Question 4

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1. Introduction

I previously calculated the full daily return of the ALSI by summing the returns per day from each
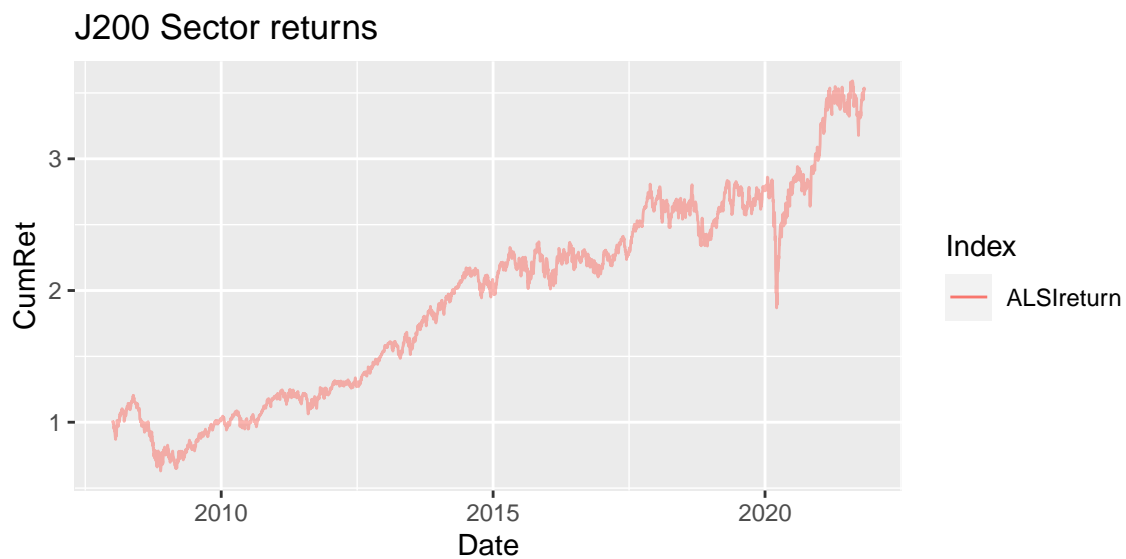constituent stock in Question 3. I will continue to make use of this data.

Figure 1.1: ALSI cumulative returns

Figure 1.1 above displays the cumulative return of the ALSI.

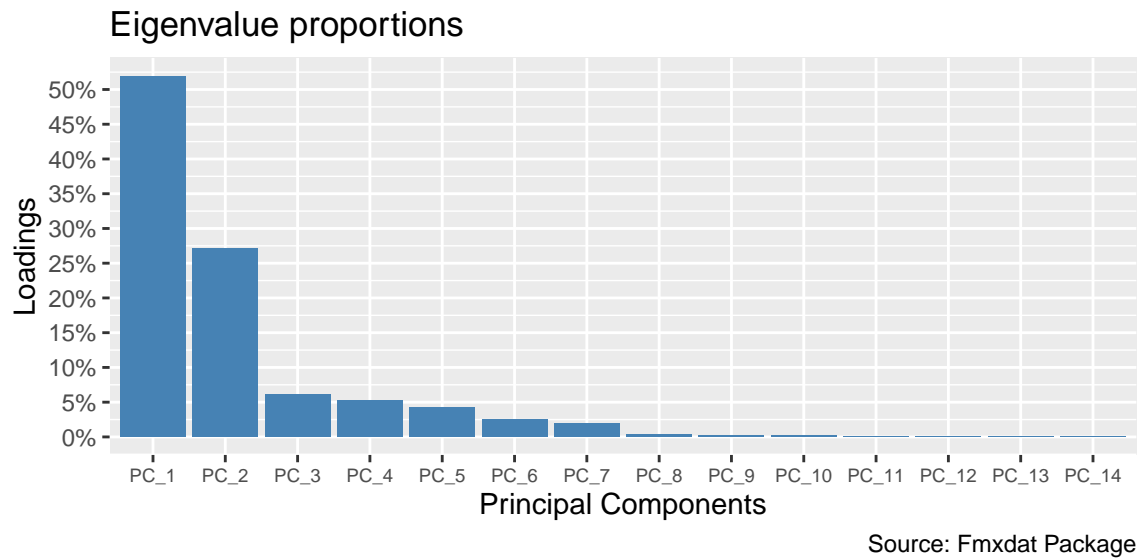## 2. Principal Component Analysis

Eigenvalue proportions

Figure 2.1: Eigenvalue proportions

Figure 2.1 says that nearly 55% of variation in the sectors are explained by a single component. The eigenvectors can be interpreted as the loadings or the weights of each PC. I will now look at the first two PC's loadings so that I can make an interesting observation.
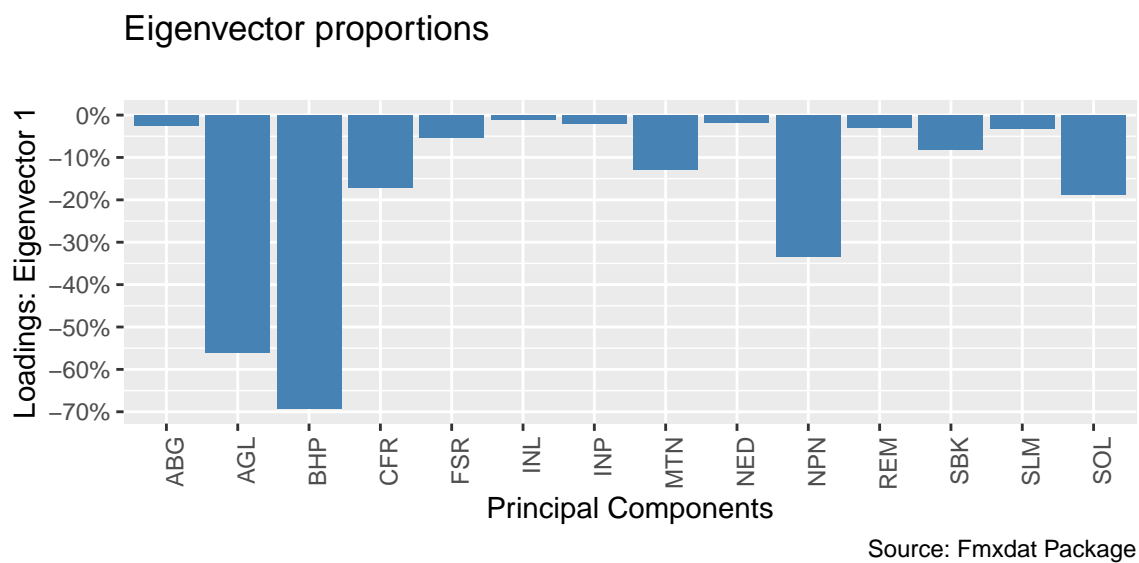
Eigenvector proportions

Figure 2.2: Eigenvector proportions

I noted from the eigenvalues that a unique linear combination of all the sector returns can explain roughly 55% of the variation in the returns series. From Figure 2.2 above, I note that this unique combination does not have an equal weighted input for the series.

Eigenvector proportions

Figure 2.3: Eigenvector proportions
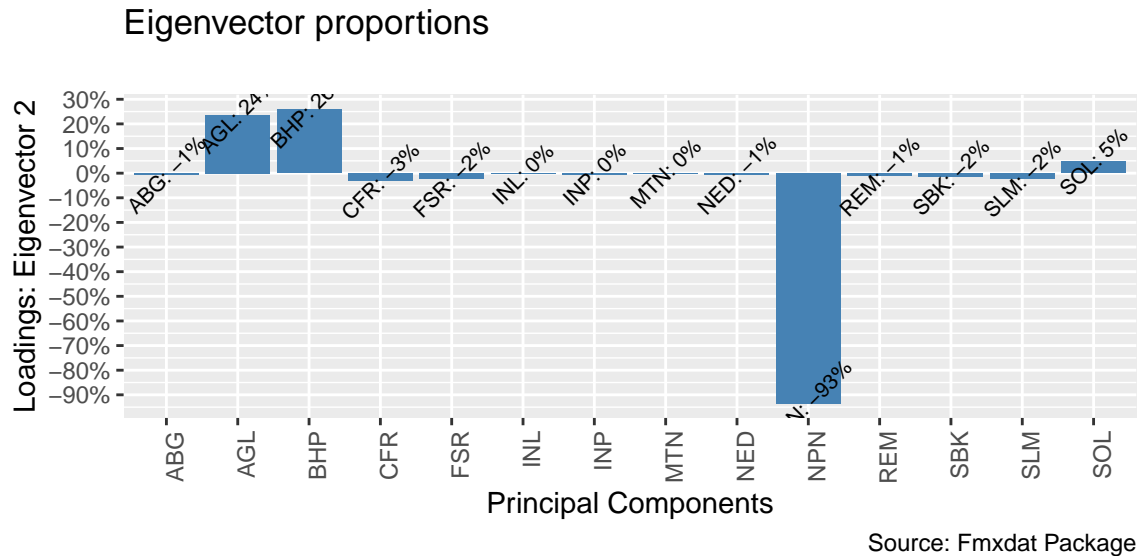
From Figure 2.3, I note that the second eigenvalue (which explains about 27% of the total variation) loads nearly equally on AGL and BHP in the same direction but loads heavily on NPN in the opposite direction. This implies (loosely) that holding a long AGL and BHP position and a short NPN position explains a sizeable part of the total variation in these sectors' overall returns.
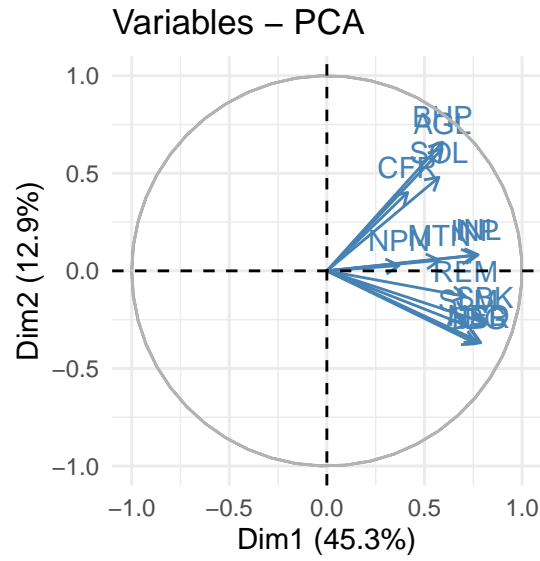
Figure 2.4: PCA variables

Figure 2.4 shows the relationship between all variables. Positively correlated variables are grouped together. The distance between variables and the origin measures the quality of the variables on the factor map. Variables that are away from the origin are well represented on the factor map. The closer a variable is to the unit circle of correlations, the better its representation on the factor map (and the more important it is to interpret these components)

Table 2.1: Contributions of variables

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
	9.21	7.70	3.31	0.03	3.89
	5.51	21.64	6.52	0.22	5.22
	5.55	24.07	4.19	0.57	3.50
	2.70	8.94	19.36	0.00	4.43
	9.81	7.52	1.46	0.35	1.38
	9.48	0.38	9.88	20.73	0.07
	9.06	0.35	13.62	21.39	0.51
	5.25	0.16	2.60	1.24	64.56
	9.53	7.19	1.81	0.00	2.21
	2.15	0.04	26.75	50.39	5.07
	7.96	0.95	0.20	2.02	8.18
	10.29	3.89	3.23	0.02	0.48
	8.28	4.45	0.80	2.14	0.37

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Table 2.1: Contributions of variables

	Dim.1	Dim.2	Dim.3	Dim.4	Dim.5
	5.20	12.73	6.27	0.91	0.14

The above table shows the contribution of the variables. I will now provide a visual representation of this.
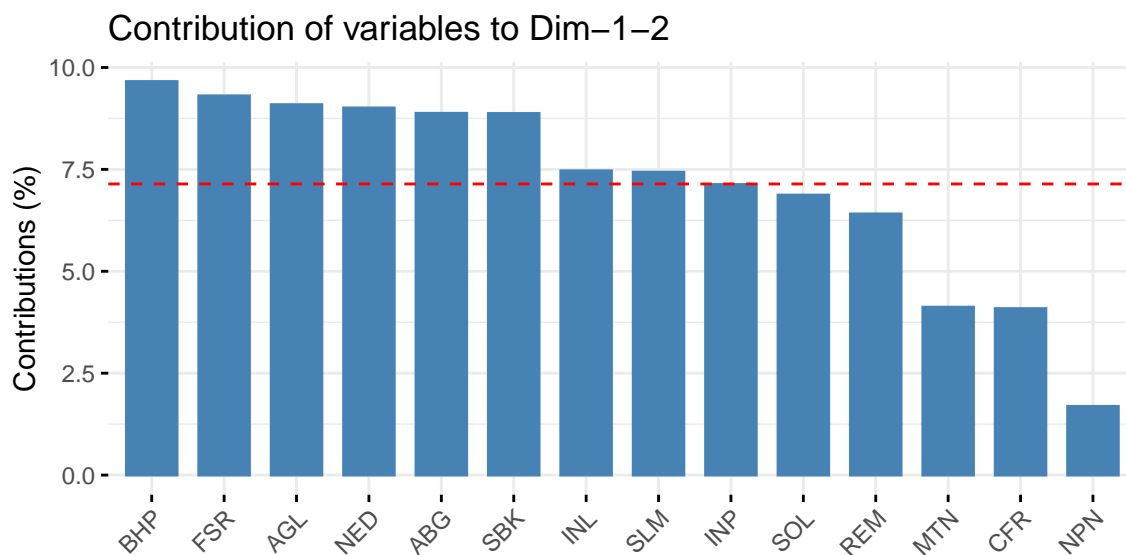
Figure 2.5: Contributions

Figure 2.5 displays the total contribution of the stocks on PC1 and PC2.

3. Dimension description

Table 3.1: Dimension description

Tickers	correlation	p.value
SBK	0.8077564	0.000000e+00
FSR	0.7887572	0.000000e+00
NED	0.7771412	0.000000e+00
INL	0.7754290	0.000000e+00
ABG	0.7642331	0.000000e+00
INP	0.7578773	0.000000e+00

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Table 3.1: Dimension description

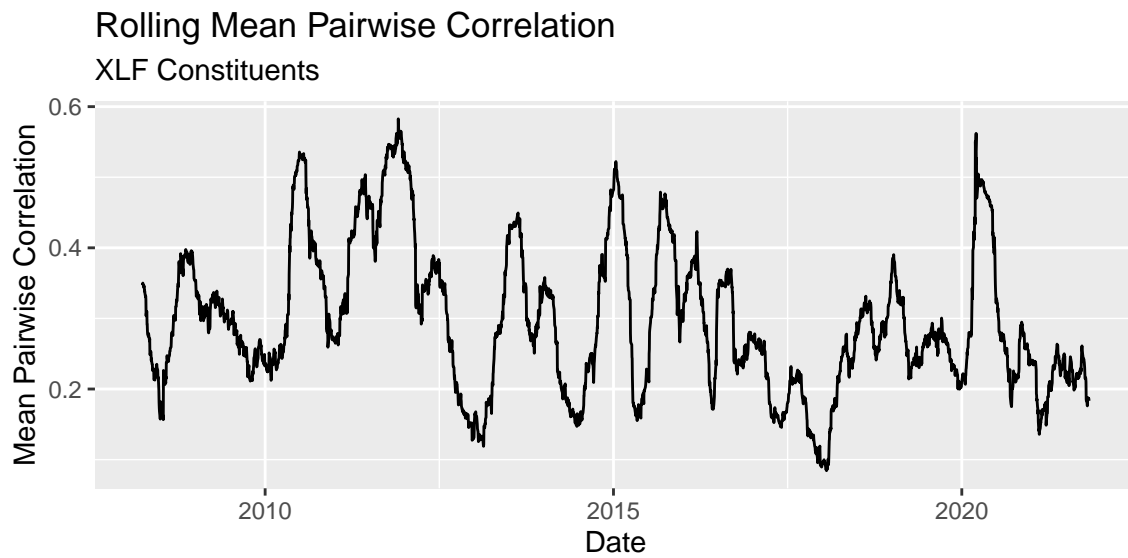| Tickers	correlation	p.value
SLM	0.7245234	0.000000e+00
REM	0.7105047	0.000000e+00
BHP	0.5932059	0.000000e+00
AGL	0.5912447	0.000000e+00
MTN	0.5766738	9.205497e-306
SOL	0.5741416	1.719383e-302
CFR	0.4138740	3.260387e-143
NPN	0.3695124	2.461847e-112

4. Rolling constituent correlation

Figure 4.1: Pairwise correlations

Figure 4.1 displays the pairwise correlations of the variables under study.

5. Stratification

Table 5.1: Stratification of variables

Tickers	SD	Full_SD	Period	Ratio
BHP	0.07	0.04	High_Vol	1.60
AGL	0.06	0.04	High_Vol	1.72
NPN	0.05	0.04	High_Vol	1.25
MTN	0.03	0.02	High_Vol	1.47
SOL	0.03	0.02	High_Vol	1.56
SAB	0.03	0.02	High_Vol	1.15
CFR	0.03	0.02	High_Vol	1.20
IMP	0.02	0.01	High_Vol	1.74
SBK	0.02	0.01	High_Vol	1.47
PRX	0.02	0.01	High_Vol	1.27
ANG	0.01	0.01	High_Vol	1.54
SSW	0.01	0.01	High_Vol	1.23
GFI	0.01	0.01	High_Vol	1.53
AMS	0.01	0.01	High_Vol	1.82
OML	0.01	0.01	High_Vol	1.51
FSR	0.01	0.01	High_Vol	1.36
BTI	0.01	0.01	High_Vol	1.30
HAR	0.01	0.00	High_Vol	1.44
MNP	0.01	0.00	High_Vol	1.57
SLM	0.01	0.01	High_Vol	1.22
ABG	0.01	0.00	High_Vol	1.37
ACL	0.01	0.00	High_Vol	1.45
REM	0.01	0.00	High_Vol	1.28
NHM	0.01	0.00	High_Vol	1.13
OMU	0.01	0.00	High_Vol	1.20
NPH	0.01	0.00	High_Vol	1.10
TKG	0.01	0.00	High_Vol	1.21
BID	0.01	0.00	High_Vol	1.13
SNH	0.00	0.01	High_Vol	0.92
MUR	0.00	0.00	High_Vol	1.00
ITU	0.00	0.00	High_Vol	1.71
CPI	0.00	0.00	High_Vol	1.41
SHP	0.00	0.00	High_Vol	1.14
BVT	0.00	0.00	High_Vol	1.21
APN	0.00	0.00	High_Vol	1.10
AEG	0.00	0.00	High_Vol	1.00
KIO	0.00	0.00	High_Vol	1.30

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Table 5.1: Stratification of variables

Tickers	SD	Full_SD	Period	Ratio
NED	0.00	0.00	High_Vol	1.34
AXL	0.00	0.00	High_Vol	1.42
SAP	0.00	0.00	High_Vol	1.26
RMH	0.00	0.00	High_Vol	1.48
VOD	0.00	0.00	High_Vol	1.43
MRP	0.00	0.00	High_Vol	1.22
INP	0.00	0.00	High_Vol	1.36
CLS	0.00	0.00	High_Vol	1.20
BAT	0.00	0.00	High_Vol	1.17
MCG	0.00	0.00	High_Vol	1.18
WHL	0.00	0.00	High_Vol	1.00
MDC	0.00	0.00	High_Vol	1.54
PPC	0.00	0.00	High_Vol	1.13
ARI	0.00	0.00	High_Vol	1.64
GLN	0.00	0.00	High_Vol	1.04
TBS	0.00	0.00	High_Vol	1.20
DSY	0.00	0.00	High_Vol	1.22
RDF	0.00	0.00	High_Vol	1.28
GRT	0.00	0.00	High_Vol	1.25
NRP	0.00	0.00	High_Vol	1.26
TFG	0.00	0.00	High_Vol	1.18
MEI	0.00	0.00	High_Vol	0.91
RNI	0.00	0.00	High_Vol	1.20
BAW	0.00	0.00	High_Vol	1.00
REI	0.00	0.00	High_Vol	1.28
TRU	0.00	0.00	High_Vol	0.86
INL	0.00	0.00	High_Vol	1.46
N91	0.00	0.00	High_Vol	1.00
NTC	0.00	0.00	High_Vol	0.87
LBH	0.00	0.00	High_Vol	1.30
SPP	0.00	0.00	High_Vol	1.31
LHC	0.00	0.00	High_Vol	1.05
IPL	0.00	0.00	High_Vol	0.78
RMI	0.00	0.00	High_Vol	1.03
LGL	0.00	0.00	High_Vol	1.00
EXX	0.00	0.00	High_Vol	1.03
MTM	0.00	0.00	High_Vol	0.86

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Table 5.1: Stratification of variables

Tickers	SD	Full_SD	Period	Ratio
LON	0.00	0.00	High_Vol	1.39
NY1	0.00	0.00	High_Vol	1.00
CCO	0.00	0.00	High_Vol	1.41
MND	0.00	0.00	High_Vol	1.09
PIK	0.00	0.00	High_Vol	1.45
RES	0.00	0.00	High_Vol	0.32
FFB	0.00	0.00	High_Vol	0.81
FFA	0.00	0.00	High_Vol	1.02
ANH	0.00	0.00	High_Vol	
MTH	0.00	0.00	High_Vol	
QLT	0.00	0.00	High_Vol	

6. Conclusion

Returns for the ALSI and SWIX seem to be concentrated in the large caps stocks.