



Europe Economics

The return on equity and the Asset Beta for rail related services for 2022- 2026

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Final Report

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Contents

| | | |
|---|--|----|
| 1 | Introduction..... | 4 |
| 2 | Methodological approach | 5 |
| | 2.1 Introduction | 5 |
| | 2.2 CAPM cost of equity method..... | 5 |
| | 2.3 Method envisaged in the Request for Proposal (RfP)..... | 5 |
| | 2.4 Data used in this report..... | 6 |
| 3 | Regulatory precedents | 7 |
| | 3.1 Introduction | 7 |
| | 3.2 Regulatory precedents..... | 7 |
| 4 | Peer group selection..... | 8 |
| | 4.1 Introduction | 8 |
| | 4.2 Overview of approach to shortlisting comparators..... | 8 |
| | 4.3 Outcome: initial comparator list and relation to 'rail-related services' | 8 |
| | 4.4 Liquidity checks..... | 11 |
| | 4.5 Final peer group selection | 11 |
| 5 | Return on equity: Components | 13 |
| | 5.1 Introduction..... | 13 |
| | 5.2 Risk-free rate..... | 13 |
| | 5.3 Equity beta regressions | 13 |
| | 5.4 Gearing / Tax rate | 16 |
| | 5.5 De-leveraging equity betas..... | 16 |
| | 5.6 Asset betas | 17 |
| | 5.7 Is there evidence of a differential between the asset betas of freight and passenger services? | 17 |
| 6 | Return on equity: Recommendation | 20 |

1 Introduction

This is Europe Economics' recommendation to the ACM on the return on equity for rail related services for 2022-2026 in the Netherlands. In this report, Europe Economics calculates the cost of equity (including the asset beta), in order to give this recommendation.

The rail-related services in the scope of our recommendation are defined in the ACM's "Guide on Rail-related services and service facilities"¹ which in turn builds on Annex II of Directive 2012/34/EU establishing a single European railway area (Recast directive).² These services cover a broad range of activities including the services of passenger stations and freight terminals, storage and maintenance facilities, maritime and port facilities that are linked to rail, and services related to ticket sales in stations.

This report is organised to provide:

- (i) A methodological approach to calculate the cost of equity consistent with the ACM's requirements,
- (ii) A suitable peer group,
- (iii) Insight into a possible difference between asset betas for freight and passenger-related services,
- (iv) Discussion of the merits of adjusting to account for COVID-19 effects, and
- (v) Cost of equity parameters and a final cost of equity recommendation.

The results will be used to determine Europe Economics' recommendation for the cost of equity for the provision of rail-related services in the Netherlands to 2026.

¹ ACM (2018) "Rail-related services and service facilities" [\[online\]](#).

² Directive 2012/34/EU of the European Parliament and of the Council of 21 November 2012 establishing a single European railway area [\[online\]](#).

2 Methodological approach

2.1 Introduction

This section introduces the method for calculating the cost of equity under the Capital-Asset Pricing Model (CAPM) framework and reproduces the ACM's requirements for this study.

2.2 CAPM cost of equity method

Cost of equity (R_e)

The cost of equity is obtained from the capital asset pricing model (CAPM). Developed in the 1960s, the CAPM model expresses investment returns as: $R_e = r_f + (TMR - r_f) * \beta$, where R_e is the (expected) return on the asset; r_f is the return that would be required for a perfectly risk-free asset; TMR is the total market return, i.e. the return that would be delivered by a notional perfectly diversified portfolio consisting of all assets ("the whole market"). The component $(TMR - r_f)$ is known as the equity risk premium (ERP). Finally, β ("beta") is a measure of the correlation between movements in the value of the asset of interest and in the value of assets as a whole.

The parameters

There are eight parameters that need to be calculated. The explicit calculations to be used are described in the following table. All calculations use the guidelines provided by the ACM for this study. The resulting figure [8] is the nominal pre-tax return on equity.

Table 2.1: Summary of cost of equity calculations

| Parameter | # | Calculation method |
|--------------------------|-----|-----------------------------------|
| Tax | [1] | Parameter |
| Gearing (D/A) | [2] | Parameter |
| Gearing (D/E) | [3] | $= [2] / (1 - [2])$ |
| Asset beta | [4] | Parameter |
| Equity beta | [5] | $= [4] * (1 + (1 - [1]) * [3])$ |
| Risk free rate (equity) | [6] | Parameter |
| Equity risk premium | [7] | Parameter |
| Pre-tax return on equity | [8] | $= ([6] + [5] * [7]) / (1 - [1])$ |

Note: D/A = Debt over Assets; D/E Debt over Equity.

2.3 Method envisaged in the Request for Proposal (RfP)

The following is an extract from the RfP; Europe Economics has not changed the text.

To calculate the 'reasonable return', regulated firms need to determine the nominal pre-tax return³ on equity for the rail-related services.

To do so, the following set of parameters is needed:

- Rf = risk free rate
- Ba = Asset Beta of the reference group
- ERP = Equity Risk Premium, which the ACM specifies to be 5 per cent.

Hence the assignment consists of calculating the:

- Rf = risk free rate
- Ba = Asset Beta of the reference group

Based on the parameters mentioned above, regulated firms should be able to calculate their firm-specific nominal pre-tax 'return on equity' based on their Equity Beta (to be calculated from the Asset Beta and the firm-specific Gearing), Risk free rate and ERP (return on equity = $(Rf + Be \times ERP) / (1 - \text{tax})$). The report should provide the formula to calculate a firm-specific Equity Beta (Be), based on the Asset Beta (Ba) of the reference group and the firm-specific Gearing. Re-leveraging of the Beta (calculating Be from Ba) will be done by the firms themselves based on their actual (firm-specific) gearing.

³ Dutch rail law specifies the 'reasonable return' as the 'return on equity'. This implies that the 'return on debt' should be based on the factual 'cost of debt' of the specific firm.

Possible differentiation between freight transport and passenger transport in calculating the asset beta

The above specified rail-related services (see: 'Specification of the rail-related services') are used for freight transport, passenger transport or both. We are required to provide advice plus justification regarding whether this difference in types of users results in a need to differentiate between the Asset Betas for these two types of services. If such differentiation is needed for the Asset Beta, then we are required to calculate two Asset Betas instead of one Asset Beta.

Specification of the method to calculate R_f

We are required to update the R_f using an even-split mix of Dutch and German government bonds with 10-year remaining maturity, using a reference period of 3 years with daily data.

Specification of the method to calculate the Asset Beta

We are required to calculate the Asset Beta according to the following principles and procedure.

- Calculate Equity Betas of peers using:
 - Three years of daily data;
 - Index: Eurozone index for European peers, national index for other peers;
 - OLS-regressions;
 - Reporting of autocorrelation and heteroscedasticity statistics, but no adjustments;
 - Dimson adjustment;
 - No Vasicek adjustment;
- Calculate Asset Betas by unlevering Equity Betas with the Modigliani-Miller formula, using the actual gearing and tax rate over three years of the peer in question.
- Calculate the Asset Beta by taking the median of Asset Beta's of peer group.
- Preferably the reference group should consist of at least 10 firms with a similar risk profile.

2.4 Data used in this report

Unless otherwise specified, all financial data used to calculate the parameters are sourced from Refinitiv/Thomson Reuters Eikon.

3 Regulatory precedents

3.1 Introduction

This section maps a number of European regulators' determinations for the asset beta for rail-related activities since 2015.

3.2 Regulatory precedents

In Table 3.1 we see that there is some recent precedent in Germany for determining separate asset betas for passenger- and freight-related activities. The asset betas for freight reach a higher upper estimate than those for passenger, suggesting that the regulators believed freight companies' performance to be more closely correlated with overall market performance (betas closer to 1). It is important to note that the determinations listed in the table all used pre-COVID-19 data in their calculations of the asset beta.

Table 3.1: Regulatory precedents for asset beta determinations for rail-related activities

| Country | Sector/service | Regulator | Year | Estimation method summary | Asset beta |
|---------|---|--|------|--|--|
| DE | Rail infrastructure | Bundesnetzagentur (Federal Network Agency) | 2021 | Comparators include passenger rail, freight, utilities, ports and energy networks. 3-yr data horizon (2018-2020). Daily frequency. Country-specific indices of FTSE All-World Index Series. | Passenger: 0.26-0.74 Freight: 0.26-0.96 Mix: 0.26-0.93 Ports: 0.36-0.85 |
| DE | Rail infrastructure | Bundesnetzagentur (Federal Network Agency) | 2019 | Comparators include passenger rail, freight, utilities, ports and energy networks. 3-yr data horizon (2016-2018). Daily frequency. Country-specific indices of FTSE All-World Index Series. | Passenger: 0.21-0.56 Freight: 0.21-1.05 Mix: 0.21-0.98 Ports: 0.35-0.83 |
| ES | Complementary rail freight services provided by Terminal Catalunya (firm) | CNMC (National Commission on Markets and Competition) | 2017 | Comparators include infrastructure managers and concessionaires of highways, and various ports and logistics companies. 5-yr data horizon. Weekly frequency. | 0.58 |

| Country | Sector/service | Regulator | Year | Estimation method summary | Asset beta |
|---------|---------------------|---|------|--|--|
| DE | Rail infrastructure | Bundesnetzagentur (Federal Network Agency) | 2016 | Comparators include passenger rail, freight, utilities, ports and energy networks. 3-yr data horizon (2013-2015). Daily frequency. Country-specific indices of FTSE All-World Index Series. | Passenger: 0.29-0.57 Freight: 0.29-1.07 Mix: 0.29-1.00 Ports: 0.33-0.58 |
| IT | Rail infrastructure | Autorita-Transporti (Transport Authority) | 2015 | Average of the equity betas estimated calculated by/for ORR, TERNA, SAM and DB ML Group Infrastructure at recent regulatory reviews. | 0.7 |

4 Peer group selection

4.1 Introduction

This section details the selection of suitable comparator companies to comprise the peer group for subsequent equity beta analysis.

4.2 Overview of approach to shortlisting comparators

We first shortlisted four European Refinitiv sector indices comprised of companies providing services that may have some cross-over with rail-related services.

Each sector index provided a number of companies. We then sifted the long list of companies as follows:

1. The first sift identified firms that represent at least 1 per cent of the total market capitalisation of firms in each sector index.
2. The second sift identified the relevance of selected firms' activities from the business descriptions provided by Refinitiv.
3. Finally, recent annual reports of the sifted companies were checked to identify an estimated share of revenues from 'rail-related services' and the approximate split of passenger and freight activities. This resulted in a short list, so steps 1-3 were repeated with some of the firms originally excluded in sift 1.

Once an initial list had been identified, we carried out liquidity checks on the companies (see subsection 4.4).

4.3 Outcome: initial comparator list and relation to 'rail-related services'

The four sector indices are: Passenger Transportation (denoted "P"); Freight and Logistics ("F"); Transport infrastructure ("TI"); and Highways and Railtrack ("HR"). The resulting companies are shown in Table 4.1.

Passenger transportation (P)

Five rail comparators were shortlisted from this sector index, four of them headquartered in the UK. The remaining firms in the sector index are either car rentals or airlines.

Freight & logistics (F)

This sector index contains only one firm that appears to gain revenue from rail-related services. Although many firms have storage and maintenance facilities in this sector index, these services are not obviously a source of revenue. Furthermore, this sector index is mostly comprised of marine/deep sea freight and logistics firms, and some in aviation. One firm is included from this sector index.

Transport infrastructure (TI)

Five rail comparators were shortlisted from this sector index. Many firms of this index appear to provide services similar to rail, such as infrastructure management, management and storage. Some firms operate in road, sea and/or aviation, but not rail. The majority of the firms in this sector index are airport operators.

Highways & Railtrack (HR)

This sector index comprises just three firms in total. The two we include also appear in sector index TI.

Because of the inclusion of certain maritime and inland port-related services in the ACM's definition of rail-related services, we also sought to include some marine ports. A number of marine port service providers are included in indices TI and F.

We also included five firms which provide rail maintenance, infrastructure or logistics services from a wider search. These appear at the bottom of the table without an 'Index' entry.

Indices: Transport infrastructure (TI), Highways and Railtrack (HR), Freight and logistics (F), Passenger transport (P).

Table 4.1: Sifted potential comparators

| Firm | Domicile | Index | Refinitiv Industry | % Revenues from 'rail-related' services | Split (passenger: freight) | 'Rail-related' services | Idiosyncrasies to be aware of |
|------------------|----------|-------|--|---|----------------------------|---|--|
| PKP Cargo | Poland | F | Railway Freight Operators | 98 | 0:100 ^a | <ul style="list-style-type: none"> - Rail transportation and freight forwarding - Infrastructure management: terminals - Siding services - Maintenance and other facilities | <ul style="list-style-type: none"> - Largest rail freight carrier in Poland. - Operates 25 transshipment terminals in Poland. |
| National Express | UK | P | Passenger Transportation, Ground & Sea (NEC) | 7 | 100:0 | Passenger rail | <ul style="list-style-type: none"> - German passenger rail services. - Ran West Midlands Metro (UK) until 2018; C2C (UK) until 2017. - Share of rail revenue averaged ~3% before 2020. |
| FNM SpA | Italy | P | Commuting Services | 69 | 15:85 | <ul style="list-style-type: none"> - Construction and management of rail infrastructure. - Passenger rail | Second largest railway company in Italy. |
| FirstGroup | UK | P | Commuting Services | 41 | 100:0 | Passenger rail | <ul style="list-style-type: none"> - Owned majority share in TransPennine Express (UK) passenger operator until 2016. - Consistent growth in share of rail revenues: 23% (2017); 31% (2018); 38% (2019); 41% (2020) |
| Stagecoach Group | UK | P | Commuting Services | 1 | 100:0 | Passenger rail | <ul style="list-style-type: none"> - Operated passenger operator franchises: East Midlands Trains (UK) until 2019; South West Trains (UK) until 2017; InterCity East Coast (UK) until 2018; InterCity West Coast (UK) until 2019. - Share of rail revenues was 11% and 31% in 2019/20 and 2018/19, respectively. |

| Firm | Domicile | Index | Refinitiv Industry | % Revenues from 'rail-related' services | Split (passenger: freight) | 'Rail-related' services | Idiosyncrasies to be aware of |
|------------------------------|----------|--------|----------------------------------|---|----------------------------|--|---|
| Go-Ahead Group | UK | P | Rail Services | 74 | 100:0 | Passenger rail | Operated passenger operator franchise London Midland (UK) until 2017; London Southeastern (UK) until financial breach of franchise agreement in 2021. |
| Hamburger Hafen und Logistik | Germany | TI | Marine Port Services (NEC) | 94 | 0:100 | <ul style="list-style-type: none"> - Container transfer between modes of transport - Container-related services (e.g. storage, repair) - Container transport via rail and truck in the seaports | Operates container trains from its own terminals in the Czech Republic, Austria, Slovakia, Hungary, Poland and neighbouring countries. |
| Piraeus Port Authority | Greece | TI | Marine Port Services (NEC) | 17 | 0:100 ^c | Storage, supply of water(fuel), shipbuilding repair services | |
| Thessaloniki Port Authority | Greece | TI | Marine Cargo Handling Services | 2 | 0:100 ^a | Services and maintenance facilities at ports | Significant drop in cargo throughput in Q2 2020. |
| Atlantia | Italy | TI, HR | Highways & Rail Tracks (NEC) | 92 | 0:100 ^c | Construction, operation and maintenance of toll motorways | <p>No rail activities, but 92% of revenue from infrastructure management (roads).</p> <p>Two issues in 2018:</p> <ul style="list-style-type: none"> - Concerns over net debt level raised by rating agencies; - Collapse of Atlantia-owned Morandi bridge in Genoa. |
| Getlink | France | TI, HR | Highways & Rail Tracks (NEC) | 36 | 30:70 | Eurotunnel rail network and rail freight | <ul style="list-style-type: none"> - Eurostar (passenger operator) is Getlink's largest single customer. - Operates the Eurostar shuttle trains that transport vehicles through the Channel Tunnel (64% of revenue). |
| Alstom | France | N/A | Heavy Machinery & Vehicles (NEC) | 100% | 75:25 ^b | Rolling stock manufacturers, systems, services and signalling | Significant divestments in 2021. |

| Firm | Domicile | Index | Refinitiv Industry | % Revenues from 'rail-related' services | Split (passenger: freight) | 'Rail-related' services | Idiosyncrasies to be aware of |
|------------------------|----------|-------|------------------------------------|---|----------------------------|---|--|
| NRC Group | Norway | N/A | Construction & Engineering (NEC) | 67% | 0:100 ^c | Rail infrastructure contractor (construction and maintenance) | |
| Talgo SA | Spain | N/A | Locomotive Engines & Rolling Stock | 100% | 100:0 | Manufacturer of passenger trains | |
| Nurminen Logistics Oyj | Finland | N/A | N/A | Unavailable | 0:100 | Three rail revenue streams: railway, terminal and warehousing | Significant growth in rail logistics between China and Northern Europe |
| Railcare Group | Sweden | N/A | N/A | 100% | N/A | Solutions and services to the railroad industry (railway maintenance) | Operates in Scandinavian countries and the UK. |

a: No precise estimates but freight dominated

b: No precise estimates but passenger dominated

c: Sorted into one category based on qualitative analysis of company description: majority B2B activities.

4.4 Liquidity checks

After the initial selection, we test whether the companies satisfy the two liquidity thresholds as described by the ACM for the inclusion of listed companies in the peer group:

- Liquidity test 1 ("L1"): At least €100 million in annual sales.
- Liquidity test 2 ("L2"): Trade at least 90% of trading days.

The result of the liquidity checks is that three companies fail L1 (Thessaloniki Port Authority, Railcare Group, Nurminen Logistics Oyj), and no company fails L2.

Table 4.2: Results of liquidity checks on the peer group

| Firm | Liquidity check 1: Revenue >100m EUR in most recent year | Liquidity check 2: Traded days |
|------------------------------|---|--------------------------------|
| Atlantia | PASS | PASS |
| Getlink | PASS | PASS |
| Hamburger Hafen und Logistik | PASS | PASS |
| Piraeus Port Authority | PASS | PASS |
| Thessaloniki Port Authority | FAIL | PASS |
| PKP Cargo | PASS | PASS |
| National Express | PASS | PASS |
| FNM SpA | PASS | PASS |
| FirstGroup | PASS | PASS |
| Stagecoach Group | PASS | PASS |
| Go-Ahead Group | PASS | PASS |
| Alstom | PASS | PASS |
| NRC Group | PASS | PASS |
| Talgo SA | PASS | PASS |
| Railcare Group | FAIL | PASS |
| Nurminen Logistics Oyj | FAIL | PASS |

4.5 Final peer group selection

Our final peer group selection consists of 13 companies as potential comparators for rail-related services.

Peer group selection

The final composition of this peer group is as follows:

- 3 companies from Commuting Services;
- 2 companies from Highways & Rail Tracks;
- 2 companies from Marine Port Services;
- 1 company from Rail Services;
- 1 company from Passenger Transportation, Ground & Sea;
- 1 company from Railway Freight Operators;
- 1 company from Heavy Machinery & Vehicles;
- 1 company from Construction & Engineering;
- 1 company from Locomotive Engines & Rolling Stock

The final peer group selection is provided in the table below. We note that National Express Group PLC and Stagecoach Group PLC both feature with low estimated shares of rail-related revenues, each being primarily road passenger transportation companies after having recently reduced their rail transportation portfolios. Since passenger road transport shares similar market outcomes with passenger rail transport, they bolster the passenger-facing dimension of the comparators and so we include these companies in the peer group.⁴ However, the final asset betas we present exclude these companies.

Table 4.3: Final peer group selection, in ascending order of share of revenues from rail-related activities

| Company name | RIC | Sector | % Revenues from rail-related activities | Split (passenger: freight) |
|---------------------------------|----------|------------------------------------|---|----------------------------|
| Alstom | ALSO.PA | Heavy Machinery & Vehicles | 100 | 75:25 ^b |
| Talgo SA | TLGO.MC | Locomotive Engines & Rolling Stock | 100 | 100:0 |
| PKP Cargo | PKPP.WA | Railway Freight Operators | 98 | 0:100 ^a |
| Hamburger Hafen und Logistik AG | HHFGn.DE | Marine Port Services | 94 | 0:100 |
| Atlantia SpA | ATL.MI | Highways & Rail Tracks | 92 | 0:100 ^c |
| Go-Ahead Group PLC | GOG.L | Rail Services | 74 | 100:0 |

⁴ As an additional check, we analysed the rolling betas of these companies provided by Refinitiv and found that they exhibit similar paths to those of the other passenger-dominant companies in the peer group.

Peer group selection

| Company name | RIC | Sector | % Revenues from rail-related activities | Split (passenger: freight) |
|----------------------------|---------|--|---|----------------------------|
| FNM SpA | FNMI.MI | Commuting Services | 69 | 15:85 |
| NRC Group | NRC.OL | Construction & Engineering | 67 | 0:100 ^c |
| FirstGroup PLC | FGP.L | Commuting Services | 41 | 100:0 |
| Getlink | GETP.PA | Highways & Rail Tracks | 36 | 30:70 |
| Piraeus Port Authority SA | OLPr.AT | Marine Port Services | 17 | 0:100 ^c |
| National Express Group PLC | NEX.L | Passenger Transportation, Ground & Sea | 7 | 100:0 |
| Stagecoach Group PLC | SGC.L | Commuting Services | 1 | 100:0 |

a: No precise estimates but freight dominated.

b: No precise estimates but passenger dominated

c: Sorted into one category based on qualitative analysis of company description: majority B2B activities.

5 Return on equity: Components

5.1 Introduction

In this section we set out our estimates of the cost of equity. As stated in the methodology section, the cost of equity is estimated using the CAPM, which estimates the expected return on equity using the components: risk free rate, the average return of the market (the ERP) and the company beta. First, we provide our estimates of the risk free rate. The section then presents the results of beta analysis for the peer group and discusses the evidence of a differential between passenger and freight betas. It also provides some analysis of the impact of COVID-19 on the estimates.

5.2 Risk-free rate

The ACM method prescribes that the risk-free rate should be estimated on the basis of Dutch and German government bond yields over the most recent three-year period.

We obtained the yields on 10-year government bonds in both the Netherlands and Germany between 14/01/2019 and 14/01/2022. The risk-free rate is then constructed as the simple average of the two series. Table 5.1, below, reports the results obtained for both bonds and the risk-free rate point estimate. Immediately, below, Table 5.2 presents a range of summary statistics from the same analysis.

The simple arithmetic average of government bonds from the Netherlands and Germany gives a risk-free rate of **-0.27 per cent**.

Table 5.1: Risk-free rate: point estimate, Jan-19 to Jan-22 (per cent)

| Region | Average (2019-2022) |
|----------------|------------------------|
| Netherlands | -0.198 |
| Germany | -0.334 |
| Average | -0.266 |

Source: Refinitiv. Europe Economics calculations.

Table 5.2: Risk-free rate: summary statistics, Jan-19 to Jan-22 (per cent)

| Variable | Netherlands | Germany | Average |
|--------------------|-------------|---------|---------|
| Average | -0.198 | -0.334 | -0.266 |
| Spot value | 0.050 | -0.047 | 0.002 |
| Standard deviation | 0.218 | 0.205 | 0.212 |
| Maximum | 0.396 | 0.262 | 0.329 |
| Minimum | -0.635 | -0.844 | -0.740 |

Source: Refinitiv. Europe Economics calculations.

5.3 Equity beta regressions

For each comparator, the equity beta is calculated from market data as the covariance of the company's returns and the returns on the market index. We have used daily frequency data and an estimation period of three years, from 14/01/2019 to 14/01/2022, as provided by Refinitiv. Equity betas are estimated using the Ordinary Least Squares (OLS) estimator with no adjustments to standard errors.

Several measures have been taken to ensure the robustness of the estimates:

- The peer group of comparators is comprised of companies that pass the ACM's liquidity checks, which increases the reliability of the equity betas calculated.
- The presence of autocorrelation and heteroskedasticity is tested in OLS regressions through the Breusch-Godfrey test and the White test, respectively.
- We compare the OLS betas against Dimson-corrected betas and adjust where necessary.

5.3.1 Market indices

The relative risk of each comparator company, as represented by its beta parameter, is measured against an index representing the overall market. Our comparator group comprises a number of companies domiciled in the Eurozone, and others in non-Eurozone territories. Using indices of the currency zone or country concerned avoids the influence of exchange rate movements on equity betas. For each territory we have used the following broad index to capture the overall market.

Table 5.3: Market indices

| Domicile | Index |
|----------|-------------------------------|
| Eurozone | Euro Stoxx Total Market Index |

| | |
|----------------|-------------------------------------|
| United Kingdom | FTSE All-Share |
| Norway | Refinitiv Norway Total Return Index |
| Poland | Refinitiv Poland Total Return Index |

5.3.2 Equity betas obtained with the OLS estimator

In Table 5.4 we present the three-year equity betas calculated using the OLS estimator. The returns of each company are regressed on the returns of its respective overall market index (Table 5.3). The estimates are statistically significant for all of the included comparators (at the 1 per cent level of significance).

Table 5.4: OLS specification: Equity beta, p-value, standard error, 95% confidence interval

| Company name | Equity beta | p-value | standard error | 95% conf. interval |
|------------------------------|-------------|---------|----------------|--------------------|
| PKP Cargo | 1.17 | 0.00 | 0.06 | 1.04-1.29 |
| National Express | 1.85 | 0.00 | 0.11 | 1.64-2.05 |
| FNM SpA | 0.86 | 0.00 | 0.06 | 0.74-0.98 |
| FirstGroup | 1.70 | 0.00 | 0.12 | 1.47-1.94 |
| Stagecoach Group | 1.44 | 0.00 | 0.11 | 1.23-1.65 |
| Go-Ahead Group | 1.48 | 0.00 | 0.11 | 1.27-1.69 |
| Hamburger Hafen und Logistik | 1.11 | 0.00 | 0.05 | 1.01-1.21 |
| Piraeus Port Authority | 0.69 | 0.00 | 0.05 | 0.6-0.79 |
| Atlantia | 1.23 | 0.00 | 0.06 | 1.1-1.35 |
| Getlink | 1.10 | 0.00 | 0.04 | 1.02-1.17 |
| Alstom | 0.84 | 0.00 | 0.05 | 0.75-0.93 |
| NRC Group | 0.83 | 0.00 | 0.09 | 0.66-1.01 |
| Talgo SA | 0.64 | 0.00 | 0.06 | 0.53-0.75 |

5.3.3 Test for autocorrelation and heteroskedasticity

We carried out the Breusch-Godfrey test for autocorrelation and the White test for heteroskedasticity to identify the prevalence of these possible issues in the data.

The results in Table 5.5 show that the standard errors are correlated over different time periods (autocorrelation) for six of the 13 comparators, and that the variance of the error term is not constant (heteroskedasticity) for 11 of them.

Table 5.5: Autocorrelation [A] and heteroskedasticity [H] tests (chi-squared, p-value, result)

| Company name | Chi2 [A] | p-value [A] | Autocorr- elation? | Chi2 [H] | p-value [H] | Heteroske- dasticity? |
|------------------------------|-------------|----------------|-----------------------|-------------|----------------|--------------------------|
| PKP Cargo | 2.15 | 0.14 | NO | 33.69 | 0.00 | YES |
| National Express | 18.91 | 0.00 | YES | 23.79 | 0.00 | YES |
| FNM SpA | 0.01 | 0.93 | NO | 10.32 | 0.01 | YES |
| FirstGroup | 4.08 | 0.04 | YES | 16.56 | 0.00 | YES |
| Stagecoach Group | 6.77 | 0.01 | YES | 27.74 | 0.00 | YES |
| Go-Ahead Group | 4.93 | 0.03 | YES | 39.53 | 0.00 | YES |
| Hamburger Hafen und Logistik | 6.09 | 0.01 | YES | 20.82 | 0.00 | YES |
| Piraeus Port Authority | 1.54 | 0.22 | NO | 2.61 | 0.27 | NO |
| Atlantia | 0.01 | 0.91 | NO | 21.18 | 0.00 | YES |
| Getlink | 2.48 | 0.12 | NO | 52.82 | 0.00 | YES |
| Alstom | 0.05 | 0.83 | NO | 7.89 | 0.02 | YES |
| NRC Group | 8.43 | 0.00 | YES | 0.58 | 0.75 | NO |
| Talgo SA | 0.28 | 0.60 | NO | 16.99 | 0.00 | YES |

Tests are performed using OLS estimators. The null hypothesis is rejected at the 0.05 level.

Following ACM guidance, we have not adjusted the OLS regressions for the presence of autocorrelation and heteroskedasticity.

5.3.4 Assess the equity betas against Dimson-corrected betas

Finally, we have calculated equity betas obtained from the Dimson correction of the OLS estimates. This correction estimates equity betas using the same-day market index as an independent variable, supplemented with the market index from one period earlier and one period later. Where these lag and forward variables are found jointly significant, the Dimson equity beta is calculated as the sum of the three coefficients.

The results are shown in Table 5.6. The F-test of joint significance of the lag and forward variables indicates that the Dimson adjustment is needed in nine cases. The Dimson betas for these companies are used in the analysis that follows.

Table 5.6: Results of OLS and Dimson betas, and results of the test (F-test p-value denotes joint significance of lag and forward variables)

| Company name | Equity beta [OLS] | Equity beta [Dimson] | F-test p-value | Correction needed? |
|------------------|-----------------------|-------------------------|----------------|-----------------------|
| PKP Cargo | 1.17 | 1.41 | 0.00 | YES |
| National Express | 1.85 | 2.61 | 0.00 | YES |

Return on equity: Components

| Company name | Equity beta [OLS] | Equity beta [Dimson] | F-test p-value | Correction needed? |
|---------------------------------|-----------------------|-------------------------|----------------|-----------------------|
| FNM SpA | 0.86 | 1.09 | 0.00 | YES |
| FirstGroup | 1.70 | 2.33 | 0.00 | YES |
| Stagecoach Group | 1.44 | 2.07 | 0.00 | YES |
| Go-Ahead Group | 1.48 | 2.01 | 0.00 | YES |
| Hamburger Hafen und Logistik | 1.11 | 1.26 | 0.03 | YES |
| Piraeus Port Authority | 0.69 | 0.44 | 0.00 | YES |
| Atlantia | 1.23 | 1.20 | 0.72 | NO |
| Getlink | 1.10 | 1.13 | 0.53 | NO |
| Alstom | 0.84 | 0.76 | 0.22 | NO |
| NRC Group | 0.83 | 1.16 | 0.01 | YES |
| Talgo SA | 0.64 | 0.74 | 0.18 | NO |

The F-test null hypothesis that the coefficients of the lag and forward variables are jointly equal to zero is rejected at the 0.05 level.

5.4 Gearing / Tax rate

To make the equity betas comparable across firms, we de-leverage them using the firms' gearing and tax.

Gearing

Gearing is defined as net debt (D) over enterprise value ($D + E$): $\text{Gearing} = D / (D + E)$. For ACM decisions, gearing calculations are based on the actual gearing of comparator companies. We have used the average of daily gearing data for each of the comparators between 14/01/2019 and 14/01/2022 provided by Refinitiv.

Tax

We use the effective tax rate for each company domicile from KPMG's corporate tax table, which provides a summary of corporate tax rates around the world up to 2021.⁵ We use an average of years 2019 to 2021.

⁵ KPMG (n.d.) Corporate Tax Rates Table [\[online\]](#).

5.5 De-leveraging equity betas

The Hamada variation of the Modigliani-Miller equation is used to de-leverage the equity betas. This method adjusts for corporation taxes and assumes a zero debt beta, producing an asset beta⁶ thus:

$$\beta_A = \frac{\beta_E}{1 + (1 - t)\left(\frac{g}{1 - g}\right)}$$

where β_E is the calculated equity beta, t the applicable tax rate, and g the company's gearing.⁷ Table 5.7, below, shows the final equity betas and the parameters required for de-levering them. The OLS equity beta estimates with the Dimson correction are denoted by "[D]".

Table 5.7: Equity betas and asset betas

| Company name | Equity betas [a] | Gearing [b] | Tax rate [c] | Asset betas [d] |
|------------------------------|---------------------|----------------|-----------------|--------------------|
| PKP Cargo | 1.41 [D] | 0.67 | 0.190 | 0.53 |
| National Express | 2.61 [D] | 0.41 | 0.190 | 1.67 |
| FNM SpA | 1.09 [D] | 0.31 | 0.240 | 0.81 |
| FirstGroup | 2.33 [D] | 0.64 | 0.190 | 0.95 |
| Stagecoach Group | 2.07 [D] | 0.42 | 0.190 | 1.29 |
| Go-Ahead Group | 2.01 [D] | 0.45 | 0.190 | 1.21 |
| Hamburger Hafen und Logistik | 1.26 [D] | 0.26 | 0.300 | 1.01 |
| Piraeus Port Authority | 0.44 [D] | 0.03 | 0.253 | 0.43 |
| Atlantia | 1.23 | 0.62 | 0.240 | 0.55 |
| Getlink | 1.10 | 0.37 | 0.285 | 0.77 |
| Alstom | 0.84 | 0.11 | 0.285 | 0.77 |
| NRC Group | 1.16 [D] | 0.39 | 0.220 | 0.77 |
| Talgo SA | 0.64 | 0.09 | 0.250 | 0.59 |
| Mean | 1.40 | - | - | 0.87 |
| Median | 1.23 | - | - | 0.77 |

⁶ Strictly speaking, this method calculates 'unlevered betas' when a zero debt beta is assumed. In this document, we refer to the unlevered beta as an 'asset beta', accepting that this is a solecism.

⁷ Note that $\frac{g}{1-g}$ is equivalent to $\frac{D}{E}$, where D is the amount of debt on the company's balance sheet and E is the amount of equity.

Return on equity: Components

[a]: Dimson betas denoted by [D].

[b]: Average between 14/01/2019 and 14/01/2022 (Refinitiv data).

[c]: Average between 2019 and 2021 (KPMG data).

[d] = $a/(1+(1-c)[b/(1-b)])$

5.6 Asset betas

Table 5.8 summarises the asset betas for the comparator group. The median asset beta is 0.77. The median remains the same when National Express and Stagecoach are excluded from the peer group.

Table 5.8: Asset beta summary

| Company name | Country | % Revenues from 'rail-related' services | Split (passenger: freight) of 'rail- related' services | Asset beta |
|---|----------------|---|--|-------------|
| PKP Cargo | Poland | 98 | 0:100 ^a | 0.53 |
| National Express | United Kingdom | 7 | 100:0 | 1.67 |
| FNM SpA | Italy | 69 | 15:85 | 0.81 |
| FirstGroup | United Kingdom | 41 | 100:0 | 0.95 |
| Stagecoach Group | United Kingdom | 1 | 100:0 | 1.29 |
| Go-Ahead Group | United Kingdom | 74 | 100:0 | 1.21 |
| Hamburger Hafen und Logistik | Germany | 94 | 0:100 | 1.01 |
| Piraeus Port Authority | Greece | 17 | 0:100 ^c | 0.43 |
| Atlantia | Italy | 92 | 0:100 ^c | 0.55 |
| Getlink | France | 36 | 30:70 | 0.77 |
| Alstom | France | 100 | 75:25 ^b | 0.77 |
| NRC Group | Norway | 67 | 0:100 ^c | 0.77 |
| Talgo SA | Spain | 100 | 100:0 | 0.59 |
| Max | - | - | - | 1.67 |
| Min | - | - | - | 0.43 |
| Mean | - | - | - | 0.87 |
| Median | - | - | - | 0.77 |
| Median (excluding National Express and Stagecoach) | - | - | - | 0.77 |

Equity betas are de-leveraged using the Hamada variation of the Modigliani-Miller equation assuming zero debt betas.

a: No precise estimates but freight dominates; b: No precise estimates but passenger dominates; c: Sorted into one category based on qualitative analysis of company description: majority B2B activities.

5.7 Is there evidence of a differential between the asset betas of freight and passenger services?

Now we turn to investigate whether the systematic risk exposure of freight rail-related services is comparable to that of passenger rail-related services, or whether the ACM should assume two different asset betas between the two segments.

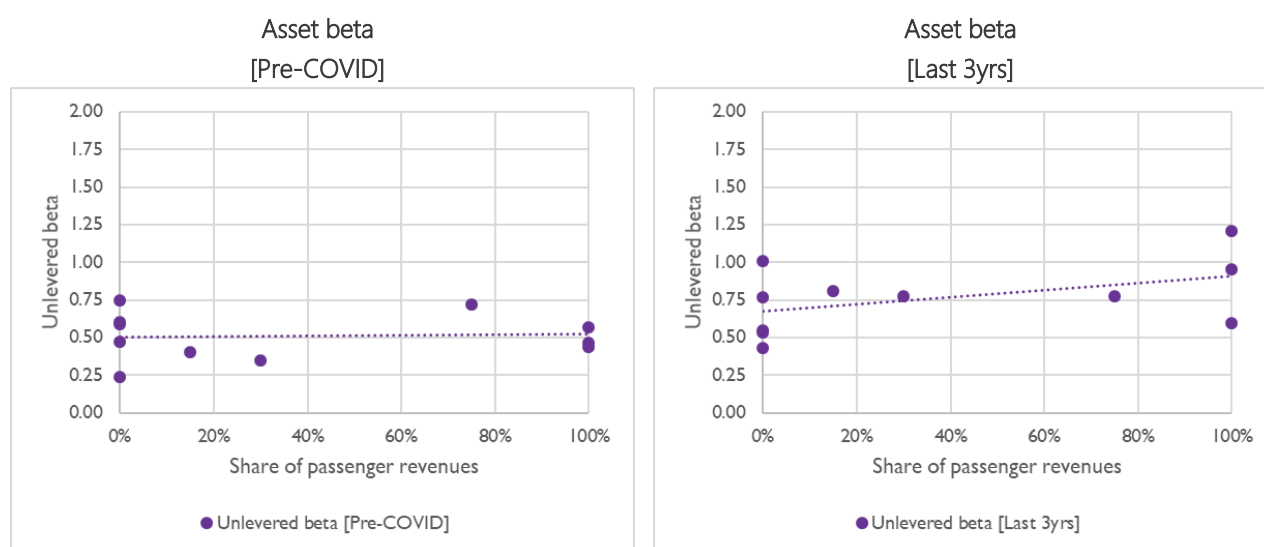
Asset betas plotted against estimated passenger/freight revenue split

In Figure 5.1, we plot the asset betas of Table 5.8 against the share of company revenues from passenger-related services. For comparison, the results are also shown for asset betas calculated over the three years to January 2020 (the “pre-COVID” period).⁸ The flat dotted best-fit line in the left-hand panel of Figure 5.1 shows that, in the pre-COVID period, the majority-freight and majority-passenger comparators exhibit fairly similar asset betas, only differing visibly in their range.

The asset betas show a slight differential during the last three years, which covers the COVID-19 pandemic and has been the period of analysis so far in this paper (right-hand panel of Figure 5.1). The best-fit line indicates that the majority-passenger oriented firms in the peer group have a higher risk exposure than the majority-freight firms. This might be explained by recalling that the pandemic era has been associated with considerable reductions in passenger transport activity, whilst freight transport activity has remained relatively more stable. Overall, the two panels in Figure 5.1 show that the COVID pandemic increased the market-perceived systematic risk exposure of both passenger and freight entities in the peer group.

⁸ We conducted a series of Chow tests to identify whether there is a common series break in the returns of the comparators. These tests hinted at a statistically significant break around March 2020, the onset of the COVID-19 pandemic in Europe, especially among passenger-oriented companies. This finding was confirmed in panel regressions that included a time trend and dummy variables that are ‘switched on’ from specified months (March 2020, as well as: December 2020 – coinciding with the announcement of successful vaccines, plus the alpha variant; May 2021 – arrival of the delta variant; and December 2021 – arrival of omicron variant).

Figure 5.1: Asset betas of comparator companies by the share of passenger-related revenue



Europe Economics analysis. National Express and Stagecoach excluded.

In Table 5.9 we show the median asset beta for both periods and the separate medians for majority-passenger and majority-freight comparators. Betas for both passenger and freight services have risen in the COVID period relative to the pre-COVID period. In addition the wedge is higher in the last three years (0.09) than in the pre-COVID period (0.05).

Table 5.9: Median asset betas for passenger and freight

| Median | Asset beta [Pre-COVID] | Asset beta [Last 3yrs] |
|-----------------|---------------------------|---------------------------|
| All comparators | 0.47 | 0.77 |
| Freight | 0.47 | 0.77 |
| Passenger | 0.52 | 0.86 |

Note that the median firm overall is the median majority-freight firm

Deconstructing the implied betas of the mixed-activity comparators

The medians analysis in Table 5.9 has the drawback of treating a mixed activity firm as if its majority activity were its entire activity. Another way in which we can investigate the differential between passenger and freight segments is to infer the betas of passenger and freight activities based on the revenue weights of the different companies in our peer group. This involves first identifying the comparators whose revenue is split between passenger- and freight-related activities (i.e. the revenue is not 100 per cent from one segment or the other). Next, we use the median passenger and freight betas calculated previously to infer the passenger and freight betas of the those mixed-

activity comparators.⁹ This exercise yields a list of synthetic comparators of only exclusively-freight and exclusively-passenger companies. The results of this exercise are shown in Table 5.10.

Table 5.10: Median asset betas for passenger and freight with inferred passenger and freight betas

| Median | Asset beta [Pre-COVID] | Asset beta [Last 3yrs] |
|-----------------|---------------------------|---------------------------|
| All comparators | 0.47 | 0.77 |
| Freight | 0.53 | 0.64 |
| Passenger | 0.45 | 0.86 |

In Table 5.10 we see that in the pre-COVID period freight business had slightly higher risk exposure than passenger-facing business. This conforms to the expected intuition: in normal times we would expect freight activity to respond more to changes in the general economy cycle than passenger activity. It also aligns with the recent regulatory precedents (see chapter 3). The relationship reverses in the latest period of data (consistent with our analysis in and around Figure 5.1), with passenger services now having a higher beta than freight (reflecting the experience of the COVID pandemic), as we also saw in Table 5.9, though in this new analysis the wedge is larger (0.22 vs 0.09).

It is important to note that this method relies on our disaggregation of freight- and passenger-related revenues in the assumed rail-related services component of each company. Many of the comparators are understood to make revenue from other services, which could suggest the presence of a separate beta in respect of those activities. Identifying those betas is out of the scope of this report. The key point is that, in the most recent data period, the passenger beta may be materially higher than the freight beta.

In conclusion, the analysis above suggests that passenger services have been subject to higher systematic risks than freight services over the pandemic, reversing (possibly temporarily) the relationship prior to the pandemic (when freight services were subject to higher systematic risk). Whether in the post-pandemic period the new risks facing the transport sector mean we should expect the pandemic-period direction of differentiation (passengers riskier than freight) to persist

⁹ This exploits the Modigliani-Miller theorem in that a company's beta is the weighted combination of the betas for each of its assets. Here, we proxy revenues for assets. Hence the implied passenger beta = (Company beta – weighting of freight revenue * median freight beta) / weighting of passenger revenue.

or whether we should expect reversion to the pre-pandemic norm (freight riskier than passengers) is not analytically clear. We conclude that whilst the transport sector continues at present to be subject to risks going forward even into the post-COVID period (quite apart from the risk of further variants), our finding that betas are elevated compared with the past has a good chance of being persistent, however the basis for differentiation between passenger and freight betas is less robust.

6 Return on equity: Recommendation

Our analysis has taken into consideration all the relevant variables necessary to estimate the cost of equity. To sum up:

- We have estimated the relevant risk-free rate using the average of 10-year government bonds in the Netherlands and Germany. Our risk-free rate estimate is **-0.27** per cent.
- We have estimated asset betas using the peer companies. Our median asset beta estimate is **0.77**.
- We have used the equity risk premium as requested by the ACM: **5.00** per cent.

Consequently, the formula for companies to calculate a firm-specific equity beta, using the overall asset beta of the reference group (0.77), the applicable tax rate (T) and the firm-specific gearing (D/E) is:

$$B_e = 0.77 * (1 + (1 - T) * \left(\frac{D}{E}\right))$$

Hence, a firm's return on equity, based on the risk-free rate of -0.27 and the established equity risk premium of 5 per cent, will be:

$$RoE = \frac{-0.0027 + B_e * 0.05}{1 - T}$$



Europe Economics