Equity Valuation
Canadian National Railway

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Abstract

This dissertation with the title *Equity Valuation – Canadian National Railway* was written by Oliver Franz-Hermann Pach.

The master thesis deals with the determination of the fair share value of Canadian National Railway. First, the author reviews the state-of-the-art methods for equity valuation in a literature review.

Then, an analysis of the industry and the company itself is conducted and risks are highlighted. In the valuation section, a DCF valuation, sensitivity analysis and the modeling of two different scenarios are applied. In the DCF valuation, revenues and costs are forecasted, and the free cash flow to firm (FCFF) is determined, which in turn is discounted to the current value using the weighted average cost of capital (WACC). In addition, a valuation is performed using relative valuation approaches. Finally, the calculation of the value-at-risk for different time periods is intended to illustrate the risk of an investment.

Both methods achieve slightly different results, the DCF and the scenarios indicate a slight undervaluation of CNR whereas the multiples rather show a slight downside. All in all, a target price of CAD 151 and a HOLD recommendation is arrived at. The own analysis will also be compared with an existing analyst report from Vertical Research Partners to identify similarities and differences.

Keywords: equity valuation, company valuation, cost of capital, financial forecast, analyst report, stock analysis

Abstrato

Esta dissertação com o título *Equity Valuation - Canadian National Railway* foi escrita por Oliver Franz-Hermann Pach.

A tese de mestrado trata da determinação do valor justo das acções da Canadian National Railway. Em primeiro lugar, o autor revê os métodos mais avançados para a avaliação de acções numa revisão bibliográfica.

Em seguida, é feita uma análise da indústria e da própria empresa e são destacados os riscos. Na secção de avaliação, é aplicada uma avaliação DCF, uma análise de sensibilidade e a modelação de dois cenários diferentes. Na avaliação DCF, são previstas receitas e custos, e é determinado o fluxo de caixa livre para a empresa (FCFF), que por sua vez é descontado para o valor actual utilizando o custo médio ponderado do capital (WACC). Além disso, é efectuada uma avaliação utilizando abordagens de avaliação relativa. Finalmente, o cálculo do valor em risco para diferentes períodos de tempo destina-se a ilustrar o risco de um investimento.

Ambos os métodos atingem resultados ligeiramente diferentes, o DCF e os cenários indicam uma ligeira subavaliação do CNR enquanto que os múltiplos mostram uma ligeira desvantagem. Tudo considerado, chega-se a um preço-alvo de CAD 151 e a uma recomendação HOLD. A própria análise será também comparada com um relatório de analista existente dos Vertical Research Partners para identificar semelhanças e diferenças.

Palavras-chave: equity valuation, company valuation, cost of capital, financial forecast, analyst report, stock analysis

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List of Abbreviations

A/P	accounts payable
A/R	accounts receivable
APV	adjusted present value
B	net debt issuance
BNSF	Burlington Northern Santa Fe
CAD	Canadian dollar
CAGR	compound annual growth rate
CapEx	capital expenditure
CAPM	capital asset pricing model
CEO	chief executive officer
CMA	conservative minus aggressive
CNR	Canadian National Railway
CoC	cost of capital
CP	Canadian Pacific Railway
CSX	CSX Transportation
D	debt
D/E	debt-to-equity
D&A	depreciation & amortization
DCF	discounted cash flow
Div	dividend
E	equity
EBIT	earnings before interest and tax
EBITDA	earnings before interest, tax, depreciation and amortization
EIA	Environmental Investigation Agency
ERP	equity risk premium
EV	enterprise value

FCFD	free cash flow to debt
FCFE	free cash flow to equity
FCFF	free cash flow to firm
FDX	Fedex
FF3	Fama-French 3-factor model
FF5	Fama-French 5-factor model
g	growth rate
GDP	gross domestic product
GTM	gross ton-mile
HML	high minus low
I	interest payments
i.e.	id est ('that is to say')
IMF	international monetary fund
Inv	inventory
IPO	initial public offering
KCS	Kansas City Southern Railway
KPI	key performance indicator
L	loss rate
NSC	Norfolk Southerm Railway
NI	net income
NOPAT	net operating profit after tax
NWC	net working capital
p	probability
P	price
P/E	price to earnings ratio
PE	preferred equity
PPE	plants, property & equipment

PV	present value
r	respective discount rate
RMW	robust minus weak
ROE	return on equity
ROIC	return on invested capital
RTM	revenue ton-mile
S&P500	Standard & Poor's 500 index
SMB	small minus big
SWOT	strengths, weaknesses, opportunities, threats
TSX	Toronto Stock Exchange
TV	terminal value
UNP	Union Pacific Railroad
UPS	United Parcel Service
USD	United States dollar
V	value
VaR	value at risk
VR	Vertical Research Partners
WACC	weighted average cost of capital
WC	working capital
WTI	West Texas Intermediate
YTM	yield to maturity

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1. Introduction

In the course of the thesis, the fair share value of Canadian National Railway in CAD shall be determined. Accordingly, the research question is formulated as following:

What is the fair share price of Canadian National Railway on the 5th of April 2022?

The date was chosen because the final results from 2021 were available by then. Quarterly reports from 2022, on the other hand, were not yet available for analysis.

The motivation originates from the fact that the railway industry holds an incredible fascination. It has existed for centuries but still must constantly realign itself. The transport of goods is subject to global economic developments. However, the railway industry is also vital for the economy. The transport of raw materials and foodstuffs is the backbone of functioning value chains for many companies and communities.

2. Literature Review

2.1 Purpose of an analyst report

Investors have a great need for information when it comes to selecting stocks. However, obtaining information requires a great deal of effort, and there are often many different primary and secondary sources of information available to investors. Equity analysts act as an intermediate party (Huang et al., 2018). They perform in-depth analyses based on various information sources, summarize, and evaluate them in an analyst report. In addition to quantitative analyses, also qualitative considerations are reflected. I will examine the question of what elements an analyst report usually includes, what tasks it should fulfill and what information content it has.

According to Previts et al. (1994), the most essential component in an analyst report is discussing the income statement, for example, earnings, earnings per share, sales or profitability. Such discussions are found in almost three-quarters of all analyst reports examined by the authors. In addition, cash flow-related discussions are particularly relevant and serve as a basis for the company valuation and the determination of the present value.

Previts et al. (1994) also argue that not only financial information is included in analyst reports, but to a large extent also non-financial information. These include a consideration of market share, competition and an assessment of management competence. Qualitative models such as SWOT analysis or Porter's Five Forces are often used to examine the company's environment and its own strengths and weaknesses. All information is bundled in an investment recommendation for the investor and a target price for the stock under consideration (Huang et al., 2018). Both the qualitative as well as the quantitative considerations in an analyst report create value for investors and are of great importance (Bradley et al., 2014).

The main task of an analyst report is to provide information for the investor and thus to reduce uncertainties with regard to her investment decision (Huang et al., 2018, p. 2833ff). The authors state, that value creation for investors can be based on private research by the analyst, or on analysis and simplification of public information. According to existing literature, these two main tasks of an analyst can be summarized as information discovery and information analysis (Chen et al., 2010). About 31% of all analysts perform the role of information discovery, and about 69% the role of information interpretation (Huang et al., 2018, p. 2848). Huang et al. (2018) define numerous possible sources of information in the discovery process, including supply chain analysis, private interaction with senior executives, hiring independent analysis firms, company visits, as well as investigating similar firms. Hence, this information can be used to make the company's valuation and forecasting more accurate. The authors define the information analysis role as analysts filtering out important issues from all publicly available documents and conference calls. This makes them directly accessible to the investor, who can therefore absorb the information in the shortest possible time. At the same time, an independent analyst's assessment can help to verify the company's or manager's statements, thus eradicating the agency problem.

Nevertheless, investors are generally to some degree skeptical of analyst reports because they do not know whether the analysts are representing the investors' interests or the interests of the bank or someone else. According to Morgan & Stocken (2003, p. 26f.), positive information and buy recommendations are therefore generally scrutinized more critically by investors. Analysts are therefore not always in a position to communicate positive information credibly to investors, even if there is no conflict of interest at all. The situation is different in the case of negative information, where investors trust analysts much more because a conflict of interest is largely ruled out.

2.2 Discussion of non-financial information

Important elements of a discussion of non-financial information are models such as Porter's Five Forces and the SWOT analysis as well as the analysis of the management.

Porter's Five Forces Model describes the five key areas to which a company is exposed. It is originally used in strategy development to position a company where the forces are weakest (Porter, 2008, p. 24). Accordingly, the five fundamental forces are supplier power, customer power, established competitors, potential new market entrants and potential substitutes for the company's own products. For each force, it is analyzed to what extent there is a threat or what opportunities the company itself has to develop further. Having its sources in strategy development, this model also helps considerably in understanding the company from an outside holistic perspective and thus be an essential part of an equity valuation (Dobbs, 2014, p. 35).

A similar framework for identifying own strengths (S) and weaknesses (W), as well as opportunities (O) and threats (T) is provided by the SWOT model. A SWOT analysis can therefore be described as an analysis of the current state of the company regarding above mentioned four categories. SWOT analysis can identify suboptimal performance and key points that may have an impact on the future development of the company (Leigh, 2009, p. 1092f.). This can be helpful for modeling scenarios in equity analysis.

In a study by Breton & Taffler (2001, p. 99) could also be shown that the analysis of the management and the corporate strategy creates a further significant information basis and is of great importance in the equity valuation.

2.3 Discussion of financial information

In addition to the non-financial information included in an analyst report, the most prominent part consists of the quantitative valuation of the company. Given that the law of one price holds (Baffes, 1991), the company's value can be determined by different methods. In the following, the foundations as well as the most important evaluation methods are discussed.

2.3.1 Cost of Capital

According to Pratt & Grabowski (2014), cost of capital can generally be defined as follows: *„The cost of capital is the expected rate of return that market participants require in order to attract funds to a particular investment."*
This means that investors expect the same return from one investment that another investment with the same risk would yield. Following this definition, it seems logical that the cost of capital consists of two components, the risk-free rate and the appropriate risk premium as compensation for holding a respective asset.
The cost of capital is used to value investments or projects by applying it as a discount rate to all future cash flows underlying this particular asset. In this way, the present value of the respective asset is determined. For this calculation it is usually assumed that the cost of capital for an asset remains constant over all future periods.
For the purpose of valuing a company, there are three components of funding to consider, debt, equity and preferred equity. Each of these components has its own cost of capital, which will be examined in more detail below. Since shareholders are subordinated to creditors in an insolvency, the risk premium for equity is generally higher than that for debt.

2.3.1.1 Cost of Equity

Although the cost of equity is determined by market forces, it cannot simply be found anywhere. Therefore, it requires the help of models, for example the practically applicable capital asset pricing model, CAPM, or the Fama-French three factor model, FF3 (Fama & French, 1996). A possible extension of the latter would be the Fama-French five factor model, FF5.

CAPM. Investors are exposed to two types of risk in their investments, systematic risk and firm-specific risk. The latter can be eliminated by diversification and does not play a major role in determining the cost of equity (Bali et al., 2005). However, systematic risk cannot be eliminated; the investors always demand compensation for taking this risk. The CAPM was developed by Sharpe (1964) and Lintner (1965) and is a way to identify this systemic risk linked with an investment.

The model consists of the risk-free rate r_f, since it is assumed that every market participant can invest and borrow money at this rate without risk. In addition, a risk premium is added. This is calculated using the beta, the so-called risk factor, and the market excess return or equity risk premium, ERP. The levered beta must be used to calculate the return on equity. The market excess return is the return of the total market against the risk-free rate.

Equation 1: CAPM

$$r_e = r_f + \beta_{levered} * (r_m - r_f) = r_f + \beta_{levered} * ERP$$

The risk-free rate is normally the return on government bonds issued by particularly creditworthy countries. The risk-free rate should always be selected in such a way that it matches the target investment both geographically and in terms of time horizon. If a long-term investment in U.S. dollars is sought, the yield of 10-year or 20-year U.S. government bonds is usually used as the risk-free rate (Pratt & Grabowski, 2014, p. 92).
The market excess return is calculated as the difference between the market return and the risk-free rate. Both the risk-free rate and the market return are forward-looking, i.e., they should reflect expected future developments. In practice, however, historical averages of the respective region are often used to calculate the market return; for U.S. equities, this is often the S&P500. To remain consistent in the analysis, the market risk premium should span the same period as the risk-free rate (Pratt & Grabowski, 2014, p. 115). Thus, if the yield of a 10-year U.S. bond is used as a risk-free rate, the market premium should also be calculated with a market return over the next 10 years. Beta is a risk factor that reflects the sensitivity of the returns of the asset compared to the market returns (Elbannan, 2014, p. 218). Mathematically this can be expressed as the following:

Equation 2: Beta levered

$$\beta_{levered} = \frac{covariance\ (r_e, r_m)}{\sigma^2(r_m)}$$

As an alternative to calculating the company-specific beta, it may be applicable to use an industry-specific beta, provided that the industry is sufficiently homogeneous, narrowly defined and competitors have similar capital structure. In addition to the CAPM, other regression models are also suitable for calculating the cost of equity with more influencing factors. A further explanation of FF3 and FF5 models can be found in the appendix.

2.3.1.2 Cost of Debt

The cost of debt is the cost that a company must pay on its debt financing. If the company has publicly traded bonds outstanding and a default is highly unlikely, then the cost of debt can be obtained from the yield of the bonds, the YTM. If several bonds are outstanding, the weighted average is used to determine the cost of debt. However, if there is a significant default probability p, this must be included in the calculation of the cost of debt (Berk & DeMarzo, 2017, p. 450). In case of default, investors would then only be compensated with $(1 - L + YTM)$, L being the loss rate.

Equation 3: Cost of debt, pre-tax

$$r_{d,pt} = (1 - p) * YTM + p * (YTM - L)$$

It is also important to distinguish between pre-tax and after-tax cost of debt. As interest expenses are tax deductible and thus form a tax shield, this must be taken into account in the calculation of the real cost of debt (Pratt & Grabowski, 2014, p. 528). The after-tax cost of debt is relevant for the further calculation of the weighted average cost of capital.

Equation 4: Cost of debt, after-tax

$$r_{d,at} = r_{d,pt} * (1 - tax)$$

2.3.1.3 Unlevered Cost of Capital

In some cases, one must know the unlevered cost of capital, i.e. the cost that the company would have if it were to disregard the effect of debt financing (Berk & DeMarzo, 2017, p. 453). In this case, the unlevered beta must be used to calculate the cost of capital. If the levered beta is known, it can be derived using the formula below.

Equation 5: Beta unlevered

$$\beta_{unlevered} = \frac{\beta_{levered}}{(1 + [(1 - tax) * \frac{D}{E}]}$$

Using the unlevered beta, the unlevered cost of capital can be determined according to the CAPM in the same way as above.

Equation 6: Unlevered cost of capital

$$r_u = r_f + \beta_{unlevered} * (r_m - r_f) = r_f + \beta_{unlevered} * ERP$$

2.3.1.4 Weighted Average Cost of Capital (WACC)

In order to value a company with a mixed capital structure, one needs the overall cost of capital of the company, the after-tax weighted average cost of capital, WACC. The WACC weights the respective cost of capital according to the share of the asset class in the total capital structure (Berk & DeMarzo, 2017, p. 461). This can consist of equity, preferred equity or debt. Since debt forms a tax shield, the after-tax cost of debt must be used to compute the after-tax WACC.

Equation 7: Weighted average cost of capital

$$r_{wacc} = r_e * \frac{E}{E + PE + D} + r_{pe} * \frac{PE}{E + PE + D} + r_{d,pt} * \frac{D}{E + PE + D} * (1 - tax)$$

The amount of equity or debt should always reflect the market value. A more controversial issue is the treatment of deferred income taxes or other positions such as lease liabilities. Deferred income taxes are an amount that the company may have to pay in the future but are not included in liabilities in the balance sheet but as an extra item. A conservative approach, however, would be to treat them as a liability and thus include them in the calculation of the debt for the WACC (Damodaran, 2012, p. 40). However, this amount should be discounted from the time the company reaches the steady state. One possible discounting factor is the cost of debt (Nurnberg, 1972, p. 660).

2.3.2 Gordon Growth Model

The Gordon Growth Model is a simple method of valuing a company based on its dividends. Since it largely ignores external market conditions and excludes detailed assumptions, its structure is less complex than other models. The model is most suitable for companies that pay

a continuous dividend and have a stable dividend policy in the future. A detailed description of the model can be found in the appendix.

2.3.3 Discounted Cash Flow Model

The discounted cash flow model works in a similar way than the Gordon Growth Model. However, instead of expected future dividend payments, future free cash flows are discounted to find their present value. A DCF is significantly more complex than the Gordon Growth Model and therefore requires a high number of assumptions to forecast future cash flows. This refers, for example, to the prediction of revenues, the development of costs, taxes, investment activities, working capital as well as the perpetuity growth rate. In modelling cash flows, a distinction must be made between free cash flow to equity (FCFE), free cash flow to debt (FCFD) and free cash flow to firm (FCFF).

FCFE. The FCFE indicates the amount that could be distributed to equity holders, for example in the form of dividends or share repurchases. However, this is not the same as the actual dividend, as a company often does not pay out the entire cash flow directly but tries to smoothen dividend payments over periods (Shrieves & Wachowicz, 2001, p. 36). There are various methods of calculating the FCFE, but the most common is via net income (Berk & DeMarzo, 2017, p. 684). First, depreciation and amortization are added back to net income, as these represent non-cash expenses. At the same time, capital expenditures are deducted, as these are an effective cash outflow. The change in working capital is also deducted, as this is not available for distribution but is used to maintain operations. In addition, the net debt issuance must be added. Net debt issuance is calculated as the difference between new debt issuance and interest payments on existing debt. Since the FCFE is attributable to the equity holders, the return on equity serves as the discount factor. Consequently, the equity value of a company can be determined.

Equation 8: Free cash flow to equity

$$FCFE_t = NI_t + D\&A_t - CapEx_t - \Delta WC_t + \Delta B_t$$

FCFD. FCFD, on the other hand, is easier to determine and reflects the amount attributable to debt holders. It consists of the difference between the interest payments and the net debt

issuance (Shrieves & Wachowicz, 2001, p. 36). The return on debt must be used as the discount factor here.

Equation 9: Free cash flow to debt

$$FCFD_t = I_t + \Delta B_t$$

FCFF. The FCFF is also called unlevered free cash flow. It allows to better compare companies with different capital structures (Mielcarz & Mlinaric, 2014). Therefore, interest income or expenses are not included in computing the FCFF. The steps to find the FCFF is described in the following and derived from Berk & DeMarzo (2017). The EBIT serves as the basis for calculation. Taxes are deducted to obtain NOPAT or unlevered net income. Since depreciation is previously deducted to reduce the tax burden, it must be added back to the NOPAT. At the same time, investments in property or equipment and changes in net working capital are deducted from the NOPAT. After complete adjustment, the FCFF of the respective period is derived.

The FCFF indicates how much cash the company has available in each period for all its stakeholders. It is disbursed to equity holders and preferred equity holders (dividends or stock repurchases) and debt providers (interest payments). Therefore, the appropriate discount rate is the WACC (Berk & DeMarzo, 2017, p. 323). Since it is not possible to infinitely forecast the individual FCFF per period in detail, a steady state of the company is assumed after five to ten periods. Thereafter the FCFF continues to grow with a constant growth factor, or no growth at all. In the model, this is indicated by the terminal value, which is calculated according to the Gordon Growth Model approach (Berk & DeMarzo, 2017, p. 323). In the case of stable companies, the FCFF from the previous year, i.e. the last detailed forecasted year, serves as the basis. For seasonal companies, an average of the last business cycle is usually used as the basis for the TV. The sum of all discounted FCFFs and the discounted TV leads to the enterprise value. According to Berk & DeMarzo (2017, p. 322), the enterprise value can be interpreted as the value that one would have to pay to acquire the equity of the company in addition to existing cash and the cost of paying off the debt. In a final step, the enterprise value must be adjusted for net debt to get the equity value of the company. This is done by adding the cash reserves and deducting the current debt and long-term debt.

Equation 10: Free cash flow to firm

$$FCFF_t = NOPAT_t + D\&A_t - CapEx_t - \Delta WC_t$$

Equation 11: Terminal value

$$TV_t = \frac{FCFF_t * (1 + g)}{r_{wacc} - g}$$

Equation 12: Equity value

$$Equity\ Value = Enterprise\ Value - Net\ Debt$$

To obtain the fair price per share, the equity value must now be divided by the number of outstanding shares. If the firm maintains a constant debt-to-equity ratio over time, a DCF method using the WACC to discount the FCFF is the most efficient method.

2.3.4 Adjusted Present Value

However, there are also cases in which the debt-to-equity ratio is variable over time, and therefore discounting the FCFF with a constant WACC is not expedient. In this case, it is helpful to determine the unlevered value of the company and to separately value the tax shields arising from interest payments. Both are added to obtain the levered value of the firm (Berk & DeMarzo, 2017, p. 680). This separate approach is called the adjusted present value method.
The unlevered value of the company is found by discounting all expected FCFF and the TV with the unlevered cost of capital. The present value of the tax shield, or also referred to as the net effect of debt, must be added. It comprises all future interest payments multiplied by the company's tax rate, discounted at the appropriate discount rate. If the company has a constant debt to equity ratio, these tax shields will also be discounted at the unlevered cost of capital. Thus, the same value is determined as with the DCF and the WACC. However, in the case that the company has a variable debt-to-equity ratio, the discount rate for the tax shields can be adjusted accordingly.

Equation 13: Adjusted present value

$$V_L = V_U + PV_{tax\ shield}$$

2.3.5 Relative Valuation

The earnings-based valuation methods such as DCF and APV are not always practicable, as important input to forecast the cash flows can be missing or the data availability is poor. For this reason, the relative valuation was developed in order to derive a reasonable valuation based on similar companies, the peer group. Thereby, valuations of companies from the peer group are projected proportionally onto the company to be valued (Högsdal et al., 2017).

The peer group may consist of companies that are in the same industry, with similar business model or line of business, or that have similarity based on their valuation fundamentals (Eberhart, 2001; Nel, 2015).

Multiples can be divided into two categories: equity multiples and enterprise value multiples. For equity multiples, the market capitalization of the company from the peer group is set in relation to a another KPI. The same principle applies to enterprise value multiples, where the enterprise value is found in the numerator instead. If the multiple of the peer group is known, this can be used to extrapolate the equity or enterprise value of the company to be valued with the respective input, e.g., sales, earnings, EBITDA.

Popular equity multiples are, for example, the price earnings ratio (P/E) or the price sales ratio (price/sales). A distinction is also made between forward-looking multiples and trailing multiples. Forward-looking multiples are based on expected earnings for the next 12 months or even two to three years, while trailing multiples are based on the past 12 months. Forward-looking multiples are generally preferred insofar as possible and also show more reliant results (Liu et al., 2002, p. 137). In practice, enterprise value to EBITDA (EV/EBITDA), enterprise value to EBIT (EV/EBIT) or enterprise value to revenue (EV/Revenue) have become established as enterprise multiples. It has also been shown that the inaccuracies in the use of multiples in the valuation with the EV/EBITDA multiple are the lowest (Berk & DeMarzo, 2017, p. 328).

It is important to be as consistent as possible in the selection of the two KPIs used (Högsdal et al., 2017). This means that for equity multiples, in addition to market capitalization, a KPI should be used that is restricted to equity holders. If this is not the case, as it is for example for the P/E ratio, the valuation using may be distorted because the companies used from the peer group have different levels of debt, i.e., a different capital structure (Damodaran, 2002).

In the further course of the dissertation, the DCF, the APV method as well as the relative valuation will be used. The Gordon Growth Model appears to be too imprecise.

The DCF makes it possible to incorporate identified developments in the forecast and therefore to create a very detailed model. However, as this can also be prone to errors, the relative valuation is used as a counterweight, which ranks and values CNR within the spectrum of the peer group. The APV method will be used primarily to shed light on a hypothetical scenario of increased indebtedness, as the tax shield can be assessed separately.

3. Company and industry analysis

3.1 Company Profile

Canadian National Railway is the largest railroad company with class 1 tracks in Canada. To be classified as a class 1 railroad, revenue must exceed USD 504m in the USA (Surface Transportation Board, 2020) or CAD 250m in Canada (Canadian Transportation Agency, 2015). The headquarter is in Montreal where CNR employs a total of 22,600 people by end of 2021 (CNR Annual Report, 2021).

The company was founded in 1919 by the Canadian government as a crown corporation through the consolidation of several insolvent rail lines (Boardman et al., 2009, p. 62). Until its privatization in 1995, the Canadian government had to provide financial support several times to save the rail company from the threat of insolvency posed by strong U.S. competitors. The network covers 19,500 route miles and connects the Canadian west coast, east coast and the U.S. south coast. In addition, customers have access to the Mexican class 1 track network through connecting lines. These include major ports and hubs from Vancouver to Montreal to Halifax and south through Chicago to New Orleans.

According to the 2021 year-end report, CNR today transports 300 million tons of freight annually from seven business lines, giving it a highly diversified footprint. The business lines are divided into seven commodity groups such as intermodal products, automotive, petroleum and chemicals, grain and fertilizers, forest products, metals and minerals, and to a smaller extent coal. Geographically, CNR's revenues break down into approximately 18% domestic Canadian transports, 16% domestic U.S. transports, 31% trans-border transports, and 35% overseas. CNR is also a strategic pioneer in Scheduled Railroading, which operates regular lines and thus functions more efficiently for both customers and the company itself (CNR

Annual Report, 2020). The model replaced the focus on creating the longest possible trains, which led to railcars and containers sometimes having to wait a very long time for departure. CNR is also investing heavily in infrastructure and the expansion of the rail network, as well as in new efficient locomotives. This also contributes to CNR being a sustainability leader, consuming 15% less fuel per gross ton mile than the average class 1 operator in North America (CNR Annual Report 2020, p. 11).

CNR shows quite constant margins, which, due to COVID effects, slumped slightly in 2020. In 2021, however, they rose above historical levels. This is mainly due to a one-time payment, a merger termination fee resulting from the failed acquisition of KCS. Margins are therefore expected to return to normal levels thereafter.

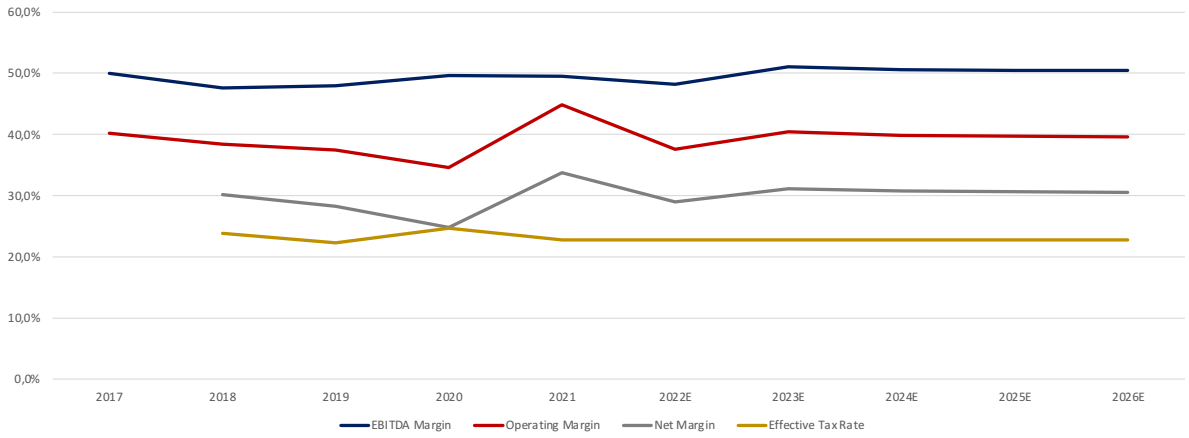


Figure 1: Margins, 2017-2021 and 2022-2026 estimated.
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), Refinitiv Eikon.

3.2 Risk Exposure

The company is exposed to various business risks as discussed in the annual report 2021. These include risks in connection with COVID-19 and the associated supply chain disruptions, higher commodity prices, staff shortages and fluctuations in freight demand. Such risks are considered later in the scenario analysis.

Competition is also a risk, especially through CP covering similar industrial regions. But also, other modes of transportation are listed as possible competitors. In addition, the company also lists regulatory risks in the areas of environment, economy and safety. CNR is subject to risks in cross-border traffic between the U.S. and Canada, as some rail lines involve multiple border crossings. It is also emphasized that general economic risks and fluctuations also have a great

impact on CNR's business. Many goods that CNR transports are subject to cyclical demand, such as wheat. Cybersecurity risks are also mentioned, as CNR's railway systems are highly interconnected. Financial risks such as interest rate risks will be shown in more detail later in the sensitivity analysis.

3.3 Industry Analysis

Canada and the USA together comprise a 300,000 road miles rail network, making it the largest in the world (John, 2021, p. 21). The market size of the Canadian as well as the U.S. railroad transportation industry was USD 18.4bn and USD 76bn, respectively, in 2021 (IBIS World, 2022). Total freight revenue in the North American railroad industry shows significant growth in both the U.S. and Canada between 2010-2019, pre-COVID. In the USA, the CAGR in the above period was 3.6% (AAR, 2020), and in Canada the CAGR between 2013-2019 was as high as 5.3% (StatCan, 2021a).

It is also noticeable that the locomotive fleet grew at a much lower rate during this period, meaning that trains became longer on average and were used more efficiently. The total fleet in North America shows a CAGR of only 1.75% between 2010-2019 (Railinc, 2021), specifically in the USA only 0.29% (Bureau of Transportation Statistics, 2022). It also shows that revenues in the industry have been driven by both more volume and higher imposed prices. For example, revenue ton-miles in Canada grew at a CAGR of 3.0% between 2010-2019 (Railway Association of Canada, 2021). A revenue ton-mile is the revenue generated to transport one ton of freight over one mile. In the same period, the volume transported in ton-kilometers in Canada also grew at a CAGR of 4.3% (StatCan, 2021b).

The market is highly concentrated, and the competitive situation is essentially determined by seven class 1 railroads on the continent: UNP, BNSF, CSX, NSC and KCS on the U.S. side, and CNR and CP on the Canadian side. BNSF and UNP represent the largest players, each with about USD 20bn in operating revenue in 2020, followed by CSX, NSC, and CNR, each with about USD 10bn in operating revenue, and CP and KCS behind them with USD 6bn and USD 2.5bn in operating revenue (Statista, 2021). Moreover, competition in North America is characterized by the existence of three regional duopolies. The western USA is served by BNSF and UNP, the eastern USA is dominated by CSX and NSC, and in Canada CNR and CP share a large part of the market. Although CNR was a pioneer in the application of Scheduled

Railroading 15 years ago, this system has now become established on the market and is being implemented by all major competitors.

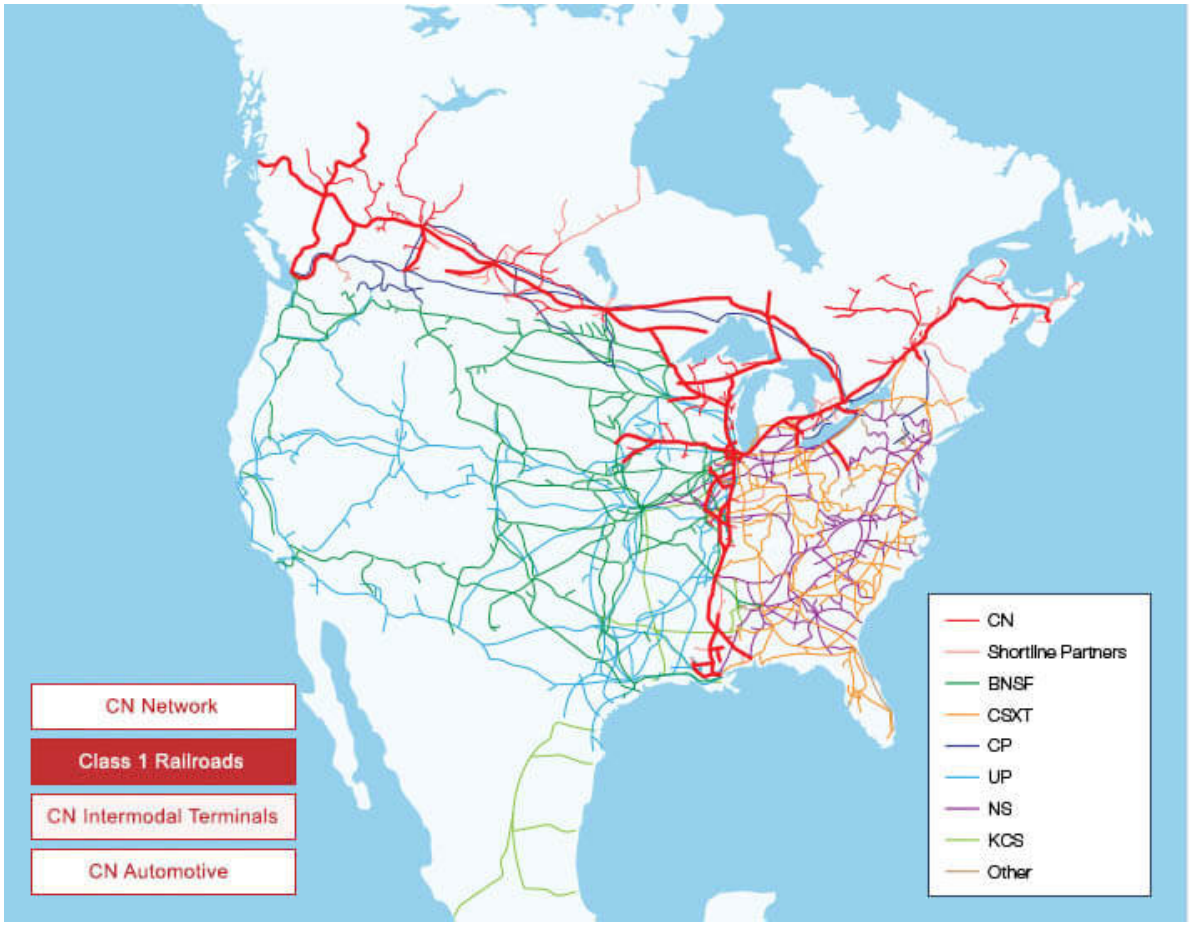


Figure 2: Railway network CNR and competitors
Source: Canadian National Railway (2022).

3.4 Discussion of Management

As of February 2022, Tracy Robinson is CNR's new CEO and therefore deserves special attention. Robinson has more than 20 years of experience with CP in the railroad business as well as leadership experience in the energy business at TransCanada Energy. There she was responsible for the pipeline business. Both expertise combined, the choice of the personnel is to be evaluated as positive, her strategic plans for the orientation of CNR will require special attention in the future.

3.5 Share Price and Shareholder Structure

CNR was only privatized in the 1990s after a long history of state ownership. The IPO then took place on November 17, 1995, and at CAD 2.25bn was the largest IPO in Canada's stock market history at the time. In the past 10 years, the share price has risen steadily from around CAD 38 to CAD 161, which corresponds to a gain of 324%. Looking at the long-term performance against the S&P 500 as the U.S. benchmark and the TSX Composite as the Canadian benchmark, a clear outperformance by CNR becomes apparent. Especially compared to the Canadian stock market this is dramatic.

The largest investor is Cascade Investment, the investment vehicle of Bill Gates with currently 12.64% of the outstanding shares. In addition to Cascade Investment, Bill Gates can also exert influence through the Bill & Melinda Gates Foundation, which holds another 1.86% of the shares. Other major investors include TCI Fund Management, MFS Investment Management and The Vanguard Group. Over 60% of the shares are held in North America, with most of the remainder in Europe and a small proportion in Asia.

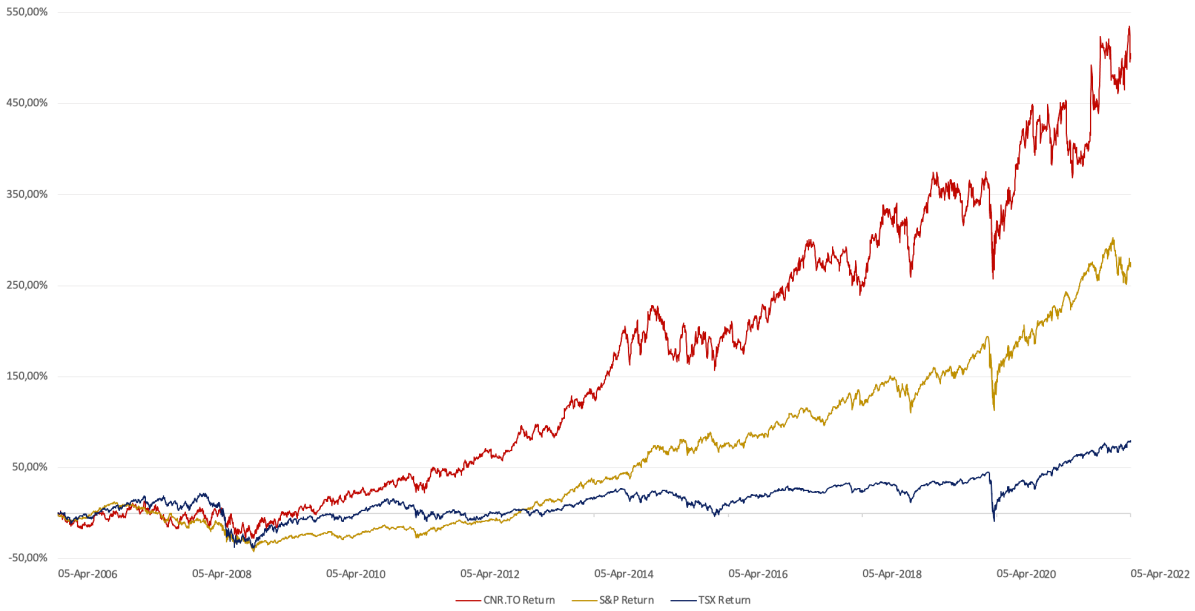


Figure 3: Share performance CNR against S&P 500 and TSX Composite
Sources: own computations, Refinitiv Eikon.

4. Valuation

In the following, CNR is valued using a DCF valuation based on FCFF with a base case, bull case as well as a bear case. In addition, a hypothetical scenario of increased indebtedness is modeled using the APV. Multiples are also applied to obtain an overall valuation.

4.1 DCF Model Base Case

CNR divides its businesses into seven commodity groups, which is why the forecasting of revenues from these groups is also carried out separately for each segment. Subsequently, I model the development of various cost items, as well as working capital, capital expenditures and depreciation. The FCFF is modeled in detail for five years, after which the terminal value is determined based on a perpetuity growth rate. The WACC, calculated by cost of equity, cost of debt and levered beta is used as the discount factor. The net debt is deducted from the resulting enterprise value to obtain the implied market capitalization as well as the implied share price.

4.1.1 Revenues

According to the CNR annual reports (2010-2020) as well as the industry analysis, the growth rates in past revenue are generally attributable to increases in volume and freight rates. Volume, measured in gross ton miles (GTM), grew pre-COVID 2010-2019 by 3.93% per year. A GTM is the product of transported weight and distance traveled in miles and thus is a measure of volume. Revenue ton-miles (RTM), as well as freight revenues per RTM as measures of profitability, grew by 3.39% and 3.96% per year, respectively, over the indicated period. An RTM measures revenue per ton transported per mile traveled. If this increases, it can be interpreted as increased profitability. For freight revenues per RTM, total freight revenues are divided by the total number of RTM. Further details on operating metrics can be found in table 20 in the appendix.

In the past years from 2016 to 2020, alternating positive and negative effects of the USD/CAD exchange rate were reported, which is why this is not explicitly included in the model (CNR Annual Reports, 2017-2021). It can be assumed that exchange rate fluctuations will remain constant over the long term and thus have a negligible impact on cash flows in the long term.

In addition, CNR has made a few smaller acquisitions, such as the intermodal transport division of H&R Transport Limited (H&R) and the Massena rail line of CSX with a scope of 220 miles of track or the TransX group, also an acquisition in the intermodal sector. The acquisition of KCS was ultimately overturned due to concerns raised by the antitrust authorities (CNR Annual Report, 2021).

The model does not explicitly account for further acquisitions, but this is to some extent embedded in the model through past growth rates as an indicator for future growth rates.

Revenues are modelled in detail for each business segment. Various factors are used to determine the projected growth rates, including past growth rates (CAGR from 2010-2019), nominal economic growth as well as industry-specific drivers and adjustments for the respective business segments. These three main variables are in turn weighted to different extents to derive the forecasted revenues. To determine the influence of the respective price drivers on the revenues of the business units, correlations were calculated for the period 1999-2021. The drivers examined include GDP development of Canada and the U.S., U.S. housing starts, crude oil price, coal price as well as general commodity price levels, wheat price, Canadian grain harvest level, and U.S. and Canadian oil production.

Past Growth Rate. Since CNR is a mature company, past growth is used as a proxy to some extent for future growth. The past growth of the individual business segments is calculated as an compounded annual growth rate from data of the annual reports from 2010-2019. The years thereafter were omitted to obtain growth rates not affected by COVID-19. Statistically, past performance has limited predictive power for future performance; only little correlation could be observed between five-year annual performance and performance in the subsequent year from 1999-2021. Therefore, past performance is weighted lower as a driver when forecasting revenues.

Nominal Economic Growth. As freight transport by rail is a good reflection of the general economic situation, it can be assumed that future growth will be to a large extent based on the economic development of the regions where CNR generates revenues from. The determination of economic growth is initially composed of forecasts for Canada, the USA and the rest of the world. Each region in turn is weighted according to its share of total CNR revenues. The IMF's current forecasts of real GDP growth, supplemented by the inflation forecast for the respective region, are primarily used to calculate nominal economic growth. This is forecasted for five years in advance. Since a high correlation of nominal economic growth and the development

of revenues has been shown for almost all segments, this driver is usually overweighted when forecasting. All results on the correlations of the different drivers are listed in the appendix, as well as the computations of nominal economic growth.

Industry-specific Drivers. Some segments are heavily dependent on factors other than the general economic trend, such as the development of raw material prices, oil consumption, housing starts in the USA, and weather influences. These influences are examined for each segment and included in the growth forecast if appropriate. Specific factors are more difficult to forecast reliably than general economic growth. Therefore, these are only considered for 2022 and 2023 and are no longer applied thereafter. From 2024 onwards, revenues are forecasted only on the basis of the general economic development and, to a smaller extent, on the basis of past growth.

Intermodal Products. Intermodal is by far the most important segment. Between 2010 and 2021, the share of total revenues could be increased from 19.0% to 28.4% (CNR Annual Report, 2010-2021). Intermodal products include transportation in containers via rail and trucks in domestic North American trade, as well as for onward transportation at ports and loading onto cargo ships. Domestic transport mainly comprises consumer goods, which is why development is strongly linked to general economic growth. International intermodal transport, on the other hand, depends heavily on international trade patterns. The two acquisitions in the intermodal segment in 2019 resulted in constant revenues in this segment being close to 0% in 2020, unlike the sharp decline in other segments due to COVID-19 effects. However, it can be assumed that there is strong organic growth beyond these acquisitions. Before the acquisitions, the compounded annual growth rate in the intermodal segment between 2010 and 2019 was 10.2% and thus above average. Although the general volumes of all intermodal companies in North America grew by only 0.9% per year on average between 2015 and 2019, CNR was able to generate above-average growth by gaining market share as well as increasing prices (Logistics Management, 2022). CNR has the largest intermodal network in North America with over 23 intermodal hubs and therefore has a strategic advantage. It also has exclusive access to major overseas ports such as the Port of Prince Rupert in British Columbia. Due to the strategic advantages, further above-average growth is forecast for the next five years. It is assumed that the intermodal segment will be the strongest growth driver in the future and that volumes for intermodal transport will be increased further. For the intermodal segment, a high correlation

with the general economic development was identified. For the forecast period, this is therefore given a strong weighting.

Intermodal Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	10,2%	10,2%	10,2%	10,2%	10,2%
Economic Growth	75%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Total Growth			8,8%	6,7%	6,2%	6,1%	6,1%
Total Revenues			4.476	4.775	5.073	5.385	5.711

Table 1: Revenue forecast intermodal products
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

Automotive. The Automotive segment comprises both finished vehicles (92%) and components (8%) delivered to the respective production centers. Automotive has so far shown slightly above average growth but is subject to high fluctuations and accounts with 4% for the smallest share of total revenues (CNR Annual Report, 2021). Growth in the automotive sector is also strongly dependent on car sales, which in turn depend on the general economic development. This could be demonstrated by a high correlation of automotive revenues with the GDP development of Canada and the USA. Other influencing factors could not be identified or do not represent a significant relationship. Therefore, economic growth serves as the most important driver for the revenue forecast in addition to past performance. Automotive has had major problems in recent years not least because of the persistent chip shortage. The volumes produced declined significantly and so did transportation on the North American continent. As this crisis has not yet been resolved, downwards adjustments for the next two years are being made.

Automotive	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,2%	7,2%	7,2%	7,2%	7,2%
Economic Growth	75%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Adjustment	100%	100%	-2,0%	-1,0%	0,0%	0,0%	0,0%
Total Growth			6,0%	4,9%	5,5%	5,4%	5,3%
Total Revenues			611	641	676	713	750

Table 2: Revenue forecast automotive
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

Petroleum & Chemicals. The Petrochemicals segment comprises the transport of chemicals and plastics, refined products, oil and liquefied gases. This segment contributes 19.5%, almost one fifth of total revenues (CNR Annual Report, 2021). The oil fields in Western Canada in particular are of great importance for the volume of shipments, in addition to which Louisiana plays an important role. Petroleum & Chemicals correlates with the general economic development, but a much stronger correlation with Canadian and U.S. oil production is

observed here. Therefore, this is weighted above average in forecasting for the years 2022 and 2023. Subsequently, precise analyses of Canadian oil production are difficult, so this factor is excluded, with general economic growth as the main driver instead.

Petroleum & Chemicals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	9,7%	9,7%	9,7%	9,7%	9,7%
Economic Growth	25%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Crude Oil Production Canada 2022/2023	50%	0%	5,2%	3,6%	-	-	-
Total Growth			7,1%	5,6%	6,1%	6,0%	5,9%
Total Revenues			3.016	3.184	3.379	3.582	3.795

Table 3: Revenue forecast petroleum & chemicals
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), Canada Energy Regulator (2022).

Grain & Fertilizers. Grain includes the transportation of all major harvested grains in North America and is subject to weather-related fluctuations. This is the third most important segment with 17.1% of all revenues. Grain is responsible for 75% of revenues in this business segment, fertilizers contribute only a smaller part to the segment (CNR Annual Report, 2021).
No correlation with the general economic development could be found. The global wheat price also does not appear to have a significant influence on the segment and therefore does not serve as a forecasting basis. Revenues are mainly driven by the Canadian grain harvest and its volume. This in turn is strongly related to weather events, which cannot be forecasted reliably. Therefore, past performance and the pure inflationary development are used as the basis for estimating future revenues. Due to the sanctions currently imposed on Russia, which is a major producer of fertilizer, demand for Canadian fertilizer products is increasing worldwide. As a consequence, the growth forecast for 2022 and 2023 has been adjusted upwards. The same applies to exports of Canadian wheat, for which demand will increase globally due to harvest shortfalls because of the war in Ukraine. This could lead to increased export movements from Canada. Forecasts are adjusted for the next two years accordingly.

Grain & Fertilizers	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	6,0%	6,0%	6,0%	6,0%	6,0%
Inflation Average	75%	75%	3,3%	2,7%	2,7%	2,6%	2,5%
Adjustment	100%	100%	1,5%	1,0%	0,0%	0,0%	0,0%
Total Growth			5,5%	4,5%	3,5%	3,5%	3,4%
Total Revenues			2.611	2.729	2.824	2.922	3.020

Table 4: Revenue forecast grain & fertilizers
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

Forest Products. Summarized here are lumber products, paper, logs and pellets. Overall, it can be observed that the share of forest products in total revenues is constantly decreasing, from 14.3% in 2010 to 12.0% in 2021 (CNR Annual Report, 2021). It is assumed that this trend

will continue. In addition to the general economic trend, the main revenue driver in this segment is housing starts in the USA. CNR cites this as the most important source of sales for forest products from Canada. The projections for U.S. hosting starts are therefore weighted stronger in the forecast for the revenues of forest products in 2022 and 2023. After that, data on planned housing starts in the USA is too imprecise, which is why this factor is excluded and general economic growth is used as the main driver instead.

Forest Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	4,8%	4,8%	4,8%	4,8%	4,8%
Economic Growth	25%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Housing Starts Forecast 2022/2023	50%	0%	-3,2%	-2,4%	-	-	-
Total Growth			1,7%	1,4%	4,9%	4,8%	4,7%
Total Revenues			1.769	1.794	1.882	1.972	2.064

Table 5: Revenue forecast forest products
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), YCharts (2022).

Metals & Minerals. A large part of the metals transported are for oil and gas production from fracking sand and thus steel, iron ore and non-ferrous base materials. But also, machinery and construction equipment as well as railroad equipment are drivers. This commodity group accounts for around 10.7% of all revenues (CNR Annual Report, 2021). Growth is heavily dependent on the general economic situation and the price of oil and gas. This can also be seen from the correlation results. Therefore, in addition to the economic development, the forecasts for the crude oil price are also included for 2022 and 2023. However, the partly dramatic developments of the crude oil price are slightly adjusted, because new development projects are more protracted than the oil price, and oil companies are increasingly investing their earnings in alternative energy sources, which could mitigate the effect of the oil price on new construction projects. From 2024, economic growth will be the main driver.

Metals & Minerals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,4%	7,4%	7,4%	7,4%	7,4%
Economic Growth	50%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Crude Oil Price for 2022/2023	25%	0%	43,6%	-9,6%	-	-	-
Adjustment	100%	100%	-2,0%	1,0%	0,0%	0,0%	0,0%
Total Growth			14,9%	3,2%	5,5%	5,4%	5,4%
Total Revenues			1.779	1.836	1.938	2.043	2.153

Table 6: Revenue forecast metals & minerals
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), U.S. Energy Information Administration (2022b).

Coal. This mainly includes hard coal, metallurgical coal and petroleum coke. A large part of the coal is transported to ports for export, so the market situation is geared to the world market. Between 2010 and 2021, this segment's share of total revenues shrank from 7.2% to 4.3% (CNR

Annual Report, 2010-2021). It is expected that this decline in importance will continue in subsequent years. In addition to GDP development, the coal price and coal production in North America also have an influence on the coal segment and show a positive correlation. As a proxy for the forecast, the estimated coal production in the USA was therefore also included. The EIA forecasts growth until 2023, after which the coal production as a driver will be taken out of the calculation and mainly economic growth will be used instead.

Coal	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	1,0%	1,0%	1,0%	1,0%	1,0%
Economic Growth	50%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
US Coal Production 2022/2023	25%	0%	7,4%	1,9%	-	-	-
Total Growth			6,3%	3,5%	3,9%	3,8%	3,8%
Total Revenues			657	680	706	733	761

Table 7: Revenue forecast coal
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), U.S. Energy Information Administration (2022b).

Other Revenues. Revenues from vessels and other support transport services that do not take place on the rail network are summarized here. Since this is strongly dependent on the revenues of all the freight services, the respective growth rate of freight revenues is used as a growth factor.

Other Revenues	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Overall Growth Rate Freight Revenues	100%	100%	7,4%	4,8%	5,4%	5,3%	5,2%
Total Growth			7,4%	4,8%	5,4%	5,3%	5,2%
Total Revenues			633	663	699	736	774

Table 8: Other revenues forecast
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

4.1.2 Expenses

Operating costs include labor costs, purchased services & materials, fuel, depreciation, equipment rents as well as casualty costs. In an analysis of costs from 2008 to 2021, most cost items are strongly aligned with total revenue, with extremely low variance. Therefore, this constant share of total revenues can be taken as a proxy for future cost levels, in the model the average of the last six years is being used. Only in the case of fuel and depreciation a different method is applied. CNR itself states in its risk assessment that fuel costs are highly dependent on future oil prices (CNR Annual Report, 2021). Fuel costs correlate strongly with the oil price and represents a more volatile share of total revenues. This is shown by a higher variance of its share of total expenses compared to the variances of all other cost items. However, diesel

consumption is subject to total revenue growth rates as the volume is not as volatile. A high correlation could be shown in data of fuel consumption and total revenue from the annual reports of 2009 to 2019. Fuel costs are hence calculated from the assumed fuel consumption and the forecast fuel price based on the development of the oil price. This is also slightly modified for improved fuel efficiency.

In 2021, there was also a reduction in the work force, which is why savings in personnel costs can be expected here for at least the next two years, before the costs reflect the long-term ratio again. Thus, labor costs will be adjusted in the near future. The amount of depreciation & amortization is based on gross property, plant and equipment. Gross PPE is forecasted in the balance sheet using the amount of Capex. In the last six years, the share of D&A in gross PPE has been almost constant at 3.6%, which is why this share is also applied for the estimated D&A. Capex is expected to account for about 17% of total revenues in the for 2022-2024 (Canadian National Railway, 2021). Thereafter, capex as a percentage of revenues is forecast to decline to 16% in 2025 and 15% in 2026, bringing the capex-to-depreciation ratio closer to steady state. After being 2.63 in 2018, a ratio of 1.39 is expected for 2026. The value is above 1.0 to correct for inflation. Future forecasts of assets held for sale and transaction-related costs are not possible. Acquisitions or other transactions have not been explicitly announced and therefore cannot be estimated. The respective cost items are therefore forecasted with a value of zero. Further details for different scenarios can be seen in table 24 in the appendix.

Fuel Expenses	Weight	2022	2023	2024	2025	2026
Revenue Growth	100%	7,4%	4,8%	5,4%	5,3%	5,2%
Adjustment for fuel efficiency	100%	-0,2%	-0,2%	-0,2%	-0,2%	-0,2%
Fuel Consumption Growth		7,2%	4,6%	5,2%	5,1%	5,0%
Fuel Consumption	*397,6*	426,3	446,0	469,1	492,9	517,7
Oil Price Growth		43,6%	-9,6%	0,0%	0,0%	0,0%
Fuel Price	*3,28*	4,71	4,26	4,26	4,26	4,26
Fuel Expenses		2.008	1.900	1.998	2.099	2.205

Table 9: Fuel expenses forecast
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), U.S. Energy Information Administration (2022b).

Expenses	2022	2023	2024	2025	2026
Labor & Fringe Benefits	2.877	3.097	3.327	3.503	3.685
Purchased services & materials	2.221	2.329	2.454	2.583	2.718
Fuel	2.008	1.900	1.998	2.099	2.205
Equipment rents	467	489	515	543	571
Casualty & Other	520	545	575	605	637
Capex	*2.615*	*2.771*	*2.920*	*2.894*	*2.854*
D&A	1.644	1.738	1.838	1.943	2.047

Table 10: Expenses forecast
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

4.1.3 EBITDA, NOPAT and FCFF

EBITDA. Operating income is then determined from total revenues and operating expenses. Subsequently, an adjustment is made for other components of net periodic benefit income, other income and other fees. In this case, the average of the last three years was used to forecast the other components of net periodic income as well as other income. Other income mainly relates to the sale of real estate but plays a minor role in overall revenues. A high merger termination fee in 2021, which was refunded to CNR, also stands out. This relates to the planned acquisition of KCS, which ultimately failed due to concerns expressed by the competition authority and had to be reversed. However, this point is irrelevant for the future, as similar transactions have not been announced.

NOPAT. After calculating the EBIT, the effective tax is deducted to obtain the NOPAT. For the tax rate, it is not possible to simply apply the Canadian corporate tax, as some operations are taxable in other countries, therefore the effective tax rate also varies slightly. In the last four years the range of the tax rate was between 22.3% and 24.7% (CNR Annual Report, 2017-2021). For this reason, the effective tax rate from 2021 is used as the closest possible proxy and amounts to 22.8%.

FCFF. To obtain the FCFF, the depreciation is added back to the NOPAT and Capex is subtracted. In addition, increases in deferred tax liabilities must be deducted. However, as in the years prior to COVID (2016-2019) this balance sheet item was almost stable, if not declining at a CAGR of -2.5%, a further constant level is assumed for the next five years (CNR Annual Report, 2016-2020). The change in net working capital must also be subtracted. CNR's net working capital consists of accounts receivable, material and supplies and accounts payable in the balance sheet. Accounts receivable and accounts payable are directly linked to total revenue growth. Materials and supplies grow at the same rate as the cost item purchased services & materials, thus in the base case also at the same rate as total revenues. In the upside and downside scenario, however, adjustments in purchased services & materials are being made which have an impact on net working capital. More detailed information can be found in table 25 in the appendix.

EBITDA	*6.687*	8.541	7.837	8.321	8.688	9.131	9.592
EBIT	*5.098*	6.943	6.193	6.582	6.850	7.188	7.545
Taxes (Effective Tax Rate)	*-1.162*	-1.583	-1.412	-1.501	-1.562	-1.639	-1.720
Unlevered Net Income (NOPAT)	*3.936*	5.360	4.781	5.082	5.288	5.549	5.825
+ Depreciation	*1.589*	1.598	1.644	1.738	1.838	1.943	2.047
- ΔNWC	*-101*	-97	52	39	46	47	49
- CapEx	*2.863*	2.891	2.615	2.771	2.920	2.894	2.854
- Deferred Income Tax Change	*427*	1.032	0	0	0	0	0
= Free Cash Flow to Firm (FCFF)	*2.336*	3.132	3.758	4.009	4.160	4.551	4.968
Discounted Free Cash Flow	*2.336*	3.132	3.557	3.593	3.529	3.655	3.776

Table 11: FCF computation for explicit period
Sources: own computations, Canadian National Railway Annual Reports (2016-2021).

4.1.4 Cost of Capital

Cost of Debt. To find the weighted average cost of capital, the cost of debt and the cost of equity are required. The former can best be calculated using the yields of outstanding notes and debentures. All data on outstanding bonds are taken from Refinitiv Eikon. Short-term debt like commercial papers are excluded. As in the literature review, the yields of all outstanding bonds are weighted according to the amount outstanding and averaged.

Currently CNR has 26 senior bonds with varying time horizons outstanding, both in USD and CAD. Therefore, an adjustment must be made here. The yields of the USD bonds are converted into CAD yields. For this purpose, the spread of the respective bonds to U.S. government bonds with the same maturity is determined. The spread is then added to the yield of Canadian government bonds with the same maturity. Thus, the respective equivalent yield in CAD is obtained. An overview of outstanding bonds and computations is shown in table 27 in the appendix.

The overall cost of debt received amounts to 3.62% as of the reporting date on 05th April 2022. To obtain the after-tax cost of debt, the yield must be adjusted for the tax effect. With an effective tax rate of 22.8%, the after-tax cost of debt is 2.79%.

Cost of Equity. The cost of equity is found using the CAPM. For this purpose, the 10-year yield of Canadian government bonds is taken as the risk-free rate, amounting to 2.43%. As equity risk premium for Canada, the country-specific value of 4.24% is taken (Damodaran, 2022a). The company specific beta of 0.88 was calculated using data from the past five years against the TSX Composite. This index comprises the 220 largest Canadian companies by market capitalization and is therefore most suitable. Alternatively, a calculation against the TSX 60 was performed, which resulted in a similar beta of 0.89. Calculating the beta against

the S&P500 is less useful as this includes U.S. companies that are less suitable for comparison with CNR as a Canadian company. Using the S&P500 as a benchmark would result in a beta of 0.71, which is in line with the industry beta of 0.73 for the U.S. railroad industry (Damodaran, 2022b). The different beta results are shown in table 26 in the appendix. For further calculations, the levered beta of 0.88 is used. All inputs lead to a cost of equity of 6.16% for CNR according to the CAPM.

WACC. To obtain the weighted average cost of capital, the cost of equity and the after-tax cost of debt are weighted according to the amount of CNR's equity and debt as market value. The equity market value is the market capitalization as of the cut-off date. This amounts to CAD 114.6bn. The market value of all bonds is the amount outstanding converted into CAD, multiplied by the respective quoted bond prices and divided by 100.
In addition, as stated in the literature review, deferred tax liabilities can also be classified as debt. This would thus have an impact on the cost of capital of the company. As the company does not have to settle this item directly, it is possible to discount the item once the steady state has been reached. In CNR's case, that would be five years from now. The discount rate applied is the cost of debt. The discounted value is added to the debt value.
Other liability items, such as lease liabilities, are also aggregated and included in the debt amount. The value of these is as per annual report 2021. The sum of the debt values is then applied for the calculation of the D/E ratio and the WACC. All in all, this gives a WACC of 5.64%.

CoD	3,62%	Equity	114.582
Tax	22,8%	Bonds	11.842
CoD after-tax	2,79%	DTL	7.788
		Oth. Debt	1.394
RF	2,43%	E/EV	0,84
Beta levered	0,88	D/EV	0,16
ERP	4,24%		
CoE	6,16%	**WACC**	**5,64%**

Table 12: WACC computation
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), Refinitiv Eikon, Bank of Canada (2022b), Damodaran (2022a).

3.1.5 Target Price

To complete the valuation, the terminal value must be added to the forecasted FCFF. This is calculated based on the estimated FCFF of 2026, the above cost of capital of 5.64% and a

perpetuity growth rate of 2.5%. The perpetuity growth rate reflects slightly higher growth than the long-term inflation target of 2.0% and is oriented on long-term economic growth of the areas CNR is doing business in. The enterprise value is therefore approximately CAD 141.5bn, which is reduced by the net debt total of CAD 20.8bn. In addition to the ordinary debt, the discounted amount of deferred income tax as well as the market value of the other debt must also be deducted from the enterprise value and is thus part of net debt. This results in an implied market capitalization of about CAD 120.6bn. There are currently 711m shares outstanding. The target price of CAD 170 indicates an upside of 5.3% compared to the current share price of CAD 161. A detailed breakdown of the DCF for the base case and the scenarios is provided in tables 28-36 in the appendix.

4.1.6 Sensitivity Analysis

Various uncertainties in the valuation are mainly due to the choice of the perpetuity growth rate and the calculation of the WACC. To illustrate the influence of deviating input variables on the share price as well as on the upside potential, a sensitivity analysis was carried out. The following table illustrates the results.

		Perpetuity Growth Rate						
WACC	169,52	1,75%	2,00%	2,25%	2,50%	2,75%	3,00%	3,25%
	4,89%	175	191	210	233	261	297	343
	5,14%	160	173	189	208	230	258	294
	5,39%	147	158	171	187	206	228	256
	5,64%	135	145	156	170	185	203	226
	5,89%	125	134	143	155	168	183	201
	6,14%	116	124	132	142	153	166	181
	6,39%	108	115	122	131	140	151	164

WACC		1,75%	2,00%	2,25%	2,50%	2,75%	3,00%	3,25%
	4,89%	9%	19%	30%	45%	62%	84%	113%
	5,14%	-1%	8%	17%	29%	43%	60%	82%
	5,39%	-9%	-2%	6%	16%	28%	42%	59%
	5,64%	-16%	-10%	-3%	5%	15%	26%	40%
	5,89%	-22%	-17%	-11%	-4%	4%	14%	25%
	6,14%	-28%	-23%	-18%	-12%	-5%	3%	12%
	6,39%	-33%	-29%	-24%	-19%	-13%	-6%	2%

Figure 4: Sensitivity analysis on WACC and g
Sources: own computations.

4.2 DCF Valuation Bull Case

The bull case scenario contains several developments, both on the cost of capital side and on the revenue and cost side. The war in Ukraine can be mediated and sanctions can be at least partially withdrawn. This takes the tension out of the energy markets, and the oil price normalizes. Nevertheless, European countries are increasingly looking for energy sources from North America in order to become politically independent of Russia. This is keeping investment and production there high, so that both the metals and minerals segment and petroleum and chemicals are benefiting. General economic growth recovers as a result of the end of the war, and real economic growth increases. As a result of an economic recovery, more houses will also be built in the USA in the coming year.

Moreover, a recovery in the automotive sector is possible, through at least a partial resolution of the chip crisis. The corresponding growth has been adjusted slightly upwards. The perpetuity growth remains at 2.5%.

Inflation, in turn, remains at the rate forecasted by the IMF, but is falling back to normal in the medium term. The central banks' interest rate steps have been successful, which is why actual further interest rate steps fall short of expectations. This leads to lower borrowing costs for CNR and a slight reduction in the yield for 10-year Canadian government bonds compared with today. The WACC is thereby reduced from 5.64% to 5.40%. Detailed estimates are being found in the appendix.

However, due to inflation, costs will also increase in the short term, especially fuel, equipment rents and purchased services and materials. These adjustments lead to a target price of CAD 207, an upside of 28.8%.

4.3 DCF Valuation Bear Case

The Bear Case also considers some influencing factors that may have a negative impact on CNR's business. It is assumed that the chip crisis will worsen, resulting in further supply bottlenecks in the automotive sector and reduced volumes for CNR.

The war in Ukraine will continue for a long time. Inflation rises, the central banks take drastic interest rate measures to get it under control, which then succeeds in the medium term. However, this leads to a painful drop in real economic growth, while nominal growth remains high due to inflation. Investments become more difficult, leading to a decline in orders for the

transportation of metal and chemical products. As a result, the higher oil price does not lead to an increase in revenues in the metals and mining segment. In addition, consumption of fossil fuels is reduced due to high energy prices, while commodity prices continue to escalate. This inevitably leads to rising fuel prices for CNR. The loss of purchasing power due to rising inflation also leads to a decline in private-sector investment, and U.S. housing starts fall sharply.

In the long term, a growth rate of only 2.25% is assumed.

The higher interest rates are also reflected in the financing conditions for CNR and increase the WACC from 5.64% to 5.88%. Overall, the target price is reduced to CAD 137, a downside of -15.0%. Detailed estimates are shown in the appendix.

4.4 Adjusted Present Value

In this scenario, a significant increase in debt is simulated, based on an annual increase in debt of 10% within the next five years to remain constant thereafter. It is important to note that this is a purely hypothetical scenario and is only intended to show the effect of significantly higher debt. Therefore, the resulting share price is not used to determine the final target price.

An increase of debt would bring CNR closer to a D/E ratio which is in line with major competitors within the next five years. This is quite feasible, as CNR has so far had an extremely low D/E ratio compared to its competitors. First, the unlevered beta is derived from the levered beta and used to calculate the unlevered cost of capital. The unlevered cost of capital of 5.88% is higher than the WACC of 5.64%. This is only logical, as the positive effects of the debt tax shield are not priced in here. Based on this, the modeled FCFF from the base case are discounted and the unlevered equity value is determined.

	2022	2023	2024	2025	2026		
FCF	3.758	4.009	4.160	4.551	4.968		
TV					162.269	EV unlevered	139.901
SUM	3.758	4.009	4.160	4.551	167.237	Net Debt	20.829
Discounted	3.549	3.576	3.504	3.621	125.652	V unlevered	119.072

Table 13: APV unlevered equity value
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), Refinitiv Eikon, Bank of Canada (2022b), Damodaran (2022a).

It is also assumed that the default risk does not increase significantly as a result of the above measure and therefore the debt continues to be subject to the current cost of debt of 3.62%.

From this the interest payments are derived, which multiplied by the tax rate give the tax shield. To calculate its present value, the cost of debt is used to discount it.

	2022	2023	2024	2025	2026	*perp*
Debt	21.024	23.127	25.439	27.983	30.782	33.860
Interest	761	837	920	1013	1114	*1225*
Tax Shield	173	191	210	231	254	*7.720*
Perpetual					7.720	
Discounted	167	178	189	200	6.676	

Table 14: APV debt tax shield value
Sources: own computations, Canadian National Railway Annual Reports (2016-2021), Refinitiv Eikon, Bank of Canada (2022b), Damodaran (2022a).

Finally, this is added to the unlevered equity value. This results in a hypothetical target price of CAD 178 and corresponds to an upside of 10.4%.

4.5 Relative Valuation

In determining the peer group, I first looked at direct industry peers and determined whether they were suitable. Suitable peers should be comparable in terms of growth, size and profitability. For price multiples, they must also have a similar financing structure.
The industry peers comprise four railway companies on the North American continent whose shares are tradable and whose figures are disclosed. This comprises CP, NSC, CSX and UNP. In addition, also other companies in the logistics sector such as FDX and UPS are taken into account. To determine suitability, data on EBITDA margin, ROE, ROIC, D/E ratio, sales growth as well as market capitalization were compared with those of CNR. This was done separately for each year in the period from 2017 to 2021. The difference between the respective values of the potential peers and those of CNR was squared for each year and added for all five years. Here, a low value indicates similarity to CNR, while a high value indicates a strong divergence. It is noticeable that FDX and UPS differ strongly from CNR in EBITDA margin, ROE, financing structure and sales growth. The other companies in the railway industry have very similar ratios and differ only slightly from CNR. Only the financing structure shows clear differences, which is why price multiples from this peer group are less meaningful. The detailed determination of the peer group can be seen in table 38 in the appendix.
The relative valuation comprises three multiples: EV/EBITDA, EV/EBIT and P/E. In principle, EV multiples are better suited to compare companies with each other, as they are not influenced by different capital structures. Since the companies in the peer group have quite different

financing structures, P/E multiples are calculated, but their results are only included for illustrative purposes, not for deriving the target price. To obtain a better overall picture, both trailing and 1-year forward multiples are used. The 1-year forward multiples are calculated based on forecasted values taken from consolidated analyst estimates on Refinitiv Eikon. Forward multiples are generally superior to trailing multiples as they cover the future expectations and do not refer to past events.

In deriving the share price for CNR, median and average values of the peer group multiples are used. Most analysts consider median to be more reliable because it excludes potential outliers, but in the specific case of CNR, both average and median are found to be close to each other and produce similar results. Using trailing multiples results in a target price range between CAD 130 and CAD 159. 1-year forward multiples produce a narrower price range between CAD 123 and CAD 140.

Peer Group	*Currency*	**EV (m)**	**EBITDA**	**EBIT**	**Share Price**	**EPS**	**EV/EBITDA**	**EV/EBIT**	**P/E**
Canadian National Railway	*CAD*	131.612	7.655	6.057	161,0	5,9			
Canadian Pacific Railway	*CAD*	111.705	4.200	3.389	77,2	3,8	26,6	33,0	20,5
Norfolk Southern	*USD*	76.251	5.628	4.447	263,8	12,1	13,5	17,1	21,8
CSX	*USD*	89.963	6.665	5.245	34,1	1,6	13,5	17,2	22,0
Union Pacific	*USD*	190.285	11.546	9.338	250,0	10,0	16,5	20,4	25,1
Average							17,5	21,9	22,3
Median							15,0	18,8	21,9

Table 15: Multiples trailing
Sources: own computations, Refinitiv Eikon.

Median			
CAD	**EV/EBITDA**	**EV/EBIT**	**P/E**
EV	114.936	113.658	
Net Debt	20.829	20.829	
Equity Value	94.107	92.829	
#Shares	712	712	
Share Price	**132**	**130**	**130**

Average			
CAD	**EV/EBITDA**	**EV/EBIT**	**P/E**
EV	134.199	132.705	
Net Debt	20.829	20.829	
Equity Value	113.369	111.876	
#Shares	712	712	
Share Price	**159**	**157**	**133**

Table 16: Multiples valuation trailing
Sources: own computations, Refinitiv Eikon.

Peer Group		**EV (m)**	**EBITDA**	**EBIT**	**Share Price**	**EPS**	**EV/EBITDA**	**EV/EBIT**	**P/E**
Canadian National Railway	*CAD*	131.612	7.837	6.193	161,0	7,0			
Canadian Pacific Railway	*CAD*	84.058	4.720	3.805	77,2	3,9	17,8	22,1	20,0
Norfolk Southern	*USD*	78.861	6.126	4.891	263,8	13,9	12,9	16,1	19,0
CSX	*USD*	93.347	7.249	5.737	34,1	1,8	12,9	16,3	18,9
Union Pacific	*USD*	197.272	12.832	10.492	250,0	11,6	15,4	18,8	21,6
Average							14,7	18,3	19,9
Median							14,1	17,5	19,5

Table 17: Multiples forward (1Y)
Sources: own computations, Refinitiv Eikon.

Median			
CAD	**EV/EBITDA**	**EV/EBIT**	**P/E**
EV	110.694	108.597	
Net Debt	20.829	20.829	
Equity Value	89.865	87.767	
#Shares	712	712	
Share Price	**126**	**123**	**137**

Average			
CAD	**EV/EBITDA**	**EV/EBIT**	**P/E**
EV	115.458	113.461	
Net Debt	20.829	20.829	
Equity Value	94.629	92.632	
#Shares	712	712	
Share Price	**133**	**130**	**140**

Table 18: Multiples valuation forward (1Y)
Sources: own computations, Refinitiv Eikon.

4.6 Valuation Conclusion

The base valuation in the DCF result in a target price of CAD 170, with a possible range between CAD 136 and CAD 207. In contrast, the multiples show a much narrower range. Multiples are a good way to validate assumptions made in the DCF and to compare them with market assumptions. However, it should also be emphasized that CNR has a strategic advantage over the competition especially in the growing intermodal segment and has exclusive access to important overseas ports on the west and east coast of Canada. This may be the reason for CNR's somewhat higher multiples compared to the peer group.
For the calculation of the final target price, the hypothetical APV scenario is not considered. Based on the trailing and forward multiples and the three scenarios modeled as DCF, a target price of CAD 151 is derived, which corresponds to a downside of -6.0% to the current share price of CAD 161. Given the solid performance in the past and the comparatively low volatility business model as well as low value-at-risk, a HOLD recommendation is issued.

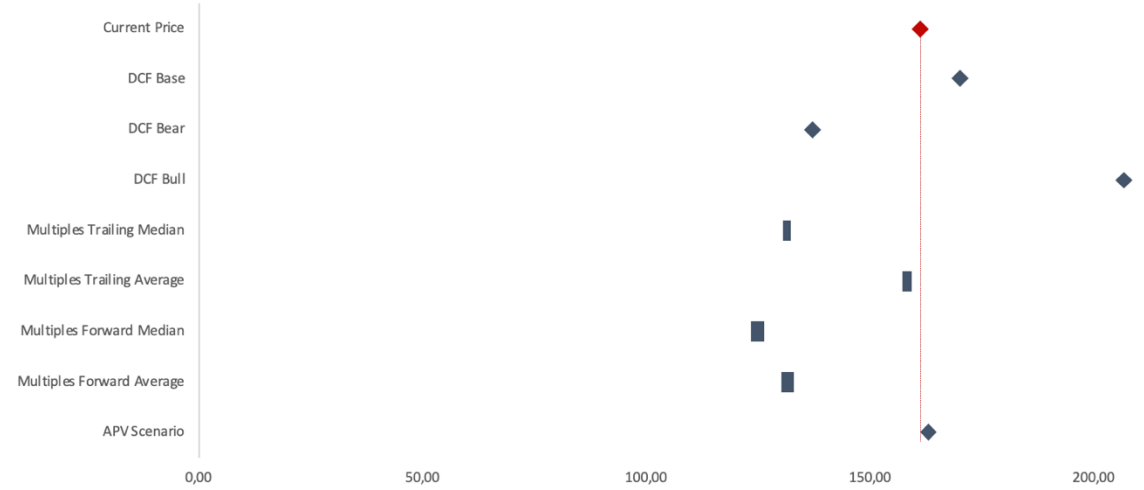


Figure 5: Valuation overview
Sources: own computations.

4.7 Value at Risk

The value-at-risk (VaR) helps to estimate the risk of an investment in CNR and is determined below for various parameters over the past 10-year period. It indicates the maximum loss for a certain probability within a certain period of time. The daily VaR is -1.57% at a confidence level of 90%, i.e., with 90% probability the maximum expected daily loss does not exceed -

1.57%. Further values as well as the weekly and monthly VaR can be found in the following table 19.

In parallel, the upside limits for certain probabilities are calculated. For example, the maximum daily profit of 1.70% is not exceeded with 90% probability. For these values, computations are also carried out in a weekly and monthly basis. With a further investigation and the Monte Carlo method for 2000 runs it can be shown that on a daily basis about 51% of all returns show positive signs. This tendency to slightly positive returns is especially visible on a weekly and monthly basis. About 60% of all returns are positive in the Monte Carlo simulation at a monthly level. However, this does not mean that positive returns can be certainly expected in the future but shows the risk of a strong price decline as well as the maximum expected price increase. You can find the histogram of the Monte Carlo simulation in the appendix in figure 6.

	Daily	Weekly	Monthly
VaR (90%)	-1,57%	-3,06%	-4,86%
VaR (95%)	-2,04%	-4,02%	-6,58%
VaR (99%)	-2,91%	-5,81%	-9,80%
Up (90%)	1,70%	3,67%	7,25%
Up (95%)	2,17%	4,62%	8,97%
Up (99%)	3,04%	6,41%	12,19%

Table 19: VaR results
Sources: own computations, Refinitiv Eikon.

5. Comparison with Analyst Report

First, the own analysis, specifically the DCF shall be compared with the report of Vertical Research dated January 25, 2022.

The available analysis of VR only forecasts explicitly until 2023, but similarities and differences can certainly be identified. No major deviations can be identified in the revenue forecasts, but the revenues were not modeled per segment, but only as a whole. This serves the purpose of clarity, but runs the risk of neglecting individual specific developments.

It is also noticeable that the main cost items, labor, material and supplies, are kept constant. This does not reflect my assessment, since I assume that these cost items move synchronously with the revenues and thus also increase with rising revenues. This thesis is supported by the currently observed general price increases, which also increase the costs for CNR. In addition, VR has set the increase in fuel costs lower, but this may also be due to the timing of the analysis. Indeed, in January 2022, oil price increases were still expected to be lower, but with the war in Ukraine and the sanctions against Russia, this situation has changed drastically. In my

estimation, this will lead to higher fuel costs in the coming years and especially a sharp increase in 2022. In addition, VR is modeling almost no asset growth in the next two years, as well as a reduction in capex as a percentage of total revenue. This contradicts statements by CNR to keep capex constant at 17% of total revenues until 2024, which in my view is also accompanied by asset growth and higher D&A. However, thereafter I also forecast a decreasing capex-to-depreciation ratio to approach steady state. In addition, VR assumes a growing effective tax rate, whereas I assume a constant tax rate based on the last fiscal year. By assuming that costs in particular can be kept constant and yet high revenue growth is realized, VR's model also increases the expected margins. For example, the EBITDA margin and the operating margin for 2023 are significantly higher than the historical averages. I, on the other hand, have forecasted constant margins in line with the historical average by linking costs to revenues to a large extent, see table 37 in the appendix. VR shows a target price of CAD 165, which is about 9.0% higher than the target price of my dissertation, being CAD 151.

6. Conclusion

The thesis addressed the topic of equity valuation and explored the research question of what the fair value of Canadian National Railway's stock on 05th April 2022 is. First, a theoretical deep dive into the state-of-the-art valuation approaches was given.

In the further course the company and the industry were analyzed quantitatively as well as qualitatively. As one of eight large tier 1 railway companies in North America, CNR faces strong competition on many routes, but also has strategic advantages in the intermodal and overseas port sectors. Risks for CNR are mainly related to the development of the global economy as well as to competition, for example due to the pending merger of CP and KCS.

To determine the target price, a base case DCF and two scenarios were developed. The base case resulted in a target price of CAD 171, the scenarios show a further range between CAD 137 and CAD 207. The inputs for the base case result in an almost constant EBITDA margin for the next five years.

A relative valuation was also used, which produces a valuation range of CAD 130 to CAD 159 when using trailing multiples, and a range of CAD 123 and CAD 133 when using forward multiples. Averaging all output prices, the fair value of **CAD 151** can be derived, a discount of about 6.0% to the current price.

A value-at-risk analysis as well as a Monte Carlo simulation over different time periods should illustrate the risk.
Due to the stable development in the past, the robust and conservative business model as well as comparatively low VaR, a **HOLD** recommendation can be issued.

Appendix

FF3 and FF5 as alternatives to CAPM

FF3. In addition to the simple model of the CAPM, the FF3 offers a more detailed approach. It extends the CAPM by two additional risk factors, namely the size factor small-minus-big (SMB) and the value factor high-minus-low risk premium (HML). The SMB risk premium states that companies with smaller market capitalizations outperform companies with larger market capitalizations in the long run. The HML risk premium is based on the idea that companies with a high book-to-market ratio outperform companies with a low book-to-market ratio (Pratt & Grabowski, 2014, p. 446). It is important to note that by including several factors, a multiple regression is performed and therefore the market beta of the market risk premium is changed and cannot be equivalent to that of the CAPM.

Equation 14: FF3 regression

$$r_e = r_f + \beta_{erp} * ERP + \beta_{smb} * SMB + \beta_{hml} * HML$$

FF5. The FF5 model is again an extension of the FF3 model and considers two more risk factors. These are a robust-minus-weak premium (RMW) and a conservative-minus-aggressive premium (CMA). RMW refers to the difference in return of the most profitable firms compared to the least profitable firms. CMA, in turn, is the difference in the return of firms that invest cautiously versus those that invest aggressively. A major criticism of the FF5 model is its complexity. The additional introduction of further risk factors does not find significance in some industries, which is why there are doubts about their usefulness (Racicot & Rentz, 2017, p. 413) Overall, the CAPM continues to be the most common asset pricing model for calculating the cost of equity, as the market risk premium is the only risk factor that appears to be consistently significant across all industries.

Equation 15: FF5 regression

$$r_e = r_f + \beta_{erp} * ERP + \beta_{smb} * SMB + \beta_{hml} * HML + \beta_{rmw} * RMW + \beta_{cma} * CMA$$

Gordon Growth Model extended literature review

All future dividends represent cash flows that together make up the value of the share. The model normally has three input variables, the amount of the most recent dividend payment Div_0 as the starting point, a growth factor g and the discount rate r.
The dividend cannot be greater than a company's earnings in the long term, as the dividend is derived from earnings. The growth rate can often be estimated from historical averages for stable companies. It can be either positive, equal to zero, or negative, depending on which company and which business model is to be modeled. The rate of return must be greater than the perpetual growth factor; anything else would not be sustainable and would therefore lead to negative output. Moreover, the growth factor can never be greater than the economic growth, since a company cannot grow more than the overall economy forever. The return on equity is used here to discount the respective cash flows, because dividends are distributed solely to equity holders.

Equation 16: Gordon Growth model

$$P_0 = \frac{Div_0 * (1+g)}{r_e - g} = \frac{Div_1}{r_e - g}$$

The model can be supplemented in its simplicity in that it includes different growth rates for different periods. Thus, a company could grow at a higher growth rate g_s in the short term until it reaches a steady state and growth reduces in the long term to g_l.

Equation 17: Gordon Growth model expanded

$$P_0 = \frac{Div_0 * (1+g_s)}{(1+r_e)} + \frac{Div_0 * (1+g_s)^2}{(1+r_e)^2} + \cdots + \frac{Div_0 * (1+g_s)^n}{(1+r_e)^n} + \frac{P_l}{(1+r_e)^l}$$

$$P_l = \frac{Div_0 * (1+g_s)^n * (1+g_l)}{r_e - g_l}$$

Porter's Five Forces for CNR

Competition. Competition in North America, as mentioned above, is essentially concentrated in three duopolies. CNR competes in Canada with CP; both are similar in large parts of the area covered. CP's pending acquisition of KCS enables CP to offer a connection up to the Mexican route network, which could intensify competition. CNR, on the other hand, has a stronger

presence in eastern Canada. In the operational comparison of CNR and CP shown in the 2020 annual reports, CNR has higher fuel efficiency and operates longer trains. CP, on the other hand, has a lower dwell time at terminals and a higher average transport speed.
Overall, it can be concluded that operative competition between the two lines is essentially homogeneous. However, looking at the market shares in the overall North American class 1 market, it is noticeable that CNR has seen a significantly stronger increase in market share between 2010 and 2020, from 12.1% to 13.5% (Wright, 2011). CP, on contrast, was only able to keep its market share stable over the same period, with an increase from 7.3% to only 7.5%.

New Entries. A threat to CNR from new competitors entering the market is considered to be ruled out, as the construction of a rail network involves several years if not decades of work and massive investments for labor and materials. A possible, though very unlikely, danger could be that North American railroad operators would be obliged to allow competitors to use their tracks for a fee, which would make it much easier for new competitors to enter the market. Similar steps have been taken in Germany, for example, where Deutsche Bahn has been obliged to open up its rail network to competitors in order to break the monopoly.

Substitution. Possible alternatives to railroad transportation are shipping, trucks and air freight. Shipping, however, only takes place along navigable rivers and at sea and is therefore a poor alternative to city-to-city transportation. Trucks are a good option, although more costly and cumbersome for large quantities of bulk. Air freight remains the exception rather than the rule for transportation and is also not suitable for large volumes. Air transportation is significantly more expensive and therefore more of an option for time-critical shipments of small quantities.

Supplier Power. In the USA and Canada there are a quite decent number of suppliers for heavy locomotive equipment and wagons, whose products are to some extent interchangeable. However, the long production times of locomotives and the specialization in the industry are also a reason that business usually goes hand in hand with good long-term relationships. All in all, supplier power is moderate.

Buyer Power. This depends very much on the desired route. If several competitors are able to connect the respective destinations, the buyer power is large, as it could simply switch providers. However, if the rail operator is the only one connecting the respective route or port,

the buyer power is low. CNR, for example, is the only railroad company serving the ports of Prince Rupert in the west and Halifax in the east of Canada all the way to New Orleans.

Additional Figures/Tables

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	CAGR 2010-2019
GTM	341.219	357.927	383.754	401.390	448.765	442.084	423.426	469.200	490.414	482.890	455.368	3,93%
RTM	179.232	187.753	201.496	210.133	232.138	224.710	214.327	237.098	248.383	241.954	230.390	3,39%
Freight rev. per RTM	4,14	4,32	4,44	4,56	4,93	5,30	5,28	5,18	5,45	5,87	5,74	3,96%

Table 20: Operative metrics.
Sources: Canadian National Railway Annual Reports.

Economic Growth	2022	2023	2024	2025	2026
USA					
GDP Growth (real, IMF)	5,2%	2,2%	1,7%	1,7%	1,7%
Inflation (IMF)	3,5%	2,7%	2,6%	2,5%	2,3%
GDP Growth (nominal, IMF)	8,7%	4,9%	4,3%	4,2%	4,0%
CANADA					
GDP Growth (real, IMF)	4,9%	2,6%	1,5%	1,4%	1,5%
Inflation (IMF)	2,6%	2,0%	2,2%	2,1%	2,0%
GDP Growth (nominal, IMF)	7,5%	4,6%	3,7%	3,5%	3,5%
WORLD					
GDP Growth (real, IMF)	4,9%	3,6%	3,4%	3,3%	3,3%
Inflation (IMF)	3,8%	3,3%	3,2%	3,2%	3,1%
GDP Growth (nominal, IMF)	8,7%	6,9%	6,6%	6,5%	6,4%
TOTAL					
35% Overseas	8,7%	6,9%	6,6%	6,5%	6,4%
33,5% Canada (domestic + 0,5* trans-border)	7,5%	4,6%	3,7%	3,5%	3,5%
31,5% USA (domestic + 0,5* trans-border)	8,7%	4,9%	4,3%	4,2%	4,0%
TOTAL NOMINAL GROWTH ECONOMY	**8,3%**	**5,5%**	**4,9%**	**4,8%**	**4,7%**

Table 21: Economic growth forecast
Sources: own calculations, International Monetary Fund (2022).

Correlations	Petrochem	Metals	Forest	Coal	Grain	Intermodal	Automotive
Canada GDP	**0,43**	**0,66**	**0,39**	**0,49**	0,12	**0,59**	**0,55**
US GDP	**0,36**	**0,51**	**0,45**	**0,34**	0,05	**0,47**	**0,45**
US Housing	0,25	0,33	**0,64**	-0,08	-0,01	0,38	0,36
WTI Price	0,19	**0,49**	0,14	**0,48**	0,02	**0,45**	0,23
Commodity	0,09	**0,50**	0,11	**0,45**	0,04	**0,46**	0,16
Wheat	0,17	0,21	-0,08	0,33	-0,06	0,14	0,05
Coal	0,04	0,55	0,06	**0,42**	0,26	0,32	0,01
Grain Harves	-0,10	0,02	0,02	-0,12	**0,64**	-0,12	-0,37
Oil Prod US	**0,71**	0,14	-0,01	0,28	0,19	0,30	0,31
CA Oil Prod.	**0,60**	0,37	0,28	0,25	0,07	0,40	0,54

Table 22: Correlations of revenue drivers 2000-2021.
Source: own calculations, StatCan (2021c), U. S. Bureau of Economic Analysis (2022), United States Census Bureau (2022), Macrotrends (2022), Our World in Data (2022), StatCan (2022), BP (2021), Bank of Canada (2022a).

Correlations	Labour & Fr. Ben.	Purch. Serv./Mat.	Fuel	Equipment Rent	Casualty & Other
Canada GDP	**0,59**	**0,67**	**0,91**	-0,04	0,02
US GDP	**0,44**	**0,39**	**0,72**	-0,30	0,07
WTI Price	0,40	0,08	**0,87**	-0,54	-0,15
Commodity	0,32	0,07	**0,86**	-0,63	-0,18

Table 23: Correlations of expense drivers 2008-2021.
Source: own calculations, StatCan (2021c), U. S. Bureau of Economic Analysis (2022), United States Census Bureau (2022), Macrotrends (2022), Our World in Data (2022), StatCan (2022), BP (2021).

		2016	2017	2018	2019	2020	2021	2022E	2023E	2024E	2025E	2026E
Base	Gross PPE	34.980	35.470	39.102	41.231	41.658	42.776	45.667	48.282	51.053	53.973	56.867
Bull	Gross PPE	34.980	35.470	39.102	41.231	41.658	42.776	45.667	48.282	51.098	54.078	57.034
Bear	Gross PPE	34.980	35.470	39.102	41.231	41.658	42.776	45.667	48.282	51.010	53.880	56.711
Base	CAPEX (17% of revenues)	2.750	2.500	3.500	3.900	2.863	2.891	2.615	2.771	2.920	2.894	2.854
Bull	CAPEX (17% of revenues)	2.750	2.500	3.500	3.900	2.863	2.891	2.615	2.816	2.979	2.957	2.918
Bear	CAPEX (17% of revenues)	2.750	2.500	3.500	3.900	2.863	2.891	2.615	2.728	2.870	2.831	2.777
Base	D&A (3.6% of gross PPE)	1.225	1.281	1.329	1.562	1.589	1.598	1.644	1.738	1.838	1.943	2.047
Bull	D&A (3.6% of gross PPE)	1.225	1.281	1.329	1.562	1.589	1.598	1.644	1.738	1.840	1.947	2.053
Bear	D&A (3.6% of gross PPE)	1.225	1.281	1.329	1.562	1.589	1.598	1.644	1.738	1.836	1.940	2.042

Table 24: Capex and D&A forecast.
Sources: Canadian National Railway Annual Reports.

	2016	2017	2018	2019	2020	2021	2022E	2023E	2024E	2025E	2026E
A/R	*875*	*984*	*1.169*	*1.213*	*1.054*	*1.074*	*1.154*	*1.209*	*1.274*	*1.342*	*1.412*
Inv	*363*	*424*	*557*	*611*	*583*	*589*	*628*	*659*	*694*	*731*	*769*
A/P	*484*	*738*	*982*	*866*	*780*	*903*	*970*	*1.017*	*1.071*	*1.128*	*1.187*
NWC	754	670	744	958	857	760	812	851	897	944	994
dNWC		-84	74	214	-101	-97	52	39	46	47	49

Table 25: Net working capital forecast.
Sources: Canadian National Railway Annual Reports.

S&P500	Var_m	0,000158
	Cov	0,000112
	levered beta	**0,71**
	unlevered beta	0,66
TSX Comp	Var_m	0,000116
	Cov	0,000102
	levered beta	**0,88**
	unlevered beta	0,81
TSX 60	Var_m	0,000120
	Cov	0,000107
	levered beta	**0,89**
	unlevered beta	0,83

Table 26: Beta computation
Sources: own computations, Refinitiv Eikon.

Table 27: Outstanding bonds
Sources: own computations, Refinitiv Eikon

Bonds (05th of April 2022, retrieved from Refinitiv Eikon, converted into CAD)

											US Gov Yield Curve		05.04.22	CAD Yield	
Maturity Date	**Duartion**	**Amount Outstanding**	**Issued Amount**	**Coupon**	**Issue Date**	**Seniority (Legacy)**	**Yield**	**Portion (Mkt P * Yield)**	**Last Price**	**Currency**	**RF USD**	**Spread**	**RF CAD**	**Conv. Yield**	**Market Price**
15-Nov-2022	0,61	312.150.000	312.150.000	2,25	20-Nov-2012	Senior Unsecured	1,77	6.207.762	100,288	USD	1,1	0,6	1,4	1,983	313.048.992
15-May-2023	1,11	187.290.000	187.290.000	7,625	20-May-1993	Senior Unsecured	3,198	6.776.123	104,778	USD	1,7	1,5	2,0	3,453	196.238.716
21-Nov-2024	2,63	437.010.000	437.010.000	2,95	14-Nov-2014	Senior Unsecured	3,168	12.325.687	99,452	USD	2,7	0,5	2,4	2,836	434.615.185
22-Sep-2025	3,47	350.000.000	350.000.000	2,8	22-Sep-2015	Senior Unsecured	3,187	11.014.065	98,741	CAD				3,187	345.593.500
01-Mar-2026	3,91	624.300.000	624.300.000	2,75	23-Feb-2016	Senior Unsecured	3,074	17.612.910	98,817	USD	2,7	0,4	2,5	2,855	616.914.531
15-Jul-2028	6,28	593.085.000	593.085.000	6,9	07-Jul-1998	Senior Unsecured	3,467	23.328.253	119,204	USD	2,7	0,8	2,5	3,300	706.981.043
31-Jul-2028	6,33	350.000.000	350.000.000	3,2	31-Jul-2018	Senior Unsecured	3,529	12.122.874	98,149	CAD				3,529	343.521.500
08-Feb-2029	6,85	350.000.000	350.000.000	3,0	08-Feb-2019	Senior Unsecured	3,62	12.197.029	96,267	CAD				3,620	336.934.500
15-Oct-2031	9,53	249.720.000	249.720.000	7,375	26-Sep-2001	Senior Unsecured	3,512	11.365.326	131,046	USD	2,6	1,0	2,5	3,473	327.248.071
01-Aug-2034	12,33	624.300.000	624.300.000	6,25	09-Jul-2004	Senior Unsecured	3,612	28.123.099	126,042	USD	2,6	1,1	2,5	3,574	786.880.206
01-Jun-2036	14,17	561.870.000	561.870.000	6,2	31-May-2006	Senior Unsecured	3,802	26.022.992	126,058	USD	2,7	1,1	2,5	3,674	708.282.085
15-Nov-2037	15,62	374.580.000	374.580.000	6,375	24-Sep-2007	Senior Unsecured	3,942	18.310.034	128,16	USD	2,7	1,3	2,5	3,814	480.061.728
15-Nov-2042	20,63	312.150.000	312.150.000	3,5	20-Nov-2012	Senior Unsecured	3,904	10.851.525	94,308	USD	2,8	1,1	2,5	3,686	294.382.422
07-Nov-2043	21,61	312.150.000	312.150.000	4,5	07-Nov-2013	Senior Unsecured	3,994	12.643.764	107,265	USD	2,8	1,2	2,5	3,776	334.827.698
22-Sep-2045	23,48	400.000.000	400.000.000	3,95	22-Sep-2015	Senior Unsecured	3,97	15.830.454	99,688	CAD				3,970	398.752.000
02-Aug-2046	24,34	811.590.000	811.590.000	3,2	02-Aug-2016	Senior Unsecured	3,577	25.898.629	93,9	USD	2,7	0,9	2,5	3,398	762.083.010
01-Aug-2047	25,34	500.000.000	500.000.000	3,6	01-Aug-2017	Senior Unsecured	3,971	18.684.548	94,105	CAD				3,971	470.525.000
03-Feb-2048	25,85	749.160.000	749.160.000	3,65	06-Feb-2018	Senior Unsecured	3,584	25.791.505	101,096	USD	2,7	0,9	2,5	3,405	757.370.794
31-Jul-2048	26,34	450.000.000	450.000.000	3,6	31-Jul-2018	Senior Unsecured	3,972	16.794.768	93,962	CAD				3,972	422.829.000
20-Jan-2049	26,81	811.590.000	811.590.000	4,45	07-Nov-2018	Senior Unsecured	3,696	32.185.736	112,747	USD	2,7	1,0	2,5	3,517	915.043.377
08-Feb-2049	26,87	450.000.000	450.000.000	3,6	08-Feb-2019	Senior Unsecured	3,972	16.782.435	93,893	CAD				3,972	422.518.500
08-Feb-2050	27,87	450.000.000	450.000.000	3,05	01-Nov-2019	Senior Unsecured	3,971	15.110.271	84,559	CAD				3,971	380.515.500
01-May-2050	28,09	749.160.000	749.160.000	2,45	01-May-2020	Senior Unsecured	3,454	20.372.140	82,041	USD	2,6	0,9	2,4	3,315	614.618.356
22-Sep-2065	43,50	100.000.000	100.000.000	4,0	22-Sep-2015	Senior Unsecured	3,969	3.994.322	100,638	CAD				3,969	100.638.000
15-Sep-2096	74,50	156.075.000	156.075.000	7,7	30-Jan-1997	Senior Unsecured	3,624	6.475.837	119,072	USD	2,6	1,0	2,4	3,485	185.841.624
15-Sep-2096	74,50	156.075.000	156.075.000	7,7	17-Dec-1996	Senior Unsecured	3,624	6.475.837	119,072	USD	2,6	1,0	2,4	3,485	185.841.624

Intermodal Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	10,2%	10,2%	10,2%	10,2%	10,2%
Economic Growth	75%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Total Growth			8,8%	6,7%	6,2%	6,1%	6,1%
Total Revenues			4.476	4.775	5.073	5.385	5.711

Automotive	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,2%	7,2%	7,2%	7,2%	7,2%
Economic Growth	75%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Adjustment	100%	100%	-2,0%	-1,0%	0,0%	0,0%	0,0%
Total Growth			6,0%	4,9%	5,5%	5,4%	5,3%
Total Revenues			611	641	676	713	750

Petroleum & Chemicals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	9,7%	9,7%	9,7%	9,7%	9,7%
Economic Growth	25%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Crude Oil Production Canada 2022/2023	50%	0%	5,2%	3,6%	-	-	-
Total Growth			7,1%	5,6%	6,1%	6,0%	5,9%
Total Revenues			3.016	3.184	3.379	3.582	3.795

Grain & Fertilizers	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	6,0%	6,0%	6,0%	6,0%	6,0%
Inflation Average	75%	75%	3,3%	2,7%	2,7%	2,6%	2,5%
Adjustment	100%	100%	1,5%	1,0%	0,0%	0,0%	0,0%
Total Growth			5,5%	4,5%	3,5%	3,5%	3,4%
Total Revenues			2.611	2.729	2.824	2.922	3.020

Forest Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	4,8%	4,8%	4,8%	4,8%	4,8%
Economic Growth	25%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Housing Starts Forecast 2022/2023	50%	0%	-3,2%	-2,4%	-	-	-
Total Growth			1,7%	1,4%	4,9%	4,8%	4,7%
Total Revenues			1.769	1.794	1.882	1.972	2.064

Metals & Minerals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,4%	7,4%	7,4%	7,4%	7,4%
Economic Growth	50%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
Crude Oil Price for 2022/2023	25%	0%	43,6%	-9,6%	-	-	-
Adjustment	100%	100%	-2,0%	1,0%	0,0%	0,0%	0,0%
Total Growth			14,9%	3,2%	5,5%	5,4%	5,4%
Total Revenues			1.779	1.836	1.938	2.043	2.153

Coal	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	1,0%	1,0%	1,0%	1,0%	1,0%
Economic Growth	50%	75%	8,3%	5,5%	4,9%	4,8%	4,7%
US Coal Production 2022/2023	25%	0%	7,4%	1,9%	-	-	-
Total Growth			6,3%	3,5%	3,9%	3,8%	3,8%
Total Revenues			657	680	706	733	761

Other Revenues	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Overall Growth Rate Freight Revenues	100%	100%	7,4%	4,8%	5,4%	5,3%	5,2%
Total Growth			7,4%	4,8%	5,4%	5,3%	5,2%
Total Revenues			633	663	699	736	774

Table 28: Revenue forecast base case
Sources: own calculation, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

DCF Model *in $C*	*2020*	***2021***	**2022e**	**2023e**	**2024e**	**2025e**	**2026e**	**TV**
Freight Revenues								
Petroleum & Chemicals	*2.631*	2.816	3.016	3.184	3.379	3.582	3.795	
Metals & Minerals	*1.409*	1.548	1.779	1.836	1.938	2.043	2.153	
Forest Products	*1.700*	1.740	1.769	1.794	1.882	1.972	2.064	
Coal	*527*	618	657	680	706	733	761	
Grain & Fertilizer	*2.609*	2.475	2.611	2.729	2.824	2.922	3.020	
Intermodal	*3.751*	4.115	4.476	4.775	5.073	5.385	5.711	
Automotive	*591*	576	611	641	676	713	750	
Total Freight Revenues	*13.218*	13.888	14.918	15.639	16.478	17.349	18.255	
Other Revenues	*601*	589	633	663	699	736	774	
Total Revenues	*13.819*	14.477	15.551	16.302	17.177	18.085	19.029	
Operating Expenses								
Labour & Fringe Benefits	*2.723*	2.879	2.877	3.097	3.327	3.503	3.685	
Purchased Services & Materials	*2.152*	2.082	2.221	2.329	2.454	2.583	2.718	
Fuel	*1.152*	1.513	2.008	1.900	1.998	2.099	2.205	
Equipment Rents	*432*	336	467	489	515	543	571	
Casualty and Other	*508*	506	520	545	575	605	637	
Losses on Assets held for Sale	*486*	-137	0	0	0	0	0	
Transaction related Costs	*0*	84	0	0	0	0	0	
Depreciation and Amortization	*1.589*	1.598	1.644	1.738	1.838	1.943	2.047	
Total Operating Expenses	*9.042*	8.861	9.737	10.098	10.706	11.276	11.863	
Operating Income	*4.777*	5.616	5.814	6.203	6.471	6.809	7.166	
Other comp. of net per. benefit income	*315*	398	345	345	345	345	345	
Merger Termination Fee	*0*	886	0	0	0	0	0	
Other Income	*6*	43	34	34	34	34	34	
EBITDA	*6.687*	8.541	7.837	8.321	8.688	9.131	9.592	
EBIT	*5.098*	6.943	6.193	6.582	6.850	7.188	7.545	
Taxes (Effective Tax Rate)	*-1.162*	-1.583	-1.412	-1.501	-1.562	-1.639	-1.720	
Unlevered Net Income (NOPAT)	*3.936*	5.360	4.781	5.082	5.288	5.549	5.825	
+ Depreciation	*1.589*	1.598	1.644	1.738	1.838	1.943	2.047	
- ΔNWC	*-101*	-97	52	39	46	47	49	
- CapEx	*2.863*	2.891	2.615	2.771	2.920	2.894	2.854	
- Deferred Income Tax Change	*427*	1.032	0	0	0	0	0	
= Free Cash Flow to Firm (FCFF)	*2.336*	3.132	3.758	4.009	4.160	4.551	4.968	162.269
Discounted Free Cash Flow	*2.336*	3.132	3.557	3.593	3.529	3.655	3.776	123.347

Table 29: DCF model base case
Sources: own calculation, Canadian National Railway Annual Reports, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

Perpetuity Growth Rate	2,5%
Tax Rate	22,8%
CoC / WACC	5,64%
r_e	6,16%
r_d	2,79%
Enterprise Value	**141.457**
Net Debt	20.829
Long-term Liabilities	11.977
Current liabilities	508
Cash & cash equivalents	838
DTL & Lease Liab.	9.182
Implied market capitalisation	120.628
# of Shares	711,6
Fair value per Share	**169,52**
Current Price	161,02
Upside (Downside)	5,3%

Table 30: Fair value base case
Sources: own computations, Canadian National Railway Annual Reports, Refinitiv Eikon.

Intermodal Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	10,2%	10,2%	10,2%	10,2%	10,2%
Economic Growth	75%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
Adjustment	100%	100%	0,0%	0,0%	0,0%	0,0%	0,0%
Total Growth			9,1%	7,1%	6,6%	6,3%	6,1%
Total Revenues			4.490	4.807	5.126	5.449	5.783

Automotive	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,2%	7,2%	7,2%	7,2%	7,2%
Economic Growth	75%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
Adjustment	100%	100%	0,5%	0,0%	0,0%	0,0%	0,0%
Total Growth			8,9%	6,3%	5,9%	5,6%	5,4%
Total Revenues			627	667	706	745	785

Petroleum & Chemicals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	9,7%	9,7%	9,7%	9,7%	9,7%
Economic Growth	25%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
Crude Oil Production Canada 2022/2023	50%	0%	9,0%	3,7%	-	-	-
Adjustment	100%	100%	1,0%	0,5%	0,0%	0,0%	0,0%
Total Growth			10,1%	6,3%	6,5%	6,2%	6,0%
Total Revenues			3.101	3.296	3.511	3.728	3.952

Grain & Fertilizers	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	6,0%	6,0%	6,0%	6,0%	6,0%
Inflation Average	75%	75%	3,3%	2,7%	2,7%	2,6%	2,5%
Adjustment	100%	100%	1,5%	1,5%	0,5%	0,0%	0,0%
Total Growth			5,5%	5,0%	4,0%	3,5%	3,4%
Total Revenues			2.611	2.742	2.852	2.950	3.049

Forest Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	4,8%	4,8%	4,8%	4,8%	4,8%
Economic Growth	25%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
Housing Starts Forecast 2022/2023	50%	0%	-1,0%	3,4%	-	-	-
Adjustment	100%	100%	0,0%	0,0%	0,0%	0,0%	0,0%
Total Growth			2,9%	4,4%	5,3%	5,0%	4,8%
Total Revenues			1.790	1.869	1.968	2.066	2.164

Metals & Minerals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,4%	7,4%	7,4%	7,4%	7,4%
Economic Growth	50%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
Crude Oil Price for 2022/2023	25%	0%	31,9%	-5,6%	-	-	-
Adjustment	100%	100%	-1,0%	1,0%	0,0%	0,0%	0,0%
Total Growth			13,2%	4,5%	5,9%	5,6%	5,4%
Total Revenues			1.753	1.831	1.940	2.049	2.160

Coal	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	1,0%	1,0%	1,0%	1,0%	1,0%
Economic Growth	50%	75%	8,7%	6,0%	5,4%	5,0%	4,8%
US Coal Production 2022/2023	25%	0%	7,4%	1,9%	-	-	-
Adjustment	100%	100%	0,0%	0,0%	0,0%	0,0%	0,0%
Total Growth			6,5%	3,7%	4,3%	4,0%	3,8%
Total Revenues			658	683	712	741	769

Other Revenues	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Overall Growth Rate Freight Revenues	100%	100%	8,2%	5,7%	5,8%	5,4%	5,3%
Total Growth			8,2%	5,7%	5,8%	5,4%	5,3%
Total Revenues			637	674	713	751	791

Table 31: Revenue forecast bull case
Sources: own calculation, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

DCF Model *in $C*	*2020*	*2021*	2022e	2023e	2024e	2025e	2026e	TV
Freight Revenues								
Petroleum & Chemicals	*2.631*	2.816	3.101	3.296	3.511	3.728	3.952	
Metals & Minerals	*1.409*	1.548	1.753	1.831	1.940	2.049	2.160	
Forest Products	*1.700*	1.740	1.790	1.869	1.968	2.066	2.164	
Coal	*527*	618	658	683	712	741	769	
Grain & Fertilizer	*2.609*	2.475	2.611	2.742	2.852	2.950	3.049	
Intermodal	*3.751*	4.115	4.490	4.807	5.126	5.449	5.783	
Automotive	*591*	576	627	667	706	745	785	
Total Freight Revenues	*13.218*	13.888	15.029	15.894	16.814	17.727	18.664	
Other Revenues	*601*	589	637	674	713	751	791	
Total Revenues	*13.819*	14.477	15.667	16.567	17.526	18.478	19.455	
Operating Expenses								
Labour & Fringe Benefits	*2.723*	2.879	2.898	3.148	3.394	3.579	3.768	
Purchased Services & Materials	*2.152*	2.082	2.238	2.367	2.503	2.639	2.779	
Fuel	*1.152*	1.513	1.859	1.853	1.841	1.817	1.782	
Equipment Rents	*432*	336	470	497	526	555	584	
Casualty and Other	*508*	506	524	554	586	618	651	
Losses on Assets held for Sale	*486*	-137	0	0	0	0	0	
Transaction related Costs	*0*	84	0	0	0	0	0	
Depreciation and Amortization	*1.589*	1.598	1.644	1.738	1.840	1.947	2.053	
Total Operating Expenses	*9.042*	8.861	9.633	10.157	10.691	11.154	11.616	
Operating Income	*4.777*	5.616	6.033	6.411	6.835	7.324	7.838	
Other comp. of net per. benefit income	*315*	398	345	345	345	345	345	
Merger Termination Fee	*0*	886	0	0	0	0	0	
Other Income	*6*	43	34	34	34	34	34	
EBITDA	*6.687*	8.541	8.056	8.528	9.054	9.650	10.271	
EBIT	*5.098*	6.943	6.412	6.790	7.214	7.703	8.217	
Taxes (Effective Tax Rate)	*-1.162*	-1.583	-1.462	-1.548	-1.645	-1.756	-1.874	
Unlevered Net Income (NOPAT)	*3.936*	5.360	4.950	5.242	5.570	5.947	6.344	
+ Depreciation	*1.589*	1.598	1.644	1.738	1.840	1.947	2.053	
- ΔNWC	*-101*	-97	58	47	50	50	51	
- CapEx	*2.863*	2.891	2.615	2.816	2.979	2.957	2.918	
- Deferred Income Tax Change	*427*	1.032	0	0	0	0	0	
= Free Cash Flow to Firm (FCFF)	*2.336*	3.132	3.921	4.116	4.380	4.887	5.428	192.173
Discounted Free Cash Flow	*2.336*	3.132	3.721	3.706	3.741	3.961	4.174	147.772

Table 32: DCF model bull case
Sources: own calculation, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

Perpetuity Growth Rate	2,50%
Tax Rate	22,8%
CoC / WACC	5,40%
r_e	5,91%
r_d	2,60%
Enterprise Value	**167.073**
Net Debt	19.530
Long-term Liabilities	11.977
Current liabilities	508
Cash & cash equivalents	838
DTL & Lease Liab.	7883
Implied market capitalisation	147.543
# of Shares	711,6
Fair value per Share	**207,34**
Current Price	161,02
Upside (Downside)	28,8%

Table 33: Fair value bull case
Sources: own computations, Canadian National Railway Annual Reports, Refinitiv Eikon.

Intermodal Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	10,2%	10,2%	10,2%	10,2%	10,2%
Economic Growth	75%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
Adjustment	100%	100%	-0,5%	-0,5%	-0,5%	-0,5%	-0,5%
Total Growth			9,4%	6,5%	6,0%	5,6%	5,4%
Total Revenues			4.502	4.796	5.082	5.366	5.653

Automotive	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,2%	7,2%	7,2%	7,2%	7,2%
Economic Growth	75%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
Adjustment	100%	100%	-3,0%	-2,0%	-0,5%	-0,5%	-0,5%
Total Growth			6,2%	4,3%	5,2%	4,8%	4,6%
Total Revenues			611	638	671	703	736

Petroleum & Chemicals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	9,7%	9,7%	9,7%	9,7%	9,7%
Economic Growth	25%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
Crude Oil Production Canada 2022/2023	50%	0%	5,2%	3,6%	-	-	-
Adjustment	100%	100%	-1,0%	-1,0%	-0,5%	-0,5%	-0,5%
Total Growth			6,5%	4,7%	5,8%	5,5%	5,2%
Total Revenues			2.998	3.139	3.322	3.504	3.687

Grain & Fertilizers	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	6,0%	6,0%	6,0%	6,0%	6,0%
Inflation Average	75%	75%	5,5%	3,4%	3,1%	2,7%	2,5%
Adjustment	100%	100%	0,0%	0,0%	0,0%	0,0%	0,0%
Total Growth			5,6%	4,1%	3,8%	3,6%	3,4%
Total Revenues			2.614	2.721	2.824	2.925	3.023

Forest Products	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	4,8%	4,8%	4,8%	4,8%	4,8%
Economic Growth	25%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
Housing Starts Forecast 2022/2023	50%	0%	-9,6%	-5,7%	-	-	-
Adjustment	100%	100%	0,0%	0,0%	-0,5%	-0,5%	-0,5%
Total Growth			-1,1%	-0,1%	4,6%	4,2%	4,0%
Total Revenues			1.720	1.718	1.797	1.873	1.948

Metals & Minerals	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	7,4%	7,4%	7,4%	7,4%	7,4%
Economic Growth	50%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
Crude Oil Price for 2022/2023	25%	0%	83,3%	-8,0%	-	-	-
Adjustment	100%	100%	-20,0%	0,0%	-0,5%	-0,5%	-0,5%
Total Growth			7,6%	2,8%	5,3%	4,9%	4,7%
Total Revenues			1.665	1.713	1.803	1.891	1.979

Coal	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Past Growth Rate	25%	25%	1,0%	1,0%	1,0%	1,0%	1,0%
Economic Growth	50%	75%	9,8%	6,0%	5,2%	4,7%	4,4%
US Coal Production 2022/2023	25%	0%	7,4%	1,9%	-	-	-
Adjustment	100%	100%	-1,0%	-1,0%	-1,0%	-1,0%	-1,0%
Total Growth			6,0%	2,7%	3,2%	2,8%	2,6%
Total Revenues			655	673	694	714	732

Other Revenues	w. 22-23	w. 24-26	2022	2023	2024	2025	2026
Overall Growth Rate Freight Revenues	100%	100%	6,3%	4,3%	5,2%	4,8%	4,6%
Total Growth			6,3%	4,3%	5,2%	4,8%	4,6%
Total Revenues			626	653	687	720	753

Table 34: Revenue forecast bear case
Sources: own calculation, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

DCF Model *in $C*	*2020*	*2021*	2022e	2023e	2024e	2025e	2026e	TV
Freight Revenues								
Petroleum & Chemicals	*2.631*	2.816	2.998	3.139	3.322	3.504	3.687	
Metals & Minerals	*1.409*	1.548	1.665	1.713	1.803	1.891	1.979	
Forest Products	*1.700*	1.740	1.720	1.718	1.797	1.873	1.948	
Coal	*527*	618	655	673	694	714	732	
Grain & Fertilizer	*2.609*	2.475	2.614	2.721	2.824	2.925	3.023	
Intermodal	*3.751*	4.115	4.502	4.796	5.082	5.366	5.653	
Automotive	*591*	576	611	638	671	703	736	
Total Freight Revenues	*13.218*	13.888	14.766	15.397	16.193	16.975	17.758	
Other Revenues	*601*	589	626	653	687	720	753	
Total Revenues	*13.819*	14.477	15.392	16.050	16.880	17.695	18.511	
Operating Expenses								
Labour & Fringe Benefits	*2.723*	2.879	2.848	3.049	3.269	3.427	3.585	
Purchased Services & Materials	*2.152*	2.082	2.199	2.293	2.411	2.528	2.644	
Fuel	*1.152*	1.513	2.536	2.428	2.327	2.203	2.300	
Equipment Rents	*432*	336	462	482	507	531	555	
Casualty and Other	*508*	506	515	537	565	592	619	
Losses on Assets held for Sale	*486*	-137	0	0	0	0	0	
Transaction related Costs	*0*	84	0	0	0	0	0	
Depreciation and Amortization	*1.589*	1.598	1.644	1.738	1.836	1.940	2.042	
Total Operating Expenses	*9.042*	8.861	10.203	10.527	10.915	11.220	11.746	
Operating Income	*4.777*	5.616	5.189	5.523	5.965	6.475	6.765	
Other comp. of net per. benefit income	*315*	398	345	345	345	345	345	
Merger Termination Fee	*0*	886	0	0	0	0	0	
Other Income	*6*	43	34	34	34	34	34	
EBITDA	*6.687*	8.541	7.212	7.640	8.180	8.793	9.186	
EBIT	*5.098*	6.943	5.568	5.902	6.344	6.854	7.144	
Taxes (Effective Tax Rate)	*-1.131*	-1.540	1.270	1.346	1.446	1.563	1.629	
Unlevered Net Income (NOPAT)	*3.967*	5.403	4.298	4.556	4.897	5.291	5.515	
+ Depreciation	*1.589*	1.598	1.644	1.738	1.836	1.940	2.042	
- ΔNWC	*0*	0	44	34	43	43	43	
- CapEx	*2.863*	2.891	2.615	2.728	2.870	2.831	2.777	
- Deferred Income Tax Change	*427*	1.032	0	0	0	0	0	
= Free Cash Flow to Firm (FCFF)	*2.266*	3.078	3.284	3.531	3.821	4.357	4.738	133.399
Discounted Free Cash Flow	*2.547*	3.963	3.101	3.150	3.219	3.467	3.560	100.243

Table 35: DCF model bear case
Sources: own calculation, U.S. Energy Information Administration (2022b), U.S. Energy Information Administration (2022c), YCharts (2022), Canada Energy Regulator (2022).

Perpetuity Growth Rate	2,25%
Tax Rate	22,8%
CoC / WACC	5,88%
r_e	6,41%
r_d	2,99%
Enterprise Value	**116.740**
Net Debt	19.342
Long-term Liabilities	11.977
Current liabilities	508
Cash & cash equivalents	838
DTL & Lease liab.	7695
Implied market capitalisation	97.398
# of Shares	711,6
Fair value per Share	**136,87**
Current Price	161,02
Upside (Downside)	-15,0%

Table 36: Fair value bear case
Sources: own computations, Canadian National Railway Annual Reports, Refinitiv Eikon.

	2017	2018	2019	2020	2021	2022E	2023E	2024E	2025E	2026E
EBITDA Margin	50,0%	47,6%	48,0%	49,6%	49,5%	50,4%	51,0%	50,6%	50,5%	50,4%
Operating Margin	40,2%	38,4%	37,5%	34,6%	44,9%	39,8%	40,4%	39,9%	39,7%	39,6%
Net Margin		30,2%	28,3%	24,8%	33,8%	30,7%	31,2%	30,8%	30,7%	30,6%
Effective Tax Rate		23,8%	22,3%	24,7%	22,8%	22,8%	22,8%	22,8%	22,8%	22,8%

Table 37: Margins

Sources: own computations, Canadian National Railway Annual Reports, Refinitiv Eikon.

EBITDA Margin	2021	2020	2019	2018	2017	2021	2020	2019	2018	2017	Sqrd Sum
CNR.TO	0,50	0,50	0,48	0,48	0,50	0,00	0,00	0,00	0,00	0,00	0,00
CP.TO	0,40	0,53	0,49	0,48	0,49	0,09	-0,03	-0,01	0,00	0,02	**0,01**
NSC	0,51	0,46	0,45	0,44	0,43	-0,01	0,03	0,03	0,03	0,07	**0,01**
CSX	0,52	0,54	0,52	0,50	0,44	-0,03	-0,05	-0,04	-0,02	0,06	**0,01**
UNP	0,53	0,51	0,50	0,47	0,47	-0,04	-0,02	-0,02	0,01	0,03	**0,00**
FDX	0,12	0,10	0,12	0,13	0,13	0,38	0,40	0,36	0,35	0,37	0,69
UPS	0,17	0,14	0,14	0,13	0,15	0,33	0,36	0,34	0,34	0,35	0,60

ROE	2021	2020	2019	2018	2017	2021	2020	2019	2018	2017	
CNR.TO	0,23	0,18	0,24	0,25	0,46	0,00	0,00	0,00	0,00	0,00	0,00
CP.TO	0,14	0,34	0,36	0,30	0,34	0,09	-0,16	-0,12	-0,05	0,12	**0,07**
NSC	0,21	0,13	0,18	0,17	0,14	0,02	0,05	0,06	0,08	0,32	**0,11**
CSX	0,28	0,22	0,27	0,24	0,15	-0,05	-0,04	-0,04	0,01	0,31	**0,10**
UNP	0,42	0,31	0,31	0,26	0,22	-0,19	-0,12	-0,07	-0,01	0,24	**0,11**
FDX	0,23	0,07	0,03	0,17	0,20	0,00	0,11	0,21	0,09	0,26	**0,13**
UPS	1,73	0,69	1,41	2,39	6,64	-1,50	-0,50	-1,18	-2,14	-6,18	46,67

ROIC	2021	2020	2019	2018	2017	2021	2020	2019	2018	2017	
CNR.TO	0,11	0,08	0,11	0,12	0,21	0,00	0,00	0,00	0,00	0,00	0,00
CP.TO	0,07	0,12	0,12	0,10	0,10	0,05	-0,04	-0,02	0,02	0,11	**0,02**
NSC	0,08	0,06	0,08	0,08	0,06	0,03	0,03	0,03	0,04	0,15	**0,03**
CSX	0,10	0,08	0,09	0,10	0,06	0,01	0,01	0,02	0,03	0,16	**0,03**
UNP	0,11	0,09	0,11	0,11	0,09	0,00	-0,01	0,00	0,01	0,12	**0,02**
FDX	0,08	0,02	0,01	0,07	0,08	0,04	0,06	0,10	0,05	0,14	**0,04**
UPS	0,27	0,03	0,11	0,14	0,15	-0,15	0,05	0,00	-0,02	0,06	**0,03**

D/E	2021	2020	2019	2018	2017	2021	2020	2019	2018	2017	
CNR.TO	0,55	0,66	0,76	0,71	0,65	0,00	0,00	0,00	0,00	0,00	0,00
CP.TO	0,59	1,34	1,24	1,30	1,27	-0,04	-0,68	-0,48	-0,59	-0,62	**1,43**
NSC	1,01	0,86	0,80	0,73	0,60	-0,46	-0,20	-0,04	-0,02	0,05	**0,26**
CSX	1,21	1,28	1,37	1,17	0,80	-0,66	-0,62	-0,61	-0,46	-0,15	**1,43**
UNP	2,10	1,58	1,39	1,10	0,68	-1,55	-0,92	-0,63	-0,39	-0,03	3,80
FDX	0,86	1,2	0,99	0,85	0,93	-0,31	-0,54	-0,23	-0,14	-0,28	**0,54**
UPS	1,54	37,53	7,73	7,53	24,44	-0,99	-36,87	-6,97	-6,82	-23,79	2021,43

Sales Growth	2021	2020	2019	2018	2017	2021	2020	2019	2018	2017	Sqrd Sum
CNR.TO	4,8%	-7,4%	4,2%	9,8%	-	0,00	0,00	0,00	0,00	-	0,000
CP.TO	3,7%	-1,1%	6,5%	11,6%	-	0,01	-0,06	-0,02	-0,02	-	**0,005**
NSC	13,8%	-13,3%	-1,4%	8,6%	-	-0,09	0,06	0,06	0,01	-	**0,015**
CSX	18,3%	-11,3%	-2,6%	7,4%	-	-0,14	0,04	0,07	0,02	-	**0,025**
UNP	11,6%	-10,0%	-4,9%	7,5%	-	-0,07	0,03	0,09	0,02	-	**0,014**
FDX	21,3%	-0,7%	6,5%	8,5%	-	-0,17	-0,07	-0,02	0,01	-	0,033
UPS	15,0%	14,2%	3,1%	7,9%	-	-0,10	-0,22	0,01	0,02	-	0,057

Market Cap	USD
CNR.TO	83.759
CP.TO	67.639
NSC	68.087
CSX	74.968
UNP	148.710
FDX	51.644
UPS	162.373

Selected Group

CP.TO

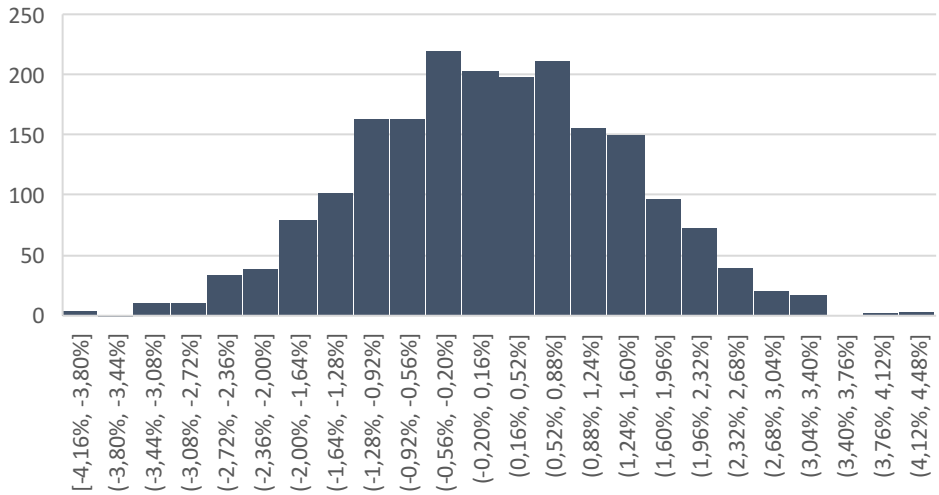
NSC

CSX

UNP

Table 38: Peer group selection

Sources: Canadian National Railway Annual Reports, Refinitiv Eikon



	<0	>0
Daily	49%	51%
Weekly	47%	53%
Monthly	40%	60%

Figure 6: Histogram of daily returns (Monte Carlo)
Sources: Refinitiv Eikon

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