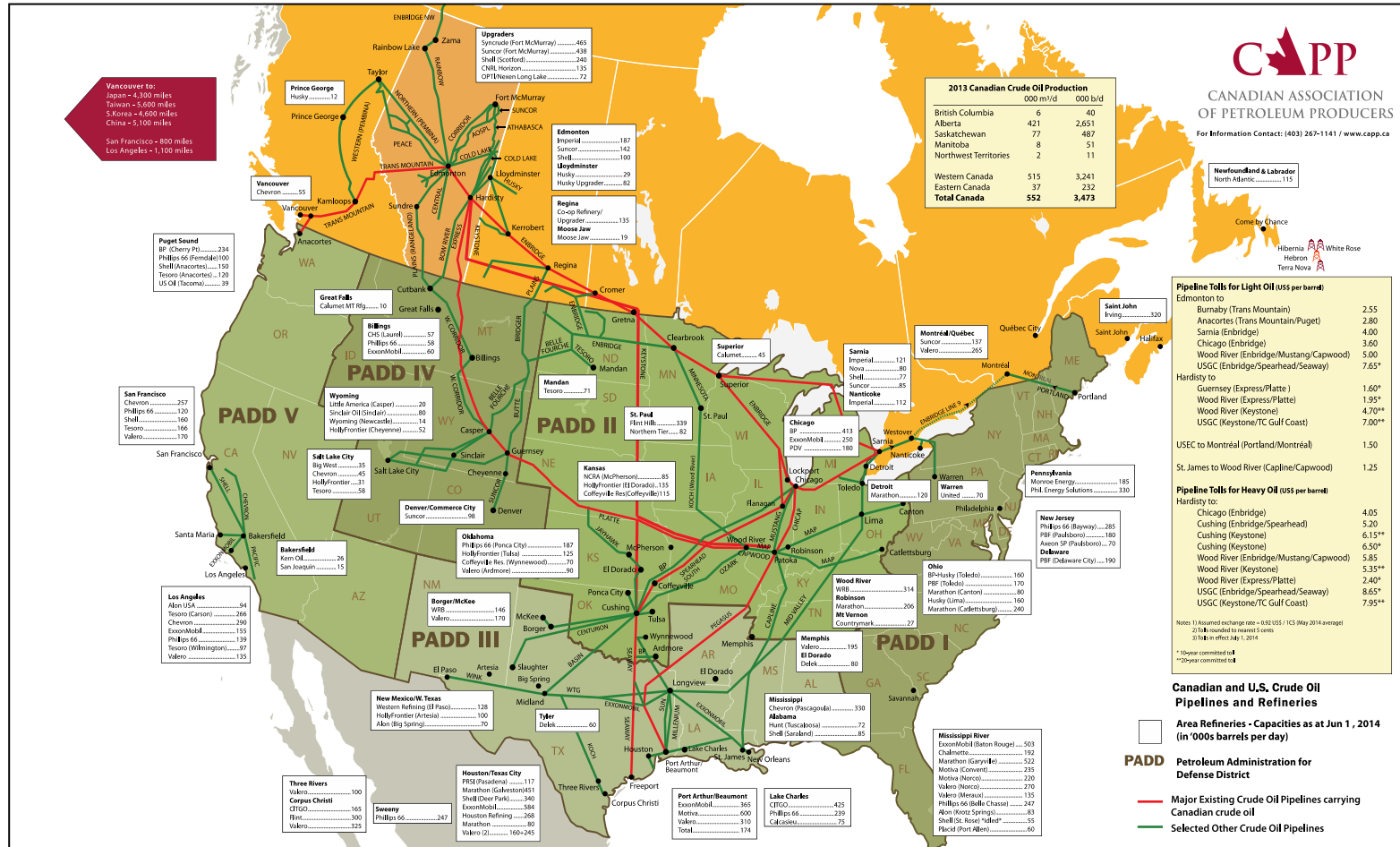
Bitumen Upgraders transform raw bitumen into synthetic oil. Bitumen upgraders reside solely in Alberta. There are currently 5 upgraders in Alberta: (i) Scotford Upgrader in Scotford (Athabasca Oil Sands Project), with average daily capacity of 255,000; (2) Horizon Oil Sands in Fort McMurray (CNRL), with average daily capacity of 110,000 bbl/d; (3) Long Lake in Fort McMurray (Nexen), with average daily capacity of; (4) Syncrude in Fort McMurray (Joint Venture), with average daily capacity of 350,000 bpd; and (5) Suncor in Fort McMurray (Suncor), with average daily capacity of. Scotford Upgrader is linked to the Corridor pipeline owned by Shell, Marathon, and Chevron, which transports crude from Fort McMurray to the Edmonton area. Horizon Oil Sands is

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<sup>97</sup> See NRCAN website – Canadian Refineries

expected to increase to 250,000 bbl/d in Q3 2014. Long Lake is connected to a pipeline that transports crude to the Cheecham Terminal, and is then transported through Enbridge's Athabasca Pipeline. Syncrude transports synthetic crude through the Alberta Oil Sands System to Edmonton.

Figure 45: Pipelines and Refineries in North America<sup>98</sup>



<sup>98</sup> [Pipelines and Refineries in North America]. Retrieved from <http://www.refinerlink.com/userfiles/RL%20MAD%20Pipeline%20Map.jpg>

### A.3.6.3. US Refineries

There are currently 139 operating refineries in the US<sup>99</sup>. For the intent and purpose of my analysis I will only consider the larger refineries served or will be served by (determined by their proposed projects) either Enbridge, TransCanada, or Kinder Morgan.

Some of the larger refineries served or will be served by one of those companies are: (1) BP Whiting<sup>100</sup> (BP) in Chicago, with average capacity of 428,000 bpd (2) Joliet<sup>101</sup> (ExxonMobil) in Chicago, with average capacity of 250,000 bpd; (3) Lemont<sup>102</sup> in Chicago, with average capacity of 167,000 bpd (4) Marathon in Detroit, with average capacity of 120,000 bpd; (5) WRB in Wood River, with average capacity of 314,000 bpd; (6) Marathon in Robinson, with average daily capacity of 206,000 bpd; and (7) Flint Hills in St.Paul, with average capacity of 339,000. In the last quarter<sup>103</sup> of 2013 BP brought their BP whiting modernization project online.

The BP whiting modernization project<sup>104</sup> has the capability to process up to 85% heavy crude, relative to the previous 20%. The project consists of: (i) Distillation Unit, (ii) Petroleum Coker, (iii) Gas Oil Hydro Treater, and (iv) Sulfur Recovery Complex.

The Joliet Refinery manufactures mostly diesel and gasoline, but also propane, butane, and asphalt. Joliet is strategically located to refine Canadian crude received through pipelines. The major refining equipment installed in the Joliet refinery<sup>105</sup> are: (1)

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<sup>99</sup> See EIA – Petroleum & Other Liquids

<sup>100</sup> See BP website – BP Whiting Refinery

<sup>101</sup> See ExxonMobil website – Joliet Refinery

<sup>102</sup> See Citgo refining website – Lemont Refinery

<sup>103</sup> See BP website – US Refinery

<sup>104</sup> See BP website – Whiting Refinery Modernization Project

<sup>105</sup> See Exxon Mobil website– Joliet Refinery

Distillation, (2) Fluid Catalytic Cracker, (3) Coker, (4) Reformer, (5) Catalytic hydro-desulfurization unit, (6) Wet gas scrubber, and (7) Wastewater treatment.

Lemont produces motor gasoline, diesel fuel, aviation turbine fuel and heating oil. Equipment installed in the Lemont Refinery are: (1) Atmospheric Distillation, (2) Vacuum Distillation, (3) Delayed Coker, (4) Fluid Catalytic Cracker, (5) Catalytic Reformer, (6) Sulphur Recovery unit, and (7) Hydrotreating units.

The Lemont refinery mainly refines Venezuelan Heavy Oil. Marathon<sup>106</sup> in Detroit uses sweet and sour crude, but has the capability to use Canadian crude as inputs. Its operations include: (1) Catalytic Cracking, (2) Atmospheric Distillation, (3) Reforming, (4) Hydrotreating, and (5) Coking. The Detroit Heavy Oil Upgrade Project, that increased daily capacity of heavy crude processing to 80,000 barrels from 14,000 barrels was completed in 2012.

WRB processes Heavy crude oil received from WCSB oil sands. In 2011, the WRB Coker and Refinery Expansion project was completed doubling the heavy crude refining daily capacity to 240,000 barrels, and increasing 65,000 bpd by installing a new Coker allowing WRB to process increasing supplies of heavy crude. WRB operations include: (1) Atmospheric Distillation (306,000 bpd), (2) Vacuum Distillation (130,200 bpd), (3) Delayed Coking (18,000 bpd), (4) Fluidized Catalytic Cracking (101,000 bpd), and Hydrocracker (41,000 bpd). Marathon in Robinson<sup>107</sup>, uses sweet, sour, and Canadian ultra heavy crude as inputs. Marathon in Robinson operations include: (i) Atmospheric Distillation (206,000 bpd), (ii) Vacuum Distillation (71,500 bpd), (iii) Delayed Coker (29,000 bpd), (iv) Fluidized Catalytic Cracker (55,000 bpd), and (v)

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<sup>106</sup> See Marathon website – Michigan Refinery

<sup>107</sup> See Abarrefull website – Wood River Refinery

Hydrocracking (28,000 bpd)<sup>108</sup>. Flint Hill processes very heavy crude, and is the largest processor of heavy crude in America.

Flint Hill received its crude through the Minnesota Oil Pipeline, which largely received its crude from the Enbridge system. Flint Hill operations include: (I) Vacuum Distillation (196,000 bpd), (II) Delayed Coker (67,000 bpd), (III) Fluid Catalytic Cracker (86,500 bpd), (IV) Hydrocracker (44,000 bpd), and (V) Catalytic Reforming (51,300 bpd).

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<sup>108</sup> See Abarrelfull website – Robinson Refinery