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Estimating Systematic Risk: Case For Borsa Istanbul

Filiz YEŞİLYURT*
Hakan AYGÖREN**
M. Ensar YEŞİLYURT***

ABSTRACT

The structure of the data set has a great impact on the estimation results. Especially the methods, which are affected by outliers like Ordinary Least Squares (OLS), will lead to biased results. For this reason robust estimation techniques are required. To investigate this structure, 237 stocks in Borsa Istanbul (BIST) is estimated using OLS and Least Median Squares (LMS) method between the years of 2001-2004. Beta coefficients are computed based on OLS and LMS methods using market model. It was found that LMS produce robust results in the presence of multivariate outliers. Especially, in case of the volatile stocks, LMS is one of the appropriate techniques to get robust results.

Keywords: OLS, LMS, robust, beta coefficient, CAPM.

Sistematik Riskin Belirlenmesi: Borsa Istanbul Örneği

ÖZET

Veri setlerinin yapısı tahmin sonuçları üzerinde büyük etkiye sahiptir Özellikle dışa düşen değerlerden etkilenen En Küçük Kareler (EKK) gibi metotlar sapmalı sonuçlara neden olabilmektedir. Bu amaçla Borsa Istanbul'da yer alan 237 Hisse Senedi EKK ve En Küçük Medyan Kareler (EMK) yöntemiyle 2001-2004 yılları için tahmin edilmiştir. Beta katsayısı piyasa modeli kullanılarak, EKK ve EMK'ya dayalı olarak hesaplanmıştır. Dışa düşen değerlerin varlığında EMK yönteminin dirençli sonuçlar ürettiği bulunmuştur. Özellikle fiyatları çok dalgalanan hisse senetlerinin olduğu durumda EMK dirençli sonuçlar veren en uygun yöntemlerden biridir.

Anahtar Kelimeler: EKK, EMK, dirençli, beta katsayısı, Piyasa Modeli.

1. Introduction

Beta (β) parameter in the Capital Asset Pricing Model (CAPM) plays a central role in modern finance as a measure of an asset's risk. Beta coefficient known as a systematic risk compares the variability of an asset's historical returns to the market as a whole. That is, beta measures an asset's expected change for every percentage change in the benchmark index (Clarfeld and Bernstein, 1997). Financial investors only focus on the systematic risk, because unsystematic risk can be diversified away by a well-balanced portfolio. For this reason, β is the only concern that the investors have when they value their securities. Researchers rely on beta estimates when estimating costs of capital, applying various valuation models, determining portfolio strategies and implementing risk management techniques. Researchers also rely on beta estimates for many applications such as determining relative risk, testing asset pricing models, testing trading strategies and conducting event studies.

The estimation of systematic risk (or 'beta') is a crucial key in financial applications and a great concern in applied studies. The very first studies are introduced by Sharpe (1964) and Lintner (1965). They reported a positive relationship between beta and expected returns and used OLS method. However OLS is criticized by its instability in estimating beta coefficient , see Faff et al. (2000), Martin and Simin (2003), Martin and Simin (1999) and Küçükkocaoğlu and Kiracı (2003), Tofallis (2011). They indicate that OLS produces biased beta estimates. Also other papers criticized and suggested new approaches in other aspects. Blume criticizes and (1971) suggests a correction method, which requires regressing the estimated

* Yrd. Doç. Dr., Pamukkale Üniversitesi
** Prof. Dr., Pamukkale Üniversitesi
*** Prof. Dr., Pamukkale Üniversitesi

values of beta in one period on the values estimated in a previous period and using this estimated relationship to modify betas for the future evaluations. Vasicek (1973) suggests correcting beta estimates using Bayesian method.

Therefore, to avoid misleading beta estimations robust estimation methods are used such as Least Median Square (LMS). The pioneering studies on the Least Median Square (LMS) and other robust estimation theories and methods belong to Rousseeuw (1984), Rousseeuw and Leroy (1987). These studies focus on the determination of the outlier and analysis of the robust regression. Beta coefficient for BIST is estimated in Turkey, see Iskenderoglu (2011), In Turkey, Önder and Zaman (1986) conducted normality tests for regression models, Önder (2001) concluded that LMS method resulted in unbiased and more significant results when compared to OLS method.

The motivation of this paper is to estimate the systematic risk (β) via OLS and LMS methods and compare the two methods in terms of its results.

The structure of the study is as follows: Section 2 explores the theoretical framework of OLS and LMS methods. Section 3 focuses on the data and empirical findings. The final section includes the concluding remarks.

2. Material and Methods

2.1 Theoretical Framework

Outliers are determined as the datas that are away from the rest of the others. OLS is based on minimizing the sum of squared residuals. It is known that the estimation with OLS method is very sensitive to outliers. (Rousseeuw and Hubert (2011), Önder (2001)). In the absence of classical regression model assumptions, the OLS results will be violated. If data contain an outlier this may change the estimation results completely and this means that OLS has a 0% break down value. (Rousseeuw (1984), Rousseeuw and Leroy (1987), Küçükkocaoğlu and Kiracı 2003).

In financial applications beta is generally estimated by using the standard market model, which is expressed as follows:

$$R_{it} = \alpha_i + \beta_i R_{mt} + \varepsilon_{it} \qquad (1)$$

where R_{it} is the return on asset i in period t; R_{mt} is the return on the market in period t; α_i is assumed to be constant over time for asset i; β_i is the sensitivity of asset i returns to the market returns and error term ε_{it} is assumed to be normally distributed. The above equation is estimated via OLS.

In financial markets the stock prices data set may contain outliers. In such a case the estimator will take large aberrant values. To solve this problem one of the most widely used robust technique is the Least Median Squares (LMS) that minimizes the median of the squared residuals. On the contrary to OLS, LMS has high breakdown value, 50%. The LMS estimator is as follows (Zaman, 1996), Rousseeuw (1984):

$$\min med\left\{(R_{it} - \alpha_i - \beta_i R_{mt})_1^2, (R_{it} - \alpha_i - \beta_i R_{mt})_2^2, \ldots, (R_{it} - \alpha_i - \beta_i R_{mt})_n^2\right\} \quad i=1,\ldots, \quad t=1,\ldots,T$$

The LMS estimator is characterized by the value of β with the smallest median of the squared residuals.

2. Data Set

In this study weekly observations of 237 stocks traded in BIST[1] and the BIST Composite Index (BISTCI-100) is used over the year of 2001 and 2004. In this sense, the data set can be a good representation of the market[2]. Observations of 237 stocks traded in BIST for year 2005 is used as a control data to see the performance of the two methods.

3. Results

[1] BIST is called as ISE in 1985 for the first time. In 2013 its name is called Borsa Istanbul. For the purpose of coherency we used the name Borsa Istanbul in this paper.

[2] There were 280 stocks traded in BIST in 2004.

Logarithmic price changes are considered as the main data, therefore this transformation results in one less observation for all samples. The logarithmic price changes are calculated as follows:

$$R_{i,t} = \ln(P_{i,t}) - \ln(P_{i,t-1})$$

Where, $P_{i,t}$ is the price of stock i at time t, $P_{i,t-1}$ is the price of stock i at time t-1 and $R_{i,t}$ is the logarithmic price changes of individual stocks, i.e., returns to individual stocks. The above equation can be reformulated for BISTCI-100 as follows:

$$R_{m,t} = \ln(I_t) - \ln(I_{t-1}) \quad (2)$$

where, I_t and $R_{m,t}$ refer to BISTCI-100 index number and return to BISTCI-100 at time t, respectively.

Systematic risk for each stock has been estimated by OLS and LMS methods and reported at Table 1.

Except three stocks the p-values of β values estimated from both methods turn out to be zero for all stocks. The empirical results show that the p-values of OLS based β of PETKM, KRDMD, and CMENT are 0.224, 0.8, and 0.04, respectively. However, only PETKM has p-value different from zero (0.03) when β s are estimated with LMS method. Hence, β values estimated from both methods can be considered as statistically significant.

Table 1. β coefficients for OLS and LMS

	Stocks	β_{OLS}	β_{LMS}	$R^2{}_{OLS}$	$R^2{}_{LMS}$		Stocks	β_{OLS}	β_{LMS}	$R^2{}_{OLS}$	$R^2{}_{LMS}$
1	AKBNK	1,058	1,005	0,729	0,762	120	ALKIM	0,758	0,769	0,307	0,572
2	ALNTF	1,245	1,030	0,487	0,576	121	AYGAZ	0,773	0,883	0,619	0,749
3	FINBN*	1,210	0,889	0,531	0,444	122	BAGFS	0,795	0,704	0,460	0,579
4	DISBA	0,956	0,644	0,558	0,434	123	BRISA	0,745	0,681	0,465	0,581
5	GARAN	1,275	1,204	0,645	0,783	124	CBSBO	0,654	0,447	0,159	0,218
6	ISCTR	1,178	1,149	0,762	0,792	125	PRTAS	0,784	0,421	0,227	0,135
7	SKBNK	0,831	0,696	0,212	0,443	126	ECILC	0,918	0,926	0,537	0,702
8	TEBNK	0,823	0,562	0,335	0,259	127	EGGUB	0,576	0,414	0,244	0,225
9	TEKST*	1,004	0,722	0,393	0,433	128	EPLAS	0,721	0,736	0,287	0,465
10	TKBNK	0,974	0,819	0,438	0,589	129	GOODY	0,708	0,675	0,411	0,546
11	TSKB	0,905	0,872	0,428	0,599	130	GUBRF	0,831	0,721	0,394	0,514
12	YKBNK	1,436	1,199	0,592	0,735	131	HEKTS	0,921	0,824	0,480	0,595
13	ALCTL	1,195	1,020	0,667	0,731	132	MRSHL	0,622	0,499	0,307	0,442
14	ARENA	0,913	0,791	0,333	0,440	133	PETKM (0.224)(0.03)	0,096	0,121	0,006	0,021
15	ESCOM	0,770	0,667	0,269	0,416	134	PIMAS	0,826	0,789	0,312	0,465
16	LINK	0,901	0,693	0,200	0,288	135	SODA	0,805	0,909	0,589	0,724
17	LOGO	0,772	0,641	0,316	0,325	136	TUPRS	0,750	0,761	0,543	0,586
18	NETAS*	1,087	0,879	0,716	0,681	137	TRCAS	0,880	0,805	0,348	0,452
19	GOLDS	0,914	0,902	0,494	0,697	138	PRKTE	1,204	1,073	0,365	0,592
20	SERVE	0,723	0,639	0,229	0,324	139	AKYO	0,925	0,814	0,587	0,732
21	ADEL	0,609	0,382	0,231	0,239	140	ATAYO	0,683	0,643	0,186	0,325
22	ACIBD	0,834	0,810	0,378	0,688	141	ATSYO	0,807	0,586	0,408	0,411
23	INTEM	0,775	0,731	0,271	0,514	142	ATLAS*	1,079	0,895	0,457	0,569
24	FVORI	0,953	0,656	0,235	0,329	143	AVRSY	0,707	0,726	0,081	0,402
25	MAALT	0,773	0,512	0,299	0,331	144	BUMYO	0,543	0,427	0,139	0,203
26	MMART	0,952	0,635	0,300	0,309	145	ECBYO	0,836	0,630	0,561	0,737
27	NTTUR*	1,221	0,932	0,410	0,447	146	EGYO*	1,083	0,871	0,481	0,570
28	TEKTU*	1,021	0,433	0,293	0,097	147	FNSYO	0,898	0,802	0,526	0,609
29	AKALT	0,733	0,763	0,383	0,525	148	GRNYO	0,841	0,423	0,160	0,162
30	ATEKS	0,689	0,721	0,221	0,543	149	ISYAT	0,995	0,910	0,573	0,718
31	AKIPD	0,726	0,627	0,343	0,435	150	MYZYO	0,784	0,701	0,139	0,356
32	ALTIN	0,891	0,614	0,413	0,402	151	PERYO*	1,411	0,930	0,442	0,485
33	ARSAN	0,867	0,658	0,197	0,451	152	TACYO	0,796	0,719	0,253	0,421
34	BERDN	0,754	0,481	0,253	0,256	153	VKFYT	0,710	0,604	0,223	0,380
35	BOSSA	0,748	0,700	0,474	0,551	154	VARYO	0,794	0,689	0,269	0,304
36	CEYLN	0,533	0,284	0,101	0,102	155	YKRYO*	1,006	0,815	0,474	0,604
37	DERIM*	1,073	0,561	0,378	0,243	156	BRSAN	0,803	0,846	0,382	0,592

38	ESEMS	0,805	0,473	0,176	0,231
39	GEDIZ	0,809	0,360	0,476	0,231
40	IDAS	0,835	0,698	0,312	0,370
41	KRTEK	0,669	0,740	0,269	0,410
42	KOTKS	0,652	0,364	0,152	0,107
43	KORDS	0,849	0,747	0,561	0,658
44	LUKSK	0,799	0,455	0,199	0,305
45	MNDRS*	1,001	0,873	0,451	0,571
46	MEMSA	0,739	0,634	0,249	0,314
47	MTEKS	0,954	0,745	0,341	0,493
48	OKANT	0,975	0,769	0,318	0,549
49	SANKO	0,742	0,654	0,399	0,508
50	SKTAS	0,539	0,692	0,146	0,448
51	SONME	0,684	0,520	0,215	0,225
52	UKIM	0,552	0,377	0,128	0,177
53	VAKKO	0,709	0,542	0,239	0,391
54	YATAS	0,907	0,908	0,259	0,534
55	YUNSA	0,582	0,492	0,274	0,412
56	AKENR	0,714	0,744	0,555	0,712
57	AKSUE	0,766	0,707	0,365	0,591
58	AYEN	0,847	0,786	0,399	0,654
59	ZOREN	0,700	0,434	0,336	0,341
60	FFKRL	0,652	0,571	0,227	0,272
61	ISFIN*	1,039	0,895	0,439	0,579
62	OZFIN	0,552	0,569	0,156	0,370
63	VAKFN	0,829	0,749	0,352	0,465
64	ALGYO	0,690	0,578	0,397	0,417
65	ALKA	0,765	0,686	0,231	0,381
66	GRGYO*	1,017	0,845	0,461	0,522
67	ISGYO	0,961	0,939	0,598	0,732
68	NUGYO	0,857	0,746	0,383	0,418
69	VKGYO	0,902	0,708	0,374	0,444
70	YKGYO*	1,103	0,945	0,562	0,658
71	AEFES	0,660	0,521	0,363	0,326
72	ALYAG	0,757	0,620	0,217	0,298
73	BANVT	0,826	0,707	0,367	0,634
74	ERSU	0,770	0,667	0,269	0,416
75	FRIGO	0,684	0,752	0,182	0,365
76	KENT	0,496	0,427	0,173	0,257
77	KNFRT	0,446	0,301	0,111	0,180
78	LIOYS	0,742	0,906	0,341	0,568
79	MERKO	0,765	0,592	0,335	0,351
80	PENGD	0,584	0,445	0,157	0,334
81	PETUN	0,857	0,798	0,363	0,546
82	PINSU	0,868	0,679	0,268	0,416
83	PNSUT	0,810	0,683	0,324	0,442
84	SKPLC*	1,020	0,623	0,231	0,320
85	TATKS	0,721	0,713	0,464	0,628
86	TBORG	0,481	0,380	0,117	0,231
87	TUKAS	0,601	0,440	0,352	0,413
88	UNTAR	0,906	0,909	0,412	0,548
89	VANET	0,791	0,605	0,327	0,454
90	TCELL	1,018	1,160	0,528	0,675
91	CLEBI	0,860	0,478	0,315	0,321
92	THYAO	0,871	0,805	0,465	0,605
93	UCAK	0,577	0,629	0,212	0,473
94	ALARK	0,916	0,906	0,671	0,729
95	BRYAT*	1,025	0,852	0,497	0,623
96	DEVA	0,830	0,816	0,260	0,517
97	DYHOL	1,395	1,316	0,611	0,796

157	BURCE	0,567	0,390	0,151	0,174
158	CEMTS	0,759	0,673	0,440	0,422
159	CELHA	0,966	0,813	0,469	0,518
160	DMSAS	0,567	0,595	0,172	0,344
161	DITAS	0,808	0,640	0,307	0,425
162	DOKTS	0,874	0,750	0,449	0,515
163	ERBOS	0,459	0,242	0,155	0,093
164	EREGL	0,945	0,870	0,619	0,707
165	FENIS	0,616	0,503	0,209	0,273
166	IZMDC*	1,097	0,932	0,490	0,662
167	KRDMA*	1,115	0,284	0,286	0,137
168	KRDMB*	1,065	0,235	0,216	0,088
169	KRDMD (0.80)*	1,075	0,003	0,281	0,000
170	SARKY	0,619	0,518	0,422	0,459
171	BSHEV	0,604	0,386	0,185	0,274
172	BFREN	0,628	0,495	0,101	0,222
173	EGEEN	0,679	0,458	0,221	0,215
174	KARSN*	0,857	1,021	0,425	0,613
175	KLMSN	0,796	0,760	0,413	0,700
176	MUTLU	0,814	0,618	0,294	0,290
177	OTKAR	0,823	0,770	0,379	0,627
178	PARSN	0,920	0,703	0,245	0,323
179	TOASO	1,012	1,149	0,634	0,762
180	TUDDF*	0,933	1,066	0,504	0,656
181	TOPFN	0,669	0,629	0,300	0,448
182	UZEL	0,927	0,433	0,416	0,254
183	VESTL	0,991	0,992	0,710	0,809
184	ASUZU	0,942	0,677	0,403	0,385
185	ALCAR	0,750	0,664	0,518	0,566
186	ARCLK	1,120	1,043	0,723	0,770
187	BEKO	0,979	0,966	0,619	0,766
188	FROTO	0,925	0,880	0,591	0,602
189	BAKAB	0,620	0,415	0,193	0,213
190	DENTA	0,582	0,578	0,345	0,541
191	DOBUR	0,995	0,733	0,327	0,466
192	DGZTE	1,182	1,044	0,414	0,612
193	EMNIS	0,658	0,412	0,212	0,228
194	GENTS	0,604	0,481	0,322	0,406
195	HURGZ	1,202	1,173	0,556	0,730
196	ISAMB	0,967	0,731	0,209	0,430
197	KAPLM	0,876	0,619	0,255	0,297
198	KARTN	0,379	0,178	0,128	0,121
199	KAVPA	0,834	0,810	0,378	0,688
200	KLBMO	0,718	0,784	0,228	0,491
201	OLMKS	0,677	0,613	0,373	0,474
202	TIRE	0,684	0,733	0,409	0,603
203	VKING	0,873	0,299	0,237	0,094
204	ANHYT	0,929	0,895	0,455	0,551
205	AKGRT	0,994	0,916	0,723	0,734
206	ANSGR*	1,011	0,975	0,613	0,638
207	AVIVA	0,469	0,254	0,075	0,112
208	GUSGR	0,974	0,776	0,402	0,485
209	RAYSG	0,912	0,616	0,377	0,392
210	YKSGR*	1,062	0,643	0,390	0,329
211	ADANA	0,747	0,641	0,469	0,484
212	ADBGR	0,647	0,447	0,463	0,371
213	ADNAC	0,786	0,788	0,422	0,624
214	AFYON	0,552	0,388	0,184	0,205
215	AKCNS*	1,012	0,886	0,559	0,534
216	ANACM	0,834	0,735	0,529	0,543

98	DOHOL	1,401	1,223	0,721	0,789
99	ECZYT	0,918	0,947	0,281	0,386
100	EFES	1,142	1,107	0,674	0,713
101	GLYHO	1,376	1,147	0,648	0,645
102	GSDHO	1,192	1,156	0,478	0,566
103	KCHOL	1,003	1,003	0,734	0,813
104	MZHLD	0,989	0,769	0,340	0,427
105	NTHOL*	1,198	0,783	0,473	0,457
106	SAHOL*	0,946	1,019	0,754	0,832
107	SISE	1,099	1,134	0,752	0,777
108	VKFRS	0,726	0,670	0,173	0,496
109	YAZIC*	1,015	0,951	0,585	0,645
110	BOYNR	1,223	1,052	0,460	0,602
111	GIMA	0,951	0,743	0,500	0,554
112	MIGRS	0,713	0,709	0,534	0,633
113	MIPAZ	1,197	1,003	0,465	0,621
114	**TNSAS***	**1,145**	**0,776**	0,507	0,617
115	KIPA	0,559	0,246	0,247	0,163
116	ASELS	0,827	0,830	0,279	0,479
117	BROVA	0,923	0,553	0,323	0,387
118	SASA	0,828	0,595	0,485	0,451
119	AKSA	0,814	0,671	0,586	0,619

217	BTCIM	0,733	0,379	0,429	0,249
218	BSOKE	0,751	0,639	0,378	0,401
219	BOLUC	0,748	0,502	0,476	0,427
220	BUCIM	0,293	0,207	0,120	0,195
221	CMBTN	0,642	0,628	0,187	0,354
222	CMENT (0.04)	0,221	0,224	0,034	0,113
223	CIMSA	0,754	0,669	0,491	0,529
224	DENCM	0,714	0,729	0,414	0,590
225	ECYAP	0,832	0,720	0,405	0,512
226	EGSER	0,711	0,753	0,234	0,444
227	EMKEL	0,871	0,600	0,210	0,285
228	HZNDR	0,683	0,530	0,201	0,302
229	IZOCM	0,773	0,761	0,434	0,574
230	KONYA	0,536	0,549	0,237	0,411
231	KUTPO	0,611	0,514	0,244	0,369
232	MRDIN	0,565	0,468	0,354	0,494
233	NUHCM	0,440	0,326	0,235	0,304
234	OYSAC	0,590	0,434	0,269	0,276
235	TRKCM	0,819	0,855	0,551	0,688
236	UNYEC	0,641	0,556	0,371	0,423
237	USAK	0,827	0,637	0,332	0,400

The results in this study show that there are important distinctions among the estimation methods. According to the results obtained from OLS, β values of 190 stocks are smaller, and 46 of them are greater than one whereas from the results obtained from LMS, it is seen that β value of 214 stocks is smaller, and 32 of them is greater than one. The empirical findings show that the number of β values smaller than one which is greater in LMS than OLS method. The reason for this is that; since LMS method excludes the values remaining outside, OLS based β values greater than one turns out to be less than one with LMS method. In terms of R^2, which is used for determining significance of the model as a whole, LMS method seems to be drastically successful. For 205 of the 237 stocks in the study, the R^2 from LMS are greater than those obtained from OLS. In other words, LMS method has a greater explanatory power than OLS method.

The striking result of this study is that, in 29 stocks, the β values obtained from both methods produce different signals in terms of risk such that 26 stocks out of 29 OLS based β values are greater than one whereas for the same 26 stocks LMS based β values are smaller than one. Especially, the β values of some stocks obtained from both methods exhibit quite different results from each other. For instance, LMS based β values of KRDMD, KRDMB, KRDMA are 0.003, 0.235, 0.284, respectively whereas OLS based β values are greater than one for the same stocks. On the other hand, the β values of some stocks obtained from both methods are very close to one. For instance, for stocks ANSGR, YAZIC, YKGYO the LMS based β values are 0.975, 0.951, and 0.945, respectively whereas OLS based β values are greater than one for the same stocks. Unlike the 26 stocks mentioned above OLS based β values of SAHOL, KARSN, and TUDDF are less than one whereas LMS based β values are greater than one. Hence, concerning with the 29 stocks each method alters the return per unit of risk. Consequently, selection of estimation methods is of importance for investors. Thus, the empirical results of this study can be regarded as an indication that both methods can produce different risk measures for investors.

Due to the existence of different methods for forecasting a parameter investors may behave indecisive in terms of selecting a forecasting method. In this sense, R-squares (R^2) of different methods provide good information for selecting a suitable forecasting method. R-square can be defined as a statistical

indicator that expresses the explanatory power of a method. In this study, the empirical results show that LMS has greater R-squares than OLS, which indicates LMS has more explanatory power than OLS.

Besides the comparison of R-squares of LMS and OLS, weekly error terms of the market model are obtained with the use of LMS-based and OLS-based betas. In other words, for each stock the differences between actual returns and expected returns are calculated for the control period 2005. In terms of error terms weekly performances of the two methods are evaluated for each stock. For instance, If OLS yields smaller error terms than LMS, OLS is to surpass LMS and *vice versa.*

Table 2 shows that a method outperforms the other one.

Table 2. Comparison of OLS and LMS[3]

Stocks	**Better performance weeks**	
	OLS	**LMS**
Banking	304	320
Information technologies	149	163
Other manufacturing	74	82
Medical Instruments and Services	28	24
Wholesaling	29	23
Tourism	138	122
Weaving, Textile and Leather	661	743
Electric, Gas and Water	108	100
Leasing and Factoring	105	103
Real Estate.	196	168
Food, Beverage and Tobacco	510	478
Cominication	33	19
Transportation	72	84
Holdings	388	444
Construction	28	24
Chemistry, Petroleum and Plastic	509	531
Mining	26	26
Investment Companies	424	460
Main Metal	362	418
Metal goods and machinery	446	490
Forest products and furniture	384	396
Retailing	140	172
Defensing	24	28
Insurance	172	192
Non-metallic Mineral Products	778	626
Total	**6088**	**6236**

Information from the Table 2, in the banking sector, the number of weeks that LMS surpasses OLS is 320 whereas it is 304 that OLS surpasses LMS. In the textile sector, it is more apparent that LMS (743 weeks) outperforms OLS (661 weeks) over the analysis period. When all sectors analyzed, it is seen that LMS outperforms OLS in 10 sectors, and in 1 sector both methods have the same performance.

To sum up, LMS outperformed OLS in banking; Information Technologies, Other Manufactured Goods; Weaving, Textile and Leather; Chemistry, Petroleum and Plastic; Holdings, Metal; Metal and Machinery, Forest Products and Furniture; Retailing; Defense; Transportation; and Communication sectors. On the other hand, OLS outperforms LMS Electric, Gas and Water; Leasing and Factoring; Real Estate, Food, Beverage and Tobacco; Construction; Non-metallic Mineral Products; Medical Instruments and Services; Wholesaling and Tourism sectors. In the mining sector however, each method performed the same. Overall, OLS surpassed LMS in 6088 weeks whereas LMS surpassed OLS in 6236 weeks.

[3] Due to fact that each stock has the same period, the number of the weeks that measure the performance of each stock will be the same. But the number of the weeks in each sector is different because in each sector there are different numbers of stocks.

4. Conclusion

The CAPM beta is a parameter, which plays a central role in modern finance as a measure of an asset's risk. Beta coefficient known as systematic risk measure compares the variability of an asset's historical returns to the market as a whole. That is, beta measures an assets expected change for every percentage change in the benchmark index.

While making investment decisions, investors are concerned only with the systematic risk, which is the risk of the market as a whole, because the unique risk (unsystematic risk) is diversified away by a well-balanced portfolio. For this reason, β is the only concern investors have when they value their securities.

In finance theory determining systematic risk is of importance for investors. Investors use β in their decisions such as to calculate cost of capital, to establish portfolio strategies, and capital asset pricing model. Hence, β estimation is a major issue for the investors. Consequently, the performance of estimation methods is significant for investors in terms of wealth creation.

Financial asset prices, especially the stock prices exhibit high volatile behavior. This arises estimation problem of β with OLS because outliers (distant data) may cause misleading estimation results under OLS method.

This study focuses on comparing the estimation and explanatory power of OLS and LMS methods in a highly volatile market namely, BIST. Weekly closing prices of 237 stocks that are traded in BIST are the main source of data for this study. The results confirm significant estimation differences between the two methods. Based on the estimation results of OLS method the β values of 190 stocks are less than 1 whereas 36 stocks have β values greater than 1. On the other hand, the estimation results of LMS show that β values of 214 stocks are less than 1 whereas 32 β values are greater than 1. Due to the fact that LMS avoids the outliers (distant data) in its analysis the number of β values less than 1 is more with LMS method than with OLS method.

R-square is another comparison indicator for the methods. Empirical results show that R-squares of 205 out of 237 stocks with LMS are greater than R-squares with OLS. In other words, LMS has more explanatory power than OLS. An interesting part of the study is that β values of 29 stocks signal different risk-return relationship such that β values of 26 stocks are greater than 1 with OLS whereas the same stocks have β values less than 1 with LMS. Concerning with the 29 stocks each method alters the return per unit of risk. Consequently, selection of estimation methods is of importance for investors.

Besides the comparison of R-squares of LMS and OLS, weekly error terms of the market model are obtained with the use of LMS-based and OLS-based betas. In other words, for each stock the differences between actual returns and expected returns are calculated. In terms of error terms weekly performances of the two methods are evaluated for each stock. For instance, If OLS yields smaller error terms than LMS, OLS is to surpass LMS and vice versa. When all sectors analysed, it is seen that LMS outperforms OLS in 10 sectors, and in 1 sector both methods have the same performance.

From the empirical findings of the study, it can be concluded that OLS-based betas may generate misleading results for the investors. Therefore, the use of LMS or other robust methods is significant in order to convey the accurate information for the interest groups.

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