SOME ROBUST RIDGE ESTIMATORS: A COMPARATIVE STUDY

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ABSTRACT

In the presence of multicollinearity and outliers, the Ordinary Least Square estimator is found to be inefficient due to the inflated standard errors. In this paper, some forms of Generalized Ridge regression parameters proposed by Fayose and Ayinde (2019) were combined with robust estimators to estimate the parameters of linear regression model when multicollinearity and outliers are jointly evident. Linear regression models with three and five regressors (p = 3 and p = 5), three levels of multicololinearity ($\rho = 0.900, 0.990 \; and \; 0.999$), three levels of percentages of outliers ($n1\% = 5\%, \; 10\% \; and \; 20\%$), three levels of magnitude of outliers ($\sigma^2_{outliers} = 10, \; 100 \; and \; 250$) and three levels of sample size ($n = 20, 40 \; and \; 100$) were considered through Monte Carlo experiments. The experiments were carried out 1000 times, and the performances of these combined estimators and Ordinary Least Square were investigated and compared using the Mean Square Error (MSE) criterion. Results show that the Maximum form of Fayose and Ayindes' modified Generalized Ridge parameter of Troskie and Chalton (1996) when combined with robust Least Absolute Deviation estimator ($\hat{\alpha}^{max}_{LADFA1}$) consistently performed more efficiently than all other methods of parameter estimation of linear regression model considered. It also shows that increasing the sample size, the number of explanatory variables, degree of multicollinearity, the magnitude of outliers and percentage of outliers affect the efficiency of these estimators.

INTRODUCTION

Ordinary Least Squares (OLS) estimator is the most popular estimator used in estimating the parameters of the linear regression model. This estimator is the Best Linear Unbiased Estimator when all the assumptions of the Classical Linear Regression Model are met (Fonby, 1984; Maddala, 2002).

One of the problems encountered in regression analysis is the existence of outlier(s) in a dataset which is one of the violations in the classical linear regression model. Outlier(s) renders the OLS residuals to be non-normal. Consequently, the OLS estimator will be inefficient, and the estimates obtained from it will be imprecise as a result of the inflated error variance (Ayinde et al., 2015). The following estimation techniques are developed to handle the problems of outliers; M estimator proposed by Huber (1964), MM estimator proposed by Yohai (1987), S estimator proposed by Rousseuw and Yohai (1984), LAD estimator proposed by Dielman (1984), LTS proposed by Rousseuw, P. J. and Van Driessen, K. (1998). Different researchers such as Neykov and Neytchev (1991), Atkinson and Weisberg (1991), Stronberg (1993), Rousseeuw and Van Driessen (1999), Agullo (2001), Jung (2005), Li (2005), Cizek (2005) and Rousseeuw and Van Driessen (2006) also suggested different algorithms for computing the LTS estimates.

Multicollinearity is another problem encountered when estimating the parameters of the linear regression model using OLS. It arises when two or more predictors move precisely in step with each other (Murray, 2006). If multicollinearity exists in a dataset, the OLS estimator will be inefficient due to the inflated variance. Multicollinearity can as well lead to erroneous conclusions and can render the actual regression coefficients insignificant (Chatterjee and Hadi, 2006; Chatterjee *et al.,* 2000). Estimators to handle this problem includes Stein estimator (Stein, 1960), Ridge regression estimator (Hoerl and Kennard, 1970), Principal Components Regression estimator (Massy, 1965), Partial Least Squares Regression estimator (Wold, 1966), and Least Absolute Shrinkage and Selection Operator (LASSO) proposed by Tibshirani (1996), Liu estimator (2003), modified ridge-type estimator (Lukman et al. 2019) and others.

Multicollinearity and outlier problem can exist together in a dataset. Research works done to handle these problems jointly includes robust M estimator for ridge regression proposed by Holland (1973), robust regression methods based on M, MM, S, and GM estimators proposed by Samkar and Alpu (2010), ridge regression with M, MM, S, LTS, LMS and LAD introduced by Lukman et al., (2014), Ridge Least Absolute Value Estimator proposed by Pfaffenberger & Dielman (1990), Ridge MM estimator proposed by Habshah & Marina (2007), ridge regression based on robust MM estimator for high dimensional data developed by Maronna (2011).
This article aims to investigate the performances of some ridge regression estimators when combined with some robust regression estimators to combat the problems of outliers and multicollinearity in a linear regression model.

MATERIALS AND METHODS

Consider the standard linear regression model of the form:

$$Y = X\beta + U \tag{1}$$

where Y is an n x 1 random vector of dependent variable, X is an n x p matrix with full rank, β is a p x 1 vector of estimable parameters, and U is an n x 1 random vector of residuals distributed as $N(0, \sigma^2 I_n)$. The Ordinary Least Squares estimator of β is

$$\hat{\beta}_{OLS} = (X'X)^{-1}X'Y \tag{2}$$

Let T be an orthogonal matrix, satisfying$T'X'XT = \Lambda = diag(\lambda_1, \lambda_2, \ldots, \lambda_p)$, where Λ is a diagonal matrix of order p x p with diagonal elements $\lambda_1, \lambda_2, \ldots, \lambda_p$ as the eigen values of $X'X$. T and Λ are the matrices of eigen vectors and eigen values, respectively. Hence, the canonical form of model (1) is:

$$Y = Z\alpha + U \tag{3}$$

where $Z = XT$ and $\alpha = T'\beta$.
Hence, the OLS estimator of α is:

$$\hat{\alpha}_{OLS} = \Lambda^{-1}Z'Y \tag{4}$$

2.1 Robust Estimators

M Estimator

M-estimator proposed by Huber (1964) perform parameter estimation by minimizing the sum of a less rapidly increasing function of the residuals. It performs better when the outliers are in the y-direction but less robust to leverage. The objective function of M estimate is given by:

$$min \sum_{i=1}^{n} \rho\left(\frac{U_i}{s}\right) = min \sum_{i=1}^{n} \rho\left(\frac{Y_i - Z'\hat{\alpha}_i}{s}\right) \tag{5}$$

where s is the scale estimate obtained as function of residuals and is estimated by

$$S = \frac{median|U_i - meadian(U_i)|}{h} \tag{6}$$

When n is large, an appropriate choice of h makes S an approximately unbiased estimator ofσ.
To minimize (5), a system of normal equations is solved by taking partial derivative with respect to β and equating them to zero, which gives

$$\sum_{i=1}^{n} X_i \psi\left(\frac{Y_i - Z'\hat{\alpha}_i}{s}\right) = 0 \tag{7}$$

Where ψ is ρ' and Z_i is the i^{th} observation. Then Iterative Reweighted Least Squares (IRLS) or nonlinear optimization techniques is used to solve these equations.

MM-Estimator

MM- estimator proposed by Yohai (1987), is the combination of the high breakdown value estimator and M-estimator. By this estimator, parameter estimates are obtained from multiple M-estimation that uses the S-estimation procedure to minimize the scale of the residuals. The procedure involved the following three stages:

1. Initial estimates $\hat{\alpha}^{(1)}$ found using a high breakdown point estimator are used to compute the initial residuals$U_i^{(1)}$.
2. M-estimate of the scale of residuals S_n are computed using the initial estimate of residuals$U_i^{(1)}$ in step 1.
3. M-estimates of regression coefficients are obtained from Weighted Least Squares (WLS) whose first iteration uses the residual scale S_n from step 2 and the estimates of residuals $U_i^{(1)}$ from step 1
$$\sum_{i=1}^{n} Z_i w_i \left(\frac{U_i^{(1)}}{S_n}\right) = 0 \tag{8}$$
4. Residuals from the initial Weighted Least Squares (WLS) in step 3 are used to construct new weights, which again is used in Weighted Least Squares estimation. The process is continually reiterated until convergence.

S-Estimator

S-estimator proposed by Rousseuw and Yohai (1984), is a high breakdown value that minimize the dispersion of residuals. S-estimator minimize the dispersion in residuals as the solution of

$$\frac{1}{n}\sum_{i=1}^{n}\psi\left(\frac{U_i}{s}\right) = K \tag{9}$$

Where K is a constant.

Least Trimmed Squares Regression Estimator

Another estimator proposed by Rousseuw (1984), is the Least Trimmed Squares (LTS) regression. It is also a high breakdown value method that minimizes the sum of the trimmed squared residuals. LTS estimator is

$$\hat{\alpha}_{LTS} = argmin\left(\sum_{i=1}^{h} U_i^2\right) \tag{10}$$

Where h is defined in the range$\frac{n}{2} + 1 \leq h \leq \frac{3n+P+1}{4}$, n and P representing sample size and number of parameters in the model.

Least Absolute Deviation Estimator

Least Absolue Deviation (LAD) regression proposed by Dielman (1984) is very resistant to observations with unusual Y values. Estimates are obtained by minimizing the sum of the absolute values of the residuals.

$$min\sum_{i=1}^{n}|U_i| = min\sum_{i=1}^{n}|Y_i - Z_i\hat{\alpha}| \tag{11}$$

LAD fails to account for leverage (Mosteller and Turkey 1977), and thus has a breakdown point of zero.

Generalized Ridge Estimator

The Generalized Ridge estimator of α is given by:

$$\hat{\alpha}_{GR} = [I - K(\Lambda + \mathrm{K})^{-1}]\hat{\alpha}_{OLS} \tag{12}$$

Where $\mathrm{K} = diag(k_1, k_2, \dots, k_p)$, is a p x p diagonal matrix whose elements $k_1, k_2, \dots, k_p$ are the p different ridge parameters corresponding to p different regressors considered. Therefore, the Generalized Ridge estimator of β is

$$\hat{\beta}_{GR} = T\hat{\alpha}_{GR} \tag{13}$$

The mean square error of Generalized Ridge estimator is:

$$MSE(\hat{\alpha}_{GR}) = \sigma^2\sum_{i=1}^{p}\lambda_i/(\lambda_i + k_i)^2 + \sum_{i=1}^{p}k_i^2\hat{\alpha}_i^2/(\lambda_i + k_i)^2 \tag{14}$$

While the MSE of $\hat{\alpha}_{OLS}$ is given by:

$$MSE(\hat{\alpha}_{OLS}) = \sigma^2\sum_{i=1}^{p}1/\lambda_i \tag{15}$$

The generalized ridge parameters used in this study are those proposed by Fayose and Ayinde (2019).
Fayose and Ayinde (2019) proposed some generalized ridge parameters by taking the Minimum (MIN), Maximum (MAX), Mid-Range (MID), Arithmetic Mean (AM), Median (MD), Geometric Mean (GM) and Harmonic Mean (HM) of eigen values (λ_i) of $X'X$ matrix to(of) the ridge parameter estimators proposed by Nomura (1988), Troskie and chalton (1996), Firinguetti (1999), Batach *et. al* (2008), Dorugade (2016) and Lukman and Ayinde (2017).

The estimators of generalized ridge parameters used in this study are the modification of Troskie and Chalton (1996) and Firinguetti (1999) by Fayose and Ayinde. The generalize ridge parameter by Troskie and Chalton is:

$$k_{TC} = \lambda_i \sigma^2 / (\lambda_i \hat{\alpha}_i^2 + \sigma^2) \qquad (16)$$

While that of Firinguetti is computed as:

$$k_F = \lambda_i \sigma^2 / (\lambda_i \hat{\alpha}_i^2 + (n-p)\sigma^2) \qquad (17)$$

Where n is the sample size and p is the number of independent variables in the model.
Hence, the generalized ridge parameters used are:

$$k_{FA1}^{min} = \lambda_{min} \sigma^2 / (\lambda_{min} \hat{\alpha}_i^2 + \sigma^2) \qquad (18)$$

Where λ_{min} = minimum (λ_i), i= 1, 2, …, p

$$k_{FA1}^{max} = \lambda_{max} \sigma^2 / (\lambda_{max} \hat{\alpha}_i^2 + \sigma^2) \qquad (19)$$

Where λ_{max} = maximum (λ_i), i= 1, 2, …, p

$$k_{FA1}^{mid} = \lambda_{mid} \sigma^2 / (\lambda_{mid} \hat{\alpha}_i^2 + \sigma^2) \qquad (20)$$

Where $\lambda_{mid} = (\lambda_{max} + \lambda_{min})/2$

$$k_{FA1}^{md} = \lambda_{md} \sigma^2 / (\lambda_{md} \hat{\alpha}_i^2 + \sigma^2) \qquad (21)$$

Where λ_{md} = median (λ_i), i= 1, 2, …, p

$$k_{FA1}^{gm} = \lambda_{gm} \sigma^2 / (\lambda_{gm} \hat{\alpha}_i^2 + \sigma^2) \qquad (22)$$

Where $\lambda_{gm} = (\lambda_1 \times \lambda_2 \times \ldots \times \lambda_p)^{\frac{1}{p}}$

$$k_{FA1}^{hm} = \lambda_{hm} \sigma^2 / (\lambda_{hm} \hat{\alpha}_i^2 + \sigma^2) \qquad (23)$$

Where $\lambda_{hm} = p / \sum_{i=1}^{p} \frac{1}{\lambda_i}$.
Following a similar fashion, these forms are again applied to equation (17).

Robust Generalized Ridge Estimator

The robust generalized ridge estimator used in this study that jointly solve the problems of multicollinearity and outliers is given by

$$\hat{\alpha}_{RGR} = [I - K_{RobustFA}(\Lambda + K_{RobustFA})^{-1}]\hat{\alpha}_{Robust} \qquad (24)$$

Where $K_{RobustFA}$ are the Fayose and Ayindes' generalized ridge parameters computed from robust (M, MM, S, LTS, LMS and LAD) estimates instead of the usual OLS estimates, and $\hat{\alpha}_{Robust}$ is the robust (M, MM, S, LTS, LMS, LAD) estimator of the model parameters.

e.g, $k_{RobustFA1}^{min} = \lambda_{min} \sigma_{Robust}^2 / (\lambda_{min} \hat{\alpha}_{Robusti}^2 + \sigma_{Robust}^2)$ (25)

$k_{RobustFA2}^{min} = \lambda_{min} \sigma_{Robust}^2 / (\lambda_{min} \hat{\alpha}_{Robusti}^2 + (n-p)\sigma_{Robust}^2)$. (26)

Where equation (25) and (26) are the robust minimum forms of Fayose and Ayinde's modified ridge parameters of Troskie and Chalton (1996) and Firinguetti (1999) respectively.

Simulation Study

In this paper, a Monte-Carlo experiment was carried out. The relation that yield the predictant is:

$$Y = X\beta + U \qquad (27)$$

The procedure adopted by [20] and Kibria (36) was used to generate the predictors, the procedure is:

$$X_{ti} = (1-\rho^2)^{\frac{1}{2}} Z_{ti} + \rho Z_{tp} \qquad (28)$$

Where Z_{ti} are the standard normal and independently distributed random variables, each with mean zero and unit variance, ρ is the degree of relationship between any two predictors, which is varied as $\rho = (0.900, 0.990, 0.999)$ so as to study the effect of variation in degrees of multicollinearity.

The error term was simulated to have a Gaussian mixture, i.e. $U_t \sim (1 - n1\%)N(0,1) + n1\%N(0, \sigma^2_{outliers})$. Where$n1\% = (5\%,\ 10\%,\ 20\%)$ were the percentages of outliers injected into the data, and $\sigma^2_{outliers} = (10,\ 100,\ 250)$ is the magnitude of outliers considered.

The number of predictors were varied as p = (3, 5) so as to study the impact of increase in number of predictors in the model. When p = 3, the true parameter values were fixed as: $\beta_1 = 0.8$, $\beta_2 = 0.1$, $\beta_3 = 0.6$, and when p = 5, $\beta_1 = 0.6$, $\beta_2 = 0.3$, $\beta_3 = 0.2$, $\beta_4 = 0.15$ and $\beta_5 = 0.7$, such that $\beta'\beta = 1$ in both cases.
To investigate the impact of sample size on the performance of these estimators, three sample sizes were considered, n = 20, 40, 100.

This experiment is replicated 1000 times and at each stage, the MSE is computed. The MSE of all the estimators is average over the number of replications and parameters as:

$$AMSE(\hat{\beta}) = \frac{1}{1000}\sum_{i=1}^{p}\sum_{j=1}^{1000}(\hat{\beta}_{ij} - \beta_i)^2. \qquad (29)$$

This criterion was used in investigating the performances of these estimators.

DISCUSSION OF RESULTS

The average of the estimated MSE of OLS and seventy-two (72) other robust generalized ridge estimators over the number of parameters of a varying number of predictors at different sample sizes, the magnitude of outliers, levels of multicollinearity and percentage of outliers are presented in Table 1 to Table 9 at the Appendix. From Table 1 to Table 9, we observed that, at a fixed magnitude of outliers, number of explanatory variables, levels of multicollinearity and percentage of outliers, as sample size increase, the AMSE of the estimators' decreases. The AMSE of the estimators increases with an increase in the magnitude of outliers.

Also, AMSE increases as the number of explanatory variables increase and as levels of multicollinearity increases. $\hat{\alpha}^{max}_{LADFA1}$ Consistently has the smallest values of AMSE, even though $\hat{\alpha}^{mid}_{LADFA1}$ compete with it favourably. OLS consistently has the largest values of AMSE, at all the levels of sample size, magnitude of outliers, number of explanatory variables, levels of multicollinearity and percentage outliers considered.

CONCLUSSION

In this study, the performances of some forms of Generalized Ridge parameters proposed by Fayose and Ayinde (2019) when combined with Robust estimators to jointly combat the problems of multicollinearity and outliers were evaluated and compared using the MSE criterion.

From the simulation study, it's found that the maximum form of Fayose and Ayinde's modified generalized ridge parameter by Troskie and Chalton (1996) when combined with robust LAD estimator outperformed all other methods of estimating the unknown regression parameters and is therefore, recommended as the most suitable estimator among the various estimators considered, when jointly faced with the problems of multicollinearity and outliers.

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APPENDIX

Table 1: AMSE of the estimators when n = 20 and $\sigma^2_{outlier}$(magnitude of outliers) = 10

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	1.920291	3.27423	6.243832	13.00315	32.97431	106.1429	198.3469	376.5565	868.8067	2.446815	5.304688	11.38342	27.31364	43.867	94.14139	241.5551	607.0205	1532.516
MMINFA2	1.767347	3.017706	5.779034	11.95886	30.30204	97.59518	182.4261	347.3772	801.3503	2.263446	4.929694	10.56318	25.24635	40.87881	87.43678	224.1479	560.4754	1410.816
MMAXFA2	0.941632	1.632572	3.510243	5.794125	13.07747	47.27722	83.88995	161.3786	410.152	1.286447	2.736478	6.213782	11.29093	20.86221	47.10114	95.88304	284.6101	818.4864

MMIDFA2	1.050662	1.777599	3.76094	5.963505	13.22188	47.82183	83.99175	161.7146	410.6337	1.384177	2.937998	6.428257	11.34954	21.05458	47.42267	95.96941	284.738	818.7343
MMFA2	1.60931	2.695313	5.425332	11.35134	26.42717	82.01056	159.6179	327.4181	710.057	2.038535	4.170941	8.86824	21.83184	36.89991	69.32083	186.6523	437.6929	1031.292
MGMFA2	1.449741	2.431005	4.890983	9.07297	19.66586	65.7574	106.8128	218.8822	504.2514	1.991335	4.08576	8.516366	15.42366	28.33996	57.47573	109.3278	304.3502	849.1199
MHMFA2	1.753582	2.946929	5.648614	12.7681	32.57709	105.2894	198.1274	376.1411	867.9713	2.318406	5.042396	10.89291	27.15939	43.58228	93.66036	241.4072	606.701	1531.949
MMINFA1	1.122167	1.981448	4.040187	7.645953	18.8268	64.12016	117.2233	223.3127	540.9144	1.580198	3.506729	7.824879	16.83799	29.0418	64.26945	151.9109	396.4343	1045.039
MMAXFA1	0.814681	1.468402	3.226469	5.643613	12.94576	46.77884	83.795	161.0649	409.6973	1.179439	2.50258	5.991745	11.23783	20.68893	46.81109	95.80309	284.4915	818.2562
MMIDFA1	0.822123	1.478333	3.243759	5.652422	12.9538	46.80944	83.8009	161.0844	409.7267	1.186688	2.519165	6.007337	11.24156	20.70099	46.83141	95.80878	284.4999	818.2726
MMFA1	0.951436	1.671538	3.657095	6.86767	15.08392	51.89171	95.9599	196.9921	458.512	1.342496	2.794562	6.483674	13.24007	24.21994	50.49469	113.1638	308.0032	848.7416
MGMFA1	0.883023	1.573012	3.413694	5.931709	13.44187	48.32204	85.21027	164.7148	415.7469	1.316882	2.75843	6.363595	11.56109	21.35994	47.77674	96.63454	285.7542	820.3259
MHMFA1	1.085987	1.839697	3.822942	10.49571	28.06331	94.8838	194.7808	369.8238	855.2036	1.675439	3.660999	8.302238	25.37091	40.43633	88.18867	239.3891	602.344	1524.173
MMMINFA2	1.759634	2.998551	5.72086	11.89557	30.12887	96.77834	181.483	344.7509	793.6517	2.246402	4.892938	10.4364	25.11706	40.56122	86.40439	222.8815	554.671	1388.958
MMMAXFA2	0.763557	1.113997	2.102114	4.190465	7.800962	23.59661	57.92443	95.0816	190.4246	0.915036	1.807971	3.007707	7.455975	11.48736	22.78302	64.75568	160.7914	338.066
MMMIDFA2	0.900249	1.320251	2.541609	4.404001	7.993695	24.35143	58.04866	95.5046	191.1113	1.054543	2.116837	3.404504	7.532091	11.76846	23.28427	64.86343	160.9711	338.4641
MMMFA2	1.581729	2.60682	5.25655	11.2069	25.56459	76.44328	155.0392	320.9687	672.5557	1.968404	3.920441	7.862779	21.1503	35.53273	59.59813	179.145	388.2897	738.8075
MMGMFA2	1.393621	2.255654	4.465125	8.436277	16.87579	52.12266	87.74447	176.1156	346.8898	1.906766	3.803105	7.252219	12.99324	23.22517	40.12271	82.33903	190.2848	393.9369
MMHMFA2	1.744597	2.919136	5.561033	12.76423	32.57283	105.2811	198.1272	376.1404	867.9701	2.310152	5.025	10.85314	27.15836	43.57922	93.65532	241.4071	606.7007	1531.949
MMMINFA1	0.990103	1.616375	3.035872	6.599328	15.75141	49.56553	101.4286	182.381	408.3852	1.33718	2.973312	6.005789	14.85367	24.29406	51.35905	136.6969	328.0994	765.5667
MMMAXFA1	0.611365	0.899214	1.648883	4.007052	7.630963	22.94153	57.80884	94.68971	189.787	0.769638	1.461777	2.623145	7.387807	11.24456	22.35273	64.6562	160.6253	337.6993
MMMIDFA1	0.619572	0.910781	1.672705	4.017517	7.641133	22.98007	57.81602	94.714	189.8267	0.778849	1.484299	2.647677	7.392563	11.26104	22.38174	64.66327	160.6371	337.7254
MMMFA1	0.775774	1.168648	2.358138	5.580383	10.60626	30.42781	73.4552	144.9212	269.3809	0.994714	1.896952	3.508051	10.07508	16.77543	28.40951	87.36843	195.8257	393.2296
MMGMFA1	0.691309	1.032258	1.938452	4.363551	8.294857	25.06635	59.55743	99.40087	198.7262	0.958158	1.841573	3.28402	7.811504	12.23008	23.85343	65.70183	162.4156	341.088

MMHMFA1	0.945168	1.430824	2.674484	10.19687	27.5453	93.63622	194.7252	369.6669	854.8924	1.481539	3.197093	7.002514	25.24525	40.08379	87.54568	239.3669	602.2809	1524.073
SMINFA2	1.77002	3.00894	5.732037	11.97398	30.26715	96.94468	182.1895	346.5614	795.1564	2.258938	4.905666	10.46163	25.24173	40.76947	86.58514	224.1532	556.5591	1391.542
SMAXFA2	0.952196	1.340853	2.352187	5.798836	11.20773	27.5082	75.42988	140.283	227.2981	1.160429	2.189521	3.572402	10.70422	16.80976	27.08502	99.01965	213.0467	418.9538
SMIDFA2	1.060422	1.5208	2.758132	5.968844	11.36659	28.22514	75.53958	140.6486	227.9364	1.270692	2.453866	3.943342	10.76876	17.03966	27.56211	99.10906	213.2039	419.3202
SMFA2	1.615568	2.650752	5.287848	11.379	26.2185	77.45317	158.2737	325.513	679.6901	2.016031	4.015191	8.051652	21.80777	36.39532	61.41754	187.6254	406.7415	786.5305
SGMFA2	1.458439	2.38336	4.541982	9.121296	18.839	54.43774	100.4923	205.8855	373.4908	1.963721	3.911081	7.488837	15.1695	26.21544	43.34059	112.5595	237.8443	470.3403
SHMFA2	1.755542	2.932792	5.577095	12.76883	32.57601	105.2829	198.1274	376.1408	867.9703	2.316757	5.031563	10.8605	27.1591	43.581	93.65628	241.4072	606.7008	1531.949
SMINFA1	1.131947	1.778751	3.214431	7.679142	17.89351	52.02466	112.0138	210.9203	431.2154	1.49608	3.187811	6.344089	16.66309	27.08384	53.78569	154.217	354.604	810.9317
SMAXFA1	0.833455	1.152089	1.929295	5.649265	11.0692	26.88315	75.32757	139.9427	226.7046	1.046547	1.889652	3.209646	10.64573	16.6074	26.67112	98.93678	212.9011	418.6163
SMIDFA1	0.839657	1.162381	1.951951	5.657941	11.07743	26.92005	75.33392	139.9637	226.7416	1.053658	1.90965	3.232991	10.64984	16.62128	26.69921	98.94268	212.9115	418.6403
SMFA1	0.961839	1.388587	2.588779	6.886754	13.56199	33.96875	88.53902	180.8625	300.8686	1.23323	2.265755	4.039828	12.8304	21.02694	32.37705	116.3733	242.4726	469.6892
SGMFA1	0.895347	1.269332	2.200523	5.936837	11.61701	28.90265	76.85288	143.9578	235.0099	1.194446	2.218322	3.830927	11.00148	17.41194	28.10044	99.79439	214.4568	421.734
SHMFA1	1.094851	1.61026	2.879226	10.52318	27.90559	93.87526	194.7675	369.7673	854.9497	1.613996	3.382131	7.235374	25.34185	40.2895	87.65204	239.3869	602.3026	1524.083
LTSMINFA2	1.787624	3.039986	5.7847	12.10972	30.58117	97.98747	183.9539	350.6362	802.4313	2.295354	4.976796	10.61134	25.60348	41.37433	87.85077	227.3118	566.7155	1414.72
LTSMAXFA2	1.177956	1.826282	3.293413	7.546274	16.53668	46.77647	105.6976	204.2396	391.2697	1.619619	3.274044	6.205889	16.06477	26.1516	49.795	147.744	360.7789	794.0741
LTSMIDFA2	1.254866	1.952569	3.572327	7.671484	16.65685	47.31157	105.7731	204.5007	391.7564	1.682756	3.427701	6.424602	16.10415	26.29894	50.10628	147.8001	360.8735	794.3094
LTSMFA2	1.664043	2.75976	5.421889	11.63992	27.41582	82.76358	164.9746	334.3129	710.7877	2.129923	4.369829	8.952085	23.17512	38.36551	71.17174	202.7397	473.6579	1017.834
LTSGMFA2	1.544224	2.529438	4.848138	9.956142	22.0285	65.98505	122.8075	249.3571	492.6984	2.096312	4.303648	8.59232	18.85091	31.95784	60.05123	156.2402	375.7153	825.4485
LTSHMFA2	1.776017	2.978303	5.657605	12.78086	32.58744	105.3011	198.1282	376.1426	867.9721	2.337968	5.071805	10.92022	27.16404	43.59255	93.66858	241.4079	606.7019	1531.95
LTSMINFA1	1.305939	2.13274	3.889632	8.912889	21.35228	64.26123	130.9307	252.8125	532.4041	1.812825	3.859564	7.876676	19.80124	32.49132	66.48779	181.937	443.6885	1032.885
LTSMAXFA1	1.094444	1.691364	3.001662	7.435669	16.43005	46.29561	105.6272	203.9961	390.8156	1.553574	3.099155	5.991098	16.02919	26.02046	49.51974	147.6919	360.6912	793.8568

LTSM IDFA1	1.098675	1.69886	3.017685	7.442052	16.43641	46.32455	105.6315	204.0111	390.8438	1.557797	3.110813	6.005151	16.03169	26.0295	49.53866	147.6956	360.6974	793.8722
LTSM FA1	1.184794	1.859906	3.45568	8.340319	18.25537	51.43841	114.557	232.2298	442.9729	1.655644	3.318371	6.4817	17.38102	28.77653	53.1668	158.6143	378.4848	825.0567
LTSG MFA1	1.137712	1.75563	3.189533	7.647956	16.84348	47.80854	106.6679	206.8425	397.0153	1.639111	3.290796	6.358204	16.24681	26.5351	50.45338	148.2313	361.6289	795.8454
LTSH MFA1	1.279937	2.01211	3.667778	10.96427	28.65319	95.37999	194.9189	370.1064	855.3404	1.881739	3.979198	8.41928	25.66902	40.95465	88.53797	239.4886	602.4866	1524.253
LMS MINFA2	1.803022	3.061212	5.838349	12.22673	30.77953	98.9477	185.7206	353.9045	808.9699	2.355427	5.107573	10.8675	26.31855	42.31439	90.31643	233.0249	580.7284	1460.753
LMS MAX FA2	1.3329	2.010526	3.891887	8.62119	19.59585	59.55899	124.0041	237.6389	479.7519	2.018067	4.319067	8.533434	22.13048	35.21377	72.30656	195.9127	472.0046	1175.387
LMS MID FA2	1.389239	2.117994	4.111038	8.721968	19.6894	59.96831	124.0633	237.8429	480.1396	2.050667	4.389962	8.644145	22.14874	35.27519	72.44961	195.9354	472.0543	1175.507
LMS MFA2	1.702657	2.816298	5.543095	11.84592	28.0988	86.71521	170.3155	340.5231	732.2209	2.272346	4.819462	9.952598	25.21994	40.76405	82.15841	220.696	529.8821	1279.063
LMS GMFA2	1.60863	2.615899	5.093106	10.51221	23.8093	73.94262	137.4011	272.6857	558.4295	2.255833	4.789354	9.762324	23.37772	37.73247	77.01757	199.4524	479.4011	1191.026
LMS HMFA2	1.794111	3.008625	5.727369	12.79466	32.59851	105.3296	198.1298	376.1459	867.9762	2.377965	5.153476	11.04789	27.18861	43.64069	93.74407	241.4151	606.7143	1531.963
LMS MINFA1	1.427189	2.272509	4.356598	9.694649	23.28624	72.65444	143.6921	275.3987	589.4869	2.116286	4.588064	9.387842	23.78502	37.97485	79.98318	210.8772	514.1302	1285.598
LMS MAX FA1	1.272316	1.896305	3.655546	8.529665	19.51218	59.18999	123.9487	237.4487	479.389	1.983528	4.239423	8.423267	22.11397	35.15916	72.18045	195.8917	471.9585	1175.275
LMS MID FA1	1.275425	1.902678	3.668892	8.535051	19.5172	59.21224	123.9522	237.4603	479.4116	1.985695	4.244634	8.430596	22.11513	35.16291	72.18908	195.8931	471.9617	1175.283
LMS MFA1	1.337868	2.039065	4.019888	9.247452	20.91399	63.09117	130.9776	259.3111	519.8385	2.036738	4.339485	8.673011	22.73154	36.32529	73.85754	200.4672	480.7679	1190.834
LMS GMFA1	1.303793	1.967631	3.808941	8.703169	19.83375	60.34737	124.7683	239.6648	484.2867	2.028193	4.326778	8.610576	22.21477	35.37373	72.60931	196.1105	472.4457	1176.289
LMS HMFA1	1.411947	2.175345	4.163502	11.29872	29.14611	96.74821	195.1185	370.4893	855.8958	2.147756	4.629367	9.662651	26.32085	42.0725	90.54859	239.9411	603.281	1525.402
LAD MINFA2	1.754674	2.990248	5.702494	11.85805	30.04671	96.46447	180.9931	343.7493	791.2527	2.23974	4.877973	10.41505	25.05965	40.46192	86.21805	222.4078	552.8373	1385.69
LAD MAX FA2	0.622783	0.792055	1.489434	2.768377	4.288232	11.06026	43.98282	55.67692	92.94477	0.747979	1.36951	2.25491	5.488709	7.678748	14.42629	46.80786	105.0179	248.955
LAD MID FA2	0.783668	1.048261	2.028139	3.030913	4.49281	11.89474	44.1092	56.12578	93.62472	0.908662	1.737492	2.70891	5.567545	7.985578	14.97203	46.92197	105.2091	249.3712
LAD MFA2	1.563059	2.564911	5.00039	11.11387	25.07076	73.94197	152.5127	318.1713	658.9698	1.939565	3.809802	7.668812	20.80998	35.05578	56.87528	175.3445	367.3934	690.8639
LAD GMFA2	1.353846	2.16713	4.311712	7.944601	14.95039	45.31661	77.11473	151.222	276.2064	1.871727	3.677943	7.003214	11.7085	21.22358	34.60529	66.41768	138.4315	311.5243

LADHMFA2	1.738061	2.902102	5.527119	12.76218	32.57098	105.2782	198.1271	376.1402	867.9698	2.306711	5.018424	10.84586	27.15803	43.57837	93.65455	241.4071	606.7006	1531.949
LADMINFA1	0.89115	1.410846	2.628452	5.73605	13.60509	42.23995	92.57958	158.6922	350.2338	1.232035	2.734351	5.632313	13.8122	22.44968	47.51177	127.9641	297.9222	719.8538
LADMAXFA1	0.448575	0.527715	0.938853	2.545826	4.113126	10.36842	43.86566	55.25927	92.30707	0.583673	0.955805	1.822409	5.419138	7.420399	13.98054	46.70258	104.8416	248.5723
LADMIDFA1	0.457245	0.541315	0.966917	2.55838	4.123396	10.40884	43.87292	55.28562	92.34865	0.593515	0.981963	1.848987	5.423962	7.43767	14.00965	46.71007	104.8541	248.5995
LADMFA1	0.637143	0.860138	1.803601	4.486039	7.471105	19.08235	61.01797	113.9224	183.1713	0.839791	1.47603	2.827288	8.394882	13.75288	20.92952	72.11637	144.8182	310.7234
LADGMFA1	0.538329	0.690245	1.288743	2.981029	4.820675	12.70995	45.67971	60.37333	101.5136	0.797667	1.40978	2.571046	5.864316	8.5002	15.61093	47.81777	106.765	252.1559
LADHMFA1	0.834615	1.161632	2.165977	9.982039	27.2817	93.12158	194.7006	369.6187	854.8031	1.396349	2.987603	6.708667	25.20139	39.96968	87.41791	239.3595	602.2656	1524.059

Table 2: AMSE of the estimators when n = 20 and $\sigma^2_{outlier}$(magnitude of outliers) = 100

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	153.6074	244.9034	581.7356	1922.809	2933.504	8241.748	13685.45	53977.96	62546.14	147.3386	484.0391	783.1869	2439.711	6236.429	9321.565	26251.26	41482.69	128763.1
MMINFA2	141.0684	225.8129	536.713	1765.465	2696.765	7576.316	12569.93	49779.6	57444.71	135.4821	449.0646	728.4052	2243.319	5761.031	8680.397	24212.73	38345.6	119289.3
MMAXFA2	67.2728	121.1813	321.8047	620.1638	1097.334	3544.245	4425.601	25591.72	27274.96	62.55406	217.9372	414.4147	840.1758	2612.348	4658.104	10779.48	16941.65	63863.05
MMIDFA2	79.68467	135.6978	349.6324	639.1354	1127.769	3608.323	4439.788	25617.54	27346.84	67.64335	235.5328	440.5016	847.6722	2628.063	4683.607	10790.14	16951.57	63896.11
MMFA2	122.7	214.4161	510.1966	1566.217	2415.1	7089.457	10201.96	40967.41	55369.32	123.7575	380.0931	658.5875	1693.162	4460.946	7703.7	18335.01	30923.23	96462.85
MGMFA2	112.9501	190.1441	458.2025	1157.474	1855.877	5465.335	6576.275	30575.92	37558.98	119.3678	368.9528	631.0544	1195.135	3314.937	5916.436	11954.12	18955.36	68091.65
MHMFA2	137.8709	216.4875	523.4649	1904.556	2896.541	8166.87	13668.22	53935.93	62470.31	135.7961	460.4672	738.2088	2425.627	6211.273	9270.323	26238.39	41455.18	128707.6
MMINFA1	81.59562	143.7589	365.5586	1018.279	1628.833	4804.183	7476.593	33934.7	36623.61	86.06054	302.6161	521.7667	1417.753	3903.16	6278.383	16447.8	26139.32	86534.41
MMAXFA1	51.05484	104.6132	289.6461	603.2554	1070.319	3485.803	4412.483	25567.57	27206.54	57.74231	199.7864	386.9677	833.5111	2598.192	4634.934	10769.65	16932.42	63832.09
MMIDFA1	52.01526	105.5561	291.5632	604.2683	1071.93	3489.523	4413.296	25569.08	27211.12	58.05178	200.9997	388.8513	833.9722	2599.182	4636.589	10770.35	16933.08	63834.34
MMFA1	61.93497	128.2066	334.8865	778.7593	1308.869	4214.814	5303.402	27677.4	33754.47	71.29048	231.0799	442.794	963.7949	2880.881	5235.029	12023.9	19430.46	69217.54

MGMFA1	57.87632	114.2601	308.5257	647.786	1133.128	3641.4	4557.242	25903.26	27844.79	68.39978	226.1175	427.705	862.6576	2656.38	4739.415	10843.61	17059.81	64102.83
MHMFA1	74.10061	129.2476	345.1392	1675.444	2475.085	7270.572	13403.23	53293.51	61321.23	85.40895	324.0596	530.3071	2256.753	5905.659	8696.047	26062.63	41080.09	127949.4
MMMINFA2	140.6754	224.1209	531.1582	1760.251	2681.791	7510.403	12515.07	49170.43	56839.41	134.7139	446.185	720.107	2234.259	5709.047	8570.862	24051.8	38007.44	117563
MMMAXFA2	58.01013	84.53533	171.0101	473.6468	606.8545	1279.524	2632.824	11524.36	10695.42	42.07355	138.6852	184.0257	592.5514	1365.611	1655.932	6862.051	8113.07	20441.93
MMMIDFA2	72.29674	105.0029	224.3286	493.9051	646.9907	1378.449	2649.022	11557.52	10800.02	49.169	164.0683	234.719	601.4759	1386.55	1698.363	6874.447	8125.647	20495.45
MMMFA2	120.842	210.561	496.4274	1545.126	2354.08	6900.24	9781.149	36646.63	54231.14	121.232	362.1023	621.5572	1612.223	4001.24	7146.579	16825.22	28288.7	81679.2
MMGMFA2	110.0387	179.7854	418.6793	1085.942	1642.87	4503.607	5285.739	19528.83	27596.2	116.0034	347.7448	578.4155	1022.802	2371.368	4033.043	8365.75	11030.12	28519.82
MMHMFA2	137.2754	213.3571	514.491	1904.488	2896.092	8165.932	13668.21	53935.85	62470.16	135.0484	459.2095	733.0332	2425.572	6211.11	9269.673	26238.38	41455.15	128707.6
MMMINFA1	74.49063	116.369	254.6945	926.3007	1337.255	3408.852	6414.794	25178.81	26055.51	74.00069	258.9077	389.1764	1288.598	3214.338	4702.531	14351.62	21510.83	63764.46
MMMAXFA1	39.31211	62.07715	113.3711	456.3443	572.888	1195.729	2617.958	11493.88	10598.5	35.34301	113.3553	133.3356	584.7291	1347.339	1619.443	6850.683	8101.452	20392.67
MMMIDFA1	40.42901	63.26142	116.3448	457.3471	574.8282	1200.602	2618.876	11495.76	10604.59	35.76875	114.9379	136.4509	585.2653	1348.59	1621.923	6851.488	8102.278	20396.17
MMMFA1	51.85936	94.42374	196.0318	650.9062	896.0233	2400.476	3698.171	14732.72	21286.43	54.18927	157.6413	239.1753	742.6314	1745.776	2735.387	8458.029	11736.44	30749.83
MMGMFA1	47.18579	74.90278	146.0582	503.318	654.1725	1431.098	2786.391	11951.33	11550.73	50.21477	150.4758	209.8173	619.517	1425.316	1795.858	6937.687	8266.634	20840.94
MMHMFA1	65.79168	96.42248	217.5453	1665.314	2424.891	7132.559	13399.98	53274.86	61283.8	72.34402	287.7154	406.3116	2249.474	5883.721	8610.748	26060.62	41074.68	127936.4
SMINFA2	141.405	224.8376	531.985	1770.951	2692.757	7527.938	12583.87	49470.79	56961.36	135.399	448.0564	721.51	2243.067	5731.05	8587.623	24209.78	38177.16	117878.7
SMAXFA2	75.03256	103.6882	203.5019	764.1262	947.0764	2013.586	4777.832	19901.23	14667.42	60.33906	189.8869	231.9508	828.9488	2011.774	2213.598	10900.81	12880.19	29495.81
SMIDFA2	86.08649	120.7921	250.6432	780.0965	980.986	2102.936	4791.054	19930.57	14768.53	65.80772	210.5541	277.7569	836.379	2029.611	2254.341	10911.18	12891.53	29546.46
SMFA2	124.3587	212.2613	498.6117	1587.564	2397.837	6952.92	10276.61	39070.59	54464.5	123.5255	374.0627	628.6268	1687.255	4218.447	7238.334	18452.52	29655	84626.18
SGMFA2	115.5582	184.6552	425.704	1225.388	1791.816	4802.102	6797.85	26002.95	29954.49	119.0722	361.8537	588.7659	1183.526	2844.895	4375.223	12075.56	15303.92	36755.2
SHMFA2	138.2597	214.8574	516.0009	1904.665	2896.417	8166.146	13668.22	53935.89	62470.19	135.6728	460.0109	733.7967	2425.631	6211.174	9269.76	26238.38	41455.17	128707.6
SMINFA1	87.77635	130.3122	277.5479	1104.636	1540.263	3854.405	7653.502	30254.97	28569.63	85.07214	287.8763	416.8465	1408.105	3549.888	4983.798	16591.01	23956.22	68367.32

SMAXFA1	60.07831	84.44383	151.3669	749.9609	916.9855	1935.747	4765.591	19873.87	14572.85	55.09418	168.8647	185.4019	822.3678	1995.941	2177.906	10891.25	12869.69	29449.04
SMIDFA1	61.00123	85.51732	154.2073	750.8147	918.7782	1940.369	4766.351	19875.58	14578.89	55.43182	170.2225	188.3467	822.822	1997.036	2180.359	10891.93	12870.44	29452.37
SMFA1	70.20636	111.9544	225.6309	898.8815	1183.15	2989.469	5598.416	22396.99	24291.19	69.67773	205.33	281.7745	952.0255	2327.029	3202.212	12146.02	15881.16	38737.08
SGMFA1	66.48842	95.58466	181.3126	787.4055	986.959	2149.855	4900.546	20260.78	15480.91	66.61341	199.5007	255.2858	851.2729	2062.185	2346.231	10963.45	13016.43	29870.05
SHMFA1	80.417	113.7333	245.0199	1687.386	2460.659	7169.266	13404.85	53282.8	61290.78	83.73612	311.124	430.5309	2257.175	5893.677	8623.416	26061.95	41077.63	127938.3
LTSMINFA2	142.6803	227.5796	537.4491	1789.503	2720.044	7598.675	12720.84	50206.75	57532.34	137.6811	455.3968	729.3206	2276.583	5827.321	8691.478	24609.03	38741.85	119311
LTSMAXFA2	92.71254	144.36	315.2544	1033.961	1439.1	3628.777	6912.837	30591.12	27604.71	92.21387	298.3549	408.4688	1370.24	3543.795	4556.489	15978.79	22456.84	58761.33
LTSMIDFA2	100.7388	155.46	344.7398	1044.845	1463.959	3692.685	6921.92	30612.1	27676	95.26618	310.5435	435.9393	1374.512	3554.71	4582.442	15985.58	22464.01	58797.16
LTSMFA2	129.1226	217.9193	511.1203	1642.354	2486.976	7133.157	10919.51	43045.23	55489.71	129.5547	407.1653	660.0859	1892.547	4849.499	7704.322	20746.39	32846.43	95035.91
LTSGMFA2	122.4416	198.0984	458.435	1365.175	2042.147	5553.832	8338.451	34648.5	37838.87	126.6761	399.7075	632.4512	1575.758	4037.651	5861.798	16723.21	23919.5	63502.16
LTSHMFA2	140.0373	219.7028	524.5825	1905.253	2897.59	8167.381	13668.3	53936.04	62470.47	137.8652	463.6893	739.0526	2426.049	6211.746	9270.716	26238.44	41455.29	128707.7
LTSMINFA1	101.968	161.6714	361.6159	1275.442	1863.175	4896.446	8963.209	37378.16	36908.27	106.2073	355.7502	520.8441	1713.972	4451.276	6236.643	19560.53	29213.03	84075.56
LTSMAXFA1	81.85264	131.9235	281.743	1024.231	1416.797	3571.829	6904.429	30571.48	27537.97	89.29892	285.7714	380.0904	1366.387	3534.038	4533.252	15972.51	22450.17	58728.14
LTSMIDFA1	82.52231	132.6198	283.6664	1024.825	1418.136	3575.257	6904.951	30572.71	27542.2	89.48693	286.5956	381.947	1366.656	3534.715	4534.87	15972.96	22450.65	58730.5
LTSMFA1	89.20963	149.7167	329.1049	1126.933	1609.6	4304.269	7481.609	32288.12	34052.75	97.43917	307.4726	438.3522	1439.818	3732.825	5154.148	16767.37	24265.45	64770.05
LTSGMFA1	86.50924	139.1199	301.2571	1049.824	1468.317	3725.839	6997.16	30844.42	28170.91	95.71764	304.0388	422.4616	1382.957	3574.505	4639.689	16019.62	22542.3	59022.88
LTSHMFA1	96.4422	150.6075	340.6995	1721.819	2532.754	7298.475	13418.89	53313.71	61336.56	105.5544	367.1625	529.3069	2287.321	5941.689	8710.541	26070.57	41095.93	127955.1
LMSMINFA2	143.9625	229.6059	541.5109	1807.404	2746.398	7656.93	12848.34	50741.45	57932.73	141.3214	464.6794	741.9126	2330.134	5970.915	8873.27	25206.18	39747	121945.2
LMSMAXFA2	104.6436	164.7177	349.6233	1210.71	1805.878	4481.318	8545.741	35580.82	33734.92	117.5189	381.3006	552.1642	1873.654	4879.674	6585.733	21107.64	32235.36	89476.69
LMSMIDFA2	110.7302	173.1136	375.0844	1219.335	1823.342	4532.416	8552.54	35596.67	33788.41	119.0379	387.1491	567.1126	1875.466	4884.547	6599.676	21110.72	32238.27	89494.32
LMSMFA2	132.8814	221.6346	518.6781	1688.744	2562.381	7262.736	11459.23	45092.97	56160.79	136.9061	437.3179	696.7235	2124.292	5486.128	8282.967	23254.87	36894.51	108003.7

LMS GMFA2	*127.5725*	*205.8413*	*473.3189*	*1470.917*	*2231.795*	*5991.945*	*9587.323*	*38662.08*	*41747.12*	*135.368*	*433.2624*	*679.7113*	*1967.083*	*5105.125*	*7271.041*	*21436.19*	*32878.6*	*91789.6*
LMS HMFA2	*141.8359*	*223.1309*	*530.0637*	*1906.146*	*2899.092*	*8169.187*	*13668.45*	*53936.33*	*62470.76*	*141.4074*	*469.8746*	*749.0886*	*2427.762*	*6214.262*	*9275.852*	*26238.93*	*41456.22*	*128708.5*
LMS MINFA1	*111.6702*	*177.8241*	*389.6974*	*1400.767*	*2103.498*	*5476.541*	*10036.53*	*40740.49*	*41009*	*124.6058*	*409.9558*	*614.401*	*2034.456*	*5298.604*	*7471.716*	*22708.19*	*35252.69*	*102240.5*
LMS MAXFA1	*96.61146*	*155.3294*	*321.2769*	*1202.982*	*1790.008*	*4435.391*	*8539.435*	*35565.98*	*33684.83*	*116.0647*	*375.3575*	*536.7695*	*1872.027*	*4875.311*	*6573.071*	*21104.79*	*32232.67*	*89460.35*
LMS MIDFA1	*97.09946*	*155.8513*	*322.851*	*1203.461*	*1790.98*	*4438.174*	*8539.829*	*35566.91*	*33688.04*	*116.16*	*375.7547*	*537.7947*	*1872.14*	*4875.614*	*6573.959*	*21104.99*	*32232.86*	*89461.52*
LMS MFA1	*102.0225*	*168.7669*	*361.5636*	*1284.228*	*1924.95*	*5013.757*	*8965.988*	*36868.36*	*38751.74*	*120.1281*	*385.6609*	*568.4336*	*1904.013*	*4964.66*	*6897.939*	*21455.63*	*33034.05*	*92414.44*
LMS GMFA1	*100.0211*	*160.7586*	*337.6341*	*1223.281*	*1826.393*	*4558.804*	*8608.681*	*35772.51*	*34163.02*	*119.2637*	*384.0086*	*559.758*	*1879.071*	*4893.383*	*6630*	*21126.09*	*32270.51*	*89605.06*
LMS HMFA1	*107.6139*	*169.4915*	*371.4204*	*1750.612*	*2598.164*	*7397.792*	*13435.38*	*53352.33*	*61377.01*	*124.5298*	*417.3252*	*620.9072*	*2337.594*	*6033.927*	*8884.521*	*26102.62*	*41162.44*	*128035.3*
LAD MINFA2	*139.9865*	*222.9182*	*529.0012*	*1750.22*	*2669.813*	*7486.723*	*12456.27*	*48874.28*	*56612.36*	*133.8422*	*443.5986*	*717.4955*	*2220.243*	*5676.692*	*8536.088*	*23828.98*	*37815.94*	*117069.4*
LAD MAXFA2	*28.8023*	*31.11779*	*71.2158*	*20.02965*	*27.21173*	*59.05004*	*55.88032*	*134.9959*	*44.74157*	*7.761906*	*29.49058*	*57.00387*	*11.94701*	*20.1601*	*132.3757*	*185.8573*	*68.5542*	*137.1952*
LAD MIDFA2	*50.19543*	*62.02199*	*143.9254*	*38.6859*	*62.86359*	*129.0498*	*61.97503*	*146.6154*	*68.88888*	*17.2553*	*63.83497*	*119.2221*	*18.10853*	*32.19048*	*155.1468*	*191.3724*	*71.49493*	*148.9219*
LAD MFA2	*116.7481*	*207.395*	*490.6124*	*1495.709*	*2295.434*	*6824.235*	*9225.404*	*33473.72*	*53757.97*	*117.8854*	*340.8394*	*606.5079*	*1426.831*	*3528.721*	*6897.341*	*14196.44*	*26057.05*	*74607.23*
LAD GMFA2	*103.0294*	*169.1286*	*399.1702*	*877.587*	*1389.928*	*3985.726*	*3257.328*	*9777.147*	*20529.2*	*111.3412*	*321.9394*	*555.3609*	*578.533*	*1235.101*	*2944.634*	*2002.819*	*3175.643*	*7911.121*
LAD HMFA2	*135.9281*	*210.1785*	*509.9748*	*1904.345*	*2895.816*	*8165.658*	*13668.19*	*53935.83*	*62470.12*	*134.2751*	*458.1975*	*731.5653*	*2425.509*	*6211.041*	*9269.539*	*26238.37*	*41455.14*	*128707.6*
LAD MINFA1	*53.43803*	*79.23748*	*185.6024*	*646.2712*	*973.6682*	*2593.95*	*4784.686*	*17659.56*	*18446.64*	*53.39978*	*199.1407*	*318.3907*	*964.3635*	*2425.102*	*3813.533*	*10581.86*	*17066.93*	*51724.14*
LAD MAXFA1	*2.276675*	*2.004822*	*3.389115*	*8.231962*	*5.87603*	*18.76773*	*50.2364*	*123.0601*	*20.94465*	*0.991569*	*1.98608*	*6.688906*	*8.121996*	*13.08666*	*118.8785*	*180.7713*	*65.63932*	*125.7158*
LAD MIDFA1	*3.612082*	*3.196531*	*6.295351*	*9.07705*	*7.360883*	*22.15668*	*50.87966*	*124.5896*	*24.8042*	*1.255274*	*3.138845*	*8.852012*	*8.394859*	*13.58754*	*119.9931*	*181.2819*	*65.97519*	*127.2048*
LAD MFA1	*19.58827*	*45.94835*	*105.0661*	*243.6916*	*368.5249*	*1298.689*	*1178.317*	*3476.383*	*11999.17*	*24.40582*	*54.92136*	*124.8646*	*186.1739*	*414.4929*	*1287.463*	*2130.893*	*4081.177*	*10526.02*
LAD GMFA1	*12.73501*	*17.30662*	*38.97349*	*48.68852*	*70.10042*	*174.1492*	*151.2008*	*393.8689*	*438.7755*	*18.72624*	*45.1225*	*88.09267*	*34.48436*	*61.96451*	*228.2514*	*228.9511*	*127.9854*	*272.2386*
LAD HMFA1	*37.27675*	*45.89358*	*126.7461*	*1642.392*	*2380.607*	*7079.848*	*13396.62*	*53268.61*	*61272.6*	*51.1498*	*242.0935*	*342.07*	*2239.272*	*5871.508*	*8587.196*	*26058.87*	*41072.28*	*127934.1*

Table 3: AMSE of the estimators when n = 20 and $\sigma^2_{outlier}$(magnitude of outliers) = 250

	NUMBER OF EXPLANATORY VARIABLES	
	3	*5*

ESTIMATORS	*DEGREES OF MULTICOLLINEARITY*									*DEGREES OF MULTICOLLINEARITY*								
	0.900			*0.990*			*0.999*			*0.900*			*0.990*			*0.999*		
	% OF OUTLIERS			*% OF OUTLIERS*			*% OF OUTLIERS*			*% OF OUTLIERS*			*% OF OUTLIERS*			*% OF OUTLIERS*		
	5%	*10%*	*20%*	*5%*	*10%*	*20%*	*5%*	*10%*	*20%*	*5%*	*10%*	*20%*	*5%*	*10%*	*20%*	*5%*	*10%*	*20%*
OLS	*1771.525*	*2679.818*	*4312.293*	*9613.339*	*27635.54*	*32899.69*	*65319.7*	*237416.3*	*308577.8*	*1397.775*	*2615.23*	*3556.334*	*21400.49*	*23509.84*	*42012.5*	*132156*	*302069.6*	*1064408*
MMINFA2	*1624.537*	*2464.288*	*3971.227*	*8824.347*	*25350.21*	*30387.7*	*60488.01*	*218721.7*	*283887*	*1291.349*	*2424.939*	*3290.393*	*19885.47*	*21724.99*	*38962.87*	*122108*	*279114.9*	*987196.7*
MMAXFA2	*710.3104*	*1257.169*	*1984.948*	*3177.655*	*9032.338*	*16115.32*	*30032.26*	*92470.17*	*126838*	*590.5711*	*1226.001*	*1972.693*	*8527.064*	*9277.926*	*19077.98*	*45851.28*	*121976.5*	*554436.4*
MMIDFA2	*777.3922*	*1398.598*	*2160.813*	*3246.786*	*9192.457*	*16530.66*	*30089.02*	*92740.03*	*127210.8*	*629.9082*	*1342.022*	*2108.898*	*8583.084*	*9398.135*	*19317.1*	*45901.92*	*122061*	*554680.9*
MMFA2	*1558.434*	*2174.227*	*3491.383*	*8198.277*	*21185.78*	*29072.79*	*54243.75*	*190449.4*	*269532.3*	*1076.574*	*2050.871*	*3152.383*	*17836.54*	*18466.77*	*33848.75*	*105456.9*	*222139.9*	*793526.4*
MGMFA2	*1290.247*	*1965.167*	*3105.917*	*5857.947*	*15430.67*	*23843.79*	*38879.5*	*129289.3*	*179816.6*	*1014.635*	*2005.549*	*3002.773*	*11956.35*	*13704.05*	*26014.84*	*54836.35*	*134334.6*	*581141.9*
MHMFA2	*1659.204*	*2461.144*	*3943.173*	*9492.882*	*27389.34*	*32416.85*	*65197.68*	*237165.5*	*308115.3*	*1326.574*	*2474.939*	*3301.341*	*21322.07*	*23342.23*	*41687.99*	*132074.4*	*301908*	*1064064*
MMINFA1	*961.5699*	*1550.85*	*2534.914*	*5052.777*	*14740.07*	*20437.25*	*41071.85*	*137865.2*	*177475.3*	*855.7915*	*1640.616*	*2342.317*	*13344.84*	*14321.43*	*27052.98*	*78417.46*	*187002*	*729152.9*
MMAXFA1	*649.0786*	*1096.383*	*1798.018*	*3116.832*	*8891.044*	*15738.24*	*29979.57*	*92218.18*	*126485.8*	*551.8854*	*1094.134*	*1821.771*	*8477.033*	*9171.388*	*18862.37*	*45804.34*	*121898.1*	*554206.7*
MMIDFA1	*652.3986*	*1105.651*	*1809.129*	*3120.457*	*8899.472*	*15761.95*	*29982.84*	*92234.13*	*126508.9*	*554.4192*	*1103.193*	*1832.272*	*8480.516*	*9178.721*	*18877.5*	*45807.68*	*121903.7*	*554223.7*
MMFA1	*860.5044*	*1265.825*	*2068.034*	*4170.931*	*10727.89*	*18711.41*	*34326*	*108763.8*	*157910.2*	*644.4568*	*1263.138*	*2159.913*	*10548.02*	*10884.81*	*21784.21*	*58109.69*	*138031.8*	*590063.9*
MGMFA1	*710.4701*	*1187.861*	*1933.329*	*3316.231*	*9373.005*	*16441.48*	*30558.95*	*94657.54*	*129756.6*	*619.5427*	*1242.46*	*2044.199*	*8729.681*	*9558.64*	*19508.12*	*46343.31*	*122670.5*	*555919.7*
MHMFA1	*1036.307*	*1514.619*	*2430.238*	*8079.846*	*24291.18*	*27672.59*	*63434.79*	*233328.4*	*301153.8*	*914.5046*	*1713.231*	*2329.871*	*20357.87*	*21433.36*	*38166.17*	*130955.8*	*299695.7*	*1059330*
MMMINFA2	*1617.209*	*2449.348*	*3938.48*	*8807.834*	*25245.17*	*30004.7*	*59725.49*	*216951.9*	*281497.5*	*1284.577*	*2410.901*	*3239.213*	*19742.79*	*21575.35*	*38567.7*	*121566.2*	*276685.9*	*970562*
MMMAXFA2	*545.8444*	*851.5426*	*1104.149*	*2452.118*	*6137.483*	*6534.713*	*16670*	*47841.72*	*48191.06*	*378.0376*	*816.1042*	*856.4136*	*5204.261*	*4733.848*	*6286.144*	*30283.15*	*61006.49*	*146730.4*
MMMIDFA2	*626.0945*	*1051.193*	*1371.284*	*2530.669*	*6330.368*	*7251.918*	*16740.27*	*48155.71*	*48705.1*	*429.5459*	*987.3275*	*1131.552*	*5272.82*	*4893.905*	*6684.138*	*30339.33*	*61120.91*	*147126.2*
MMMFA2	*1544.35*	*2102.758*	*3331.486*	*8144.951*	*20577.59*	*28246.55*	*51278.11*	*181945.8*	*263929.7*	*1026.173*	*1958.7*	*3042.954*	*17248.5*	*17541.77*	*31544.05*	*102569.9*	*203539.5*	*633092.1*
MMGMFA2	*1236.55*	*1833.501*	*2794.487*	*5552.768*	*13837.02*	*20149.85*	*28950.3*	*98480.81*	*133161.4*	*946.2668*	*1900.68*	*2810.719*	*9603.589*	*11013.57*	*18747.37*	*40908.99*	*79089.93*	*197829.1*
MMHMFA2	*1655.01*	*2445.95*	*3908.221*	*9492.531*	*27387.7*	*32401.65*	*65197.19*	*237165.2*	*308114.3*	*1323.71*	*2466.34*	*3259.407*	*21321.72*	*23340.82*	*41683.18*	*132074.4*	*301907.8*	*1064063*
MMMINFA1	*846.5698*	*1266.222*	*1944.733*	*4630.913*	*13015.62*	*14243.83*	*32139.89*	*110510.3*	*129396.4*	*734.5307*	*1412.781*	*1603.564*	*11423.21*	*11886.29*	*20549.73*	*69806.33*	*155079.1*	*502384.2*

MMMAXFA1	473.0011	631.3767	834.5101	2384.216	5969.006	5918.935	16605.23	47554.97	47718.25	328.8765	623.1931	574.8926	5143.502	4596.016	5955.892	30231.21	60901.04	146366.5
MMMIDFA1	476.9204	643.4703	849.1549	2388.215	5978.982	5954.227	16609.24	47572.72	47747.8	332.0247	635.7776	591.831	5147.715	4605.332	5977.403	30234.9	60908.53	146392.3
MMMFA1	725.6263	863.6948	1229.726	3607.566	8195.773	11151.42	22452.85	69669.05	97576.06	448.8397	871.1639	1235.383	7771.546	6983.861	11154.39	44880.72	84567.8	215772.9
MMGMFA1	546.0352	754.9235	1027.11	2610.432	6549.068	7096.298	17336.26	50507.04	52375.08	415.87	840.5248	1000.148	5454.001	5112.155	7014.488	30834.16	61960.28	149194.7
MMHMFA1	939.0282	1218.075	1799.934	8009.933	24084.93	26294.7	63328.8	233241.9	300911.3	822.4084	1496.392	1600.425	20307.53	21261.74	37605.18	130947.9	299667.9	1059267
SMINFA2	1626.165	2459.1	3945.462	8854.028	25352.02	30072.3	60198.05	218019.1	282079.1	1290.9	2423.166	3246.474	19859.88	21657.65	38633.81	122349.8	278024.7	972503.9
SMAXFA2	748.9763	1081.698	1336.905	3607.857	9055.028	8588.966	27143.68	75467.33	69218.1	551.1732	1092.619	1095.147	8345.243	7397.108	9401.547	50545.05	104436.2	210394.7
SMIDFA2	813.0723	1246.637	1577.62	3674.438	9216.666	9244.527	27195.67	75745.82	69723.05	591.5094	1235.655	1339.358	8401.8	7533.482	9779.769	50593.32	104534.5	210775.5
SMFA2	1561.468	2145.294	3368.839	8265.436	21192.01	28401.05	53263.52	187090.9	265338	1068.157	2033.52	3059.974	17739.69	18075.75	32038.14	106556.5	216184.7	655901.2
SGMFA2	1301.738	1909.235	2870.534	6093.873	15456.61	20920.36	36268.89	117229.3	146108.6	1002.225	1985.223	2843.01	11768.28	12602.88	20552.87	58956.65	118839	257515.5
SHMFA2	1660.378	2456.493	3915.773	9493.933	27389.16	32403.93	65197.52	237165.4	308114.5	1326.49	2471.71	3265.315	21322.06	23341.54	41683.78	132074.5	301907.9	1064063
SMINFA1	988.028	1425.908	2095.392	5351.534	14768.65	15567.41	38652.64	127133.8	142748.1	831.3583	1585.022	1755.63	13159.46	13323.48	22150	81067.64	177798.9	535799
SMAXFA1	689.6591	898.6503	1091.517	3548.415	8912.079	8018.683	27095.71	75209.92	68748.63	511.9551	928.4033	836.7224	8294.614	7278.956	9075.784	50500.26	104345.4	210043.1
SMIDFA1	692.9226	909.0592	1105.146	3551.99	8920.629	8051.956	27098.68	75226.07	68778.48	514.5341	939.2881	853.0484	8298.143	7286.972	9097.614	50503.45	104351.8	210068.2
SMFA1	892.0823	1091.709	1450.095	4537.944	10760.94	12775.17	31428.64	93606.75	114342.4	606.577	1138.835	1430.957	10363.84	9280.881	13823.06	62010.6	123097.9	273907.1
SGMFA1	749.1296	1002.073	1267.344	3740.67	9398.73	9102.665	27636.13	77777.36	73254.14	580.822	1113.145	1223.117	8549.35	7718.442	10087.88	51012.72	105244.7	212748.8
SHMFA1	1059.868	1393.282	1963.709	8143.99	24281.95	26550.91	63398.9	233294.4	300962.3	901.1113	1635.315	1748.525	20355.34	21356.24	37697.14	130959.3	299680.7	1059273
LTSMINFA2	1638.924	2481.194	3984.2	8955.226	25622.65	30395.38	60838.03	220067.3	284219.5	1307.865	2457.274	3287.275	20169.14	21948.55	39050.72	124688.7	282462.2	985863.4
LTSMAXFA2	939.3047	1436.975	2127.12	5267.754	13345.97	15197.09	38250.72	110725	121330.6	803.8917	1593.287	1833.501	13238.71	12769.99	19429.63	82990.27	172343.8	498649.9
LTSMIDFA2	987.7917	1555.662	2290.668	5312.864	13474.85	15645.66	38289.9	110958.4	121720.8	828.8664	1679.199	1987.339	13272.96	12854.74	19670.97	83018	172405.8	498914.5
LTSMFA2	1583.464	2226.493	3535.175	8495.648	22347.2	29061.72	55641.7	194895.9	269984.7	1145.051	2186.224	3143.046	18759.2	19396.81	34138.98	114793.7	241100.2	771092.2

LTSGMFA2	1369.444	2044.377	3175.665	6944.627	18089.24	23587.98	44415.88	142124.7	177627.8	1099.187	2154.238	2983.615	15229.69	15877.88	26460.61	87691.87	181150.5	528326.2
LTSHMFA2	1669.592	2479.541	3957.352	9499.725	27395.85	32420.52	65198.34	237166.4	308115.7	1335.981	2492.133	3300.916	21324.35	23346.57	41690.14	132074.9	301908.4	1064064
LTSMINFA1	1121.836	1685.591	2641.075	6439.721	17586.94	19907.46	45947.12	149432.4	175152.7	983.4837	1895.978	2251.926	16031.58	16323.97	27492.74	100068.9	217154	696868.2
LTSMAXFA1	894.4185	1303.983	1956.214	5227.273	13228.91	14799.2	38214.41	110507.4	120966.5	779.829	1495.234	1667.742	13207.78	12693.66	19217.42	82964.51	172286.3	498404.5
LTSMIDFA1	896.9066	1311.85	1966.073	5229.716	13236.03	14822.84	38216.66	110521.1	120989.7	781.4114	1501.975	1678.663	13209.94	12698.97	19231.84	82966.34	172290.4	498422.1
LTSMFA1	1047.985	1444.169	2204.213	5892.454	14647.68	18023.81	41248.16	124665.4	154385.1	838.272	1620.855	2045.182	14419.74	13883.4	22197.29	89391.14	183734	538313.3
LTSGMFA1	939.4204	1379.699	2079.444	5357.581	13617.34	15549.06	38616.2	112612	124402.3	822.2208	1605.511	1914.105	13361.36	12966.69	19865.56	83257.67	172851.5	500263.2
LTSHMFA1	1182.484	1664.39	2543.137	8394.647	24735.5	27620.54	63521.65	233466.3	301211.6	1034.644	1927.248	2245.74	20520.85	21703.35	38268.3	131034.1	299769.6	1059346
LMSMINFA2	1655.637	2502.235	4009.526	9048.572	25871.61	30643.84	61663.81	222611.9	286399.7	1344.94	2516.688	3365.037	20664.57	22451.12	39766.18	127712.9	288575.6	1007804
LMSMAXFA2	1119.06	1659.096	2450.243	6349.492	16473.34	18177.56	44528.11	144922.8	155118.6	1132.94	2127.799	2580.171	17484.41	17601.11	28962.18	108560.5	229051	727178.3
LMSMIDFA2	1155.513	1752.889	2585.665	6382.448	16567.9	18528.02	44559.52	145076	155433.2	1143.571	2164.014	2658.466	17499	17641.9	29089.44	108573.6	229085.1	727334
LMSMFA2	1610.604	2290.581	3620.432	8690.863	23280.15	29501.23	57735.7	203460.4	274190.8	1273.895	2386.599	3277.62	19968.36	21013.67	36756.46	122890.1	264809.6	880275.3
LMSGMFA2	1443.353	2143.096	3317.36	7551.607	20049.78	24929.02	49220.95	166018.7	199413	1255.132	2372.057	3185.584	18334.14	19158.05	32597.73	110676.5	233616.2	744576
LMSHMFA2	1681.109	2501.103	3985.23	9505.719	27404.44	32440.64	65200.88	237169.5	308118.4	1358.255	2533.876	3371.751	21335.72	23368.33	41717.3	132078.5	301913.4	1064067
LMSMINFA1	1255.823	1856.148	2874.286	7190.893	19671.3	21924.78	50387.18	171073.5	197461.9	1208.081	2257.316	2793.955	18692.57	19388.21	33137.98	116161.3	252071.7	838875.5
LMSMAXFA1	1084.515	1556.259	2307.658	6319.862	16389.2	17867.28	44498.75	144779.3	154824	1122.623	2087.409	2495.351	17471.14	17564.56	28848.42	108548.4	229019.3	727034
LMSMIDFA1	1086.484	1562.121	2315.885	6321.652	16394.25	17885.86	44500.6	144788.5	154842.8	1123.311	2090.104	2501.032	17472.07	17567.1	28856.25	108549.3	229021.6	727044.3
LMSMFA1	1200.532	1664.755	2514.193	6800.464	17451.48	20410.4	46815.71	154144.7	181138.6	1147.568	2139.368	2687.963	17982.35	18147.29	30393.52	111427.5	234931.5	750340.3
LMSGMFA1	1119.148	1614.247	2410.565	6415.044	16673.78	18452.42	44816.12	146160.4	157578.3	1140.744	2132.922	2621.178	17536.32	17696.07	29191.16	108685.8	229327.3	728128.8
LMSHMFA1	1301.621	1838.374	2793.036	8605.475	25118.66	28301.1	63732.68	233752.5	301545.7	1223.898	2270.61	2789.039	20837.93	22302.85	39260.38	131272.9	300128.9	1059707
LADMINFA2	1606.618	2436.736	3922.501	8750.52	25119.66	29884.71	59312.34	215805	280491.3	1277.27	2398.813	3230.786	19610.47	21477.92	38445.78	120893.2	275218.7	967345.4

LADMAXFA2	78.89939	285.4678	305.1375	39.47718	83.30682	373.9153	71.70825	92.92327	124.5189	53.25529	243.4796	377.2735	39.35972	56.73762	151.961	70.76858	57.68001	6592.881
LADMIDFA2	192.1963	574.2039	656.1928	95.05545	213.7268	1017.764	88.00644	162.4437	222.613	122.1779	489.2191	711.1542	70.17063	158.5425	432.3649	78.38058	72.1596	6642.403
LADMFA2	1522.034	2029.922	3230.572	7972.718	19571.45	27944.14	48917.5	174431.2	261302.6	962.3468	1851.408	3020.517	16583.34	16733.61	30555.21	98052.43	185667.2	576529.2
LADGMFA2	1123.09	1684.222	2566.854	4468.329	10409.53	18089.85	16371.28	61721.71	100824.6	856.3928	1775.681	2763.259	5881.239	8084.694	14841.77	11760.1	17980.25	50149.56
LADHMFA2	1648.255	2431.117	3887.109	9490.956	27386.26	32398.06	65197	237165	308114	1320.462	2459.878	3250.943	21321.43	23340.09	41682.18	132074.4	301907.8	1064063
LADMINFA1	538.0509	889.3491	1440.188	3087.979	9233.316	10162.42	21255.97	78506.95	95884.98	561.5899	1104.145	1307.019	8551.569	9281.354	17110.39	53361.31	120044.1	414371.9
LADMAXFA1	4.97638	11.66227	13.65062	7.296203	10.55274	31.76554	56.60552	28.85413	28.02888	2.727109	8.342876	95.73119	21.31716	6.534462	11.44199	62.28842	43.31714	6543.959
LADMIDFA1	8.378457	23.95228	27.29772	10.31417	16.88142	52.71783	58.88354	40.38513	46.93309	4.822313	18.92814	107.9471	23.08173	9.801866	19.71947	63.71813	45.80048	6552.642
LADMFA1	346.486	302.6236	467.1021	1529.26	2406.242	5919.069	6667.986	22760.51	54126.76	149.2291	321.5284	841.3144	3196.255	2595.678	5364.744	17347.89	24813.58	69435.61
LADGMFA1	79.14323	153.6328	210.8401	168.8782	407.6715	862.3305	405.8649	1397.337	1971.402	103.2959	277.9079	548.8962	198.5591	345.1358	717.1217	227.3071	321.8285	7174.829
LADHMFA1	673.7163	786.41	1189.554	7813.9	23817.33	25717.22	63280.31	233198.2	300832.5	682.1002	1217.585	1291.25	20259.43	21144.93	37439.66	130939.4	299656	1059258

Table 4: AMSE of the estimators when n = 40 and $\sigma^2_{outlier}$(magnitude of outliers) = 10

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	0.775581	1.750474	2.791644	11.1849	15.99225	37.93588	117.144	136.8288	365.0373	1.064812	2.057815	4.370666	14.15794	24.08038	38.97384	124.5023	274.2108	579.6925
MMINFA2	0.743307	1.679061	2.68124	10.73244	15.3334	36.42773	112.3346	131.2797	349.9646	1.027276	1.982732	4.221955	13.62144	23.16164	37.61519	119.929	263.9342	557.896
MMAXFA2	0.445865	0.928806	1.652534	4.081049	6.459083	16.76717	40.42566	50.83816	153.6442	0.526207	1.106259	2.363625	5.532525	9.710092	17.73103	47.75629	108.8575	255.1471
MMIDFA2	0.513749	1.086392	1.884841	4.244677	6.795759	17.25221	40.57855	51.25138	154.2421	0.598238	1.221654	2.623051	5.747566	9.86132	18.12394	47.85903	109.1733	255.6425
MMFA2	0.72935	1.568537	2.589766	9.850606	14.41161	34.60604	106.927	123.8547	315.9428	0.929651	1.728079	3.935269	11.93924	20.02946	34.92419	106.4259	229.6596	485.6882
MGMFA2	0.675681	1.469758	2.422746	7.944196	12.02613	28.56728	71.06969	89.82988	229.3733	0.947484	1.795522	3.949429	9.735775	16.09296	29.41967	65.78276	144.1375	319.0823
MHMFA2	0.699206	1.602894	2.51588	11.07365	15.80269	37.57708	117.0398	136.6358	364.6534	1.06124	1.948761	4.151987	14.08949	23.95887	38.74107	124.4342	274.0836	579.4477

MMINFA1	*0.447612*	*0.982908*	*1.678032*	*6.168768*	*9.003948*	*22.6173*	*63.3418*	*76.75103*	*216.4567*	*0.658004*	*1.343963*	*2.85032*	*8.678961*	*14.96716*	*25.17018*	*77.11356*	*167.9166*	*373.7793*
MMAXFA1	*0.334002*	*0.671396*	*1.257481*	*3.92911*	*6.141963*	*16.31297*	*40.27926*	*50.44999*	*153.0738*	*0.421433*	*0.922964*	*2.009604*	*5.329478*	*9.571049*	*17.3653*	*47.65809*	*108.5576*	*254.6729*
MMIDFA1	*0.337191*	*0.67925*	*1.269102*	*3.933065*	*6.150143*	*16.325*	*40.28329*	*50.46054*	*153.0896*	*0.424736*	*0.929102*	*2.020181*	*5.335021*	*9.57494*	*17.37551*	*47.66095*	*108.5663*	*254.6867*
MMFA1	*0.414394*	*0.794145*	*1.489634*	*4.718574*	*7.361906*	*19.25707*	*51.57896*	*62.31977*	*172.8086*	*0.495736*	*1.028305*	*2.323903*	*6.311529*	*11.01308*	*20.38183*	*56.4926*	*123.4614*	*286.7545*
MGMFA1	*0.364809*	*0.739243*	*1.362329*	*4.135442*	*6.463991*	*16.95904*	*41.31672*	*52.01561*	*156.0432*	*0.509531*	*1.066713*	*2.336622*	*5.625457*	*9.97333*	*18.17431*	*48.25873*	*109.7201*	*256.902*
MHMFA1	*0.3782*	*0.810521*	*1.40463*	*8.623036*	*11.99216*	*30.06227*	*113.5154*	*130.3447*	*352.01*	*0.560165*	*1.163737*	*2.536143*	*12.32452*	*20.91035*	*33.29966*	*122.2107*	*269.9148*	*571.4293*
MMMINFA2	*0.742732*	*1.677379*	*2.676475*	*10.72277*	*15.31141*	*36.35192*	*112.2308*	*131.1429*	*349.2246*	*1.02642*	*1.978845*	*4.213529*	*13.61089*	*23.12516*	*37.55378*	*119.7949*	*263.5503*	*556.6717*
MMMAXFA2	*0.404582*	*0.794749*	*1.38344*	*2.878444*	*3.909367*	*8.959602*	*29.29625*	*32.26634*	*79.40149*	*0.436113*	*0.821261*	*1.566461*	*4.296727*	*5.867077*	*8.872312*	*33.66004*	*67.2075*	*120.6732*
MMMIDFA2	*0.485345*	*0.989373*	*1.665982*	*3.073197*	*4.360953*	*9.676788*	*29.47511*	*32.76229*	*80.18764*	*0.52479*	*0.979939*	*1.974665*	*4.559806*	*6.064852*	*9.473938*	*33.78192*	*67.59584*	*121.3342*
MMMFA2	*0.728195*	*1.558576*	*2.574727*	*9.777859*	*14.29604*	*34.27184*	*106.5103*	*123.1592*	*309.2878*	*0.920436*	*1.671131*	*3.872959*	*11.79918*	*19.47926*	*34.42449*	*104.8452*	*224.2065*	*466.8354*
MMGMFA2	*0.67066*	*1.447675*	*2.376851*	*7.593574*	*11.41467*	*26.46001*	*65.80187*	*82.57071*	*190.2577*	*0.940338*	*1.757136*	*3.890733*	*9.299617*	*14.41354*	*27.0249*	*56.15482*	*113.8282*	*218.6265*
MMHMFA2	*0.696137*	*1.596251*	*2.488788*	*11.07303*	*15.80088*	*37.57293*	*117.0397*	*136.6356*	*364.653*	*1.004397*	*1.942868*	*4.137776*	*14.08933*	*23.95834*	*38.73945*	*124.4341*	*274.0835*	*579.4476*
MMMINFA1	*0.406666*	*0.861553*	*1.374595*	*5.443613*	*7.407497*	*17.84025*	*56.67577*	*65.77823*	*171.154*	*0.598329*	*1.149566*	*2.327587*	*8.070598*	*12.91807*	*20.6759*	*70.01615*	*145.3717*	*302.7025*
MMMAXFA1	*0.275624*	*0.491966*	*0.788439*	*2.704081*	*3.510186*	*8.317309*	*29.12548*	*31.80793*	*78.66089*	*0.311971*	*0.578454*	*1.026703*	*4.0396*	*5.691223*	*8.344779*	*33.54431*	*66.84296*	*120.0523*
MMMIDFA1	*0.27884*	*0.500118*	*0.802903*	*2.708472*	*3.51977*	*8.333658*	*29.13018*	*31.82028*	*78.68109*	*0.315456*	*0.585795*	*1.040994*	*4.060384*	*5.696012*	*8.358762*	*33.54767*	*66.85348*	*120.0702*
MMMFA1	*0.367086*	*0.630868*	*1.106412*	*3.651385*	*5.139256*	*12.73159*	*42.64467*	*46.93111*	*106.4143*	*0.398857*	*0.715396*	*1.503861*	*5.250334*	*7.616504*	*13.09464*	*44.5874*	*86.31289*	*168.6172*
MMGMFA1	*0.309058*	*0.566517*	*0.927468*	*2.942661*	*3.915823*	*9.240804*	*30.34464*	*33.69544*	*82.60188*	*0.415687*	*0.767371*	*1.523896*	*4.410144*	*6.213557*	*9.552511*	*34.26229*	*68.27667*	*123.0599*
MMHMFA1	*0.324957*	*0.656613*	*0.990548*	*8.39197*	*11.38821*	*28.56689*	*113.4636*	*130.1611*	*351.5129*	*0.478494*	*0.917302*	*1.854923*	*12.23285*	*20.61507*	*32.4636*	*122.1845*	*269.8565*	*571.2846*
SMINFA2	*0.743933*	*1.679312*	*2.678335*	*10.74367*	*15.33611*	*36.37829*	*112.4815*	*131.2896*	*349.4122*	*1.027891*	*1.982639*	*4.216341*	*13.63484*	*23.16804*	*37.57884*	*120.02*	*263.9024*	*557.1199*
SMAXFA2	*0.457746*	*0.908896*	*1.433397*	*4.590334*	*6.218786*	*11.66113*	*49.83459*	*48.36465*	*105.398*	*0.551452*	*1.041929*	*1.854106*	*6.230926*	*9.733441*	*11.93885*	*50.48886*	*103.1879*	*174.8084*
SMIDFA2	*0.523082*	*1.073248*	*1.735497*	*4.744749*	*6.578997*	*12.28061*	*49.96428*	*48.78152*	*106.0982*	*0.619019*	*1.166918*	*2.205248*	*6.420495*	*9.887442*	*12.46356*	*50.58845*	*103.5071*	*175.3989*

SMFA2	*0.730459*	*1.56891*	*2.580431*	*9.914671*	*14.41965*	*34.38664*	*107.4594*	*123.8695*	*311.2626*	*0.933995*	*1.719121*	*3.894062*	*12.05647*	*20.06957*	*34.61164*	*107.1338*	*228.9226*	*474.0449*
SGMFA2	*0.678998*	*1.469211*	*2.393448*	*8.167817*	*12.02832*	*27.17143*	*76.14607*	*89.06841*	*203.881*	*0.951054*	*1.790318*	*3.9106*	*10.02248*	*16.15318*	*27.8581*	*68.12534*	*139.6105*	*259.164*
SHMFA2	*0.701367*	*1.603142*	*2.497244*	*11.07431*	*15.80288*	*37.57437*	*117.0399*	*136.6358*	*364.6531*	*1.007396*	*1.948502*	*4.142651*	*14.08974*	*23.95901*	*38.74009*	*124.4342*	*274.0836*	*579.4476*
SMINFA1	*0.459414*	*0.965195*	*1.466866*	*6.546693*	*8.926022*	*19.44818*	*69.53604*	*75.36634*	*187.0744*	*0.675481*	*1.301038*	*2.511628*	*9.054596*	*15.02971*	*22.21317*	*79.09039*	*164.4288*	*331.1862*
SMAXFA1	*0.358659*	*0.655995*	*0.926406*	*4.450908*	*5.889988*	*11.11005*	*49.7107*	*47.97437*	*104.7425*	*0.457463*	*0.851484*	*1.391463*	*6.056387*	*9.592393*	*11.47179*	*50.39379*	*102.8858*	*174.2507*
SMIDFA1	*0.360849*	*0.66241*	*0.939384*	*4.454427*	*5.898127*	*11.12401*	*49.71411*	*47.98501*	*104.7603*	*0.460083*	*0.857343*	*1.403984*	*6.060993*	*9.596325*	*11.48435*	*50.39656*	*102.8945*	*174.2669*
SMFA1	*0.427936*	*0.770986*	*1.218982*	*5.195013*	*7.187414*	*14.94347*	*59.44553*	*60.2156*	*129.7936*	*0.523176*	*0.95895*	*1.800529*	*6.921501*	*11.05907*	*15.5955*	*59.05348*	*118.1981*	*216.2411*
SGMFA1	*0.382928*	*0.717011*	*1.053472*	*4.641416*	*6.223997*	*11.90363*	*50.59391*	*49.55614*	*108.2662*	*0.535943*	*0.999644*	*1.81767*	*6.312601*	*10.00162*	*12.5318*	*50.97692*	*104.0617*	*176.9298*
SHMFA1	*0.395249*	*0.793665*	*1.108807*	*8.753422*	*11.95937*	*29.08316*	*113.5955*	*130.3537*	*351.6417*	*0.584344*	*1.11251*	*2.103455*	*12.41396*	*20.94259*	*32.77404*	*122.2319*	*269.9168*	*571.337*
LTSMINFA2	*0.74586*	*1.683459*	*2.684927*	*10.76624*	*15.37251*	*36.46856*	*112.7478*	*131.5985*	*350.2706*	*1.030667*	*1.987033*	*4.224917*	*13.66814*	*23.22958*	*37.65336*	*120.3667*	*264.625*	*558.4637*
LTSMAXFA2	*0.519553*	*1.081657*	*1.712684*	*5.668607*	*8.147873*	*18.30976*	*61.1889*	*66.33725*	*173.5034*	*0.669986*	*1.205545*	*2.427498*	*7.868198*	*12.87561*	*18.20905*	*65.97238*	*137.0558*	*266.0475*
LTSMIDFA2	*0.568833*	*1.203317*	*1.935358*	*5.792091*	*8.41942*	*18.75539*	*61.29163*	*66.65894*	*173.9954*	*0.719346*	*1.304729*	*2.676733*	*8.0054*	*12.99262*	*18.58109*	*66.04983*	*137.2938*	*266.4906*
LTSMFA2	*0.733947*	*1.588093*	*2.598927*	*10.03521*	*14.5704*	*34.74638*	*108.2604*	*125.1057*	*318.3908*	*0.954062*	*1.758805*	*3.948293*	*12.34223*	*20.67582*	*35.08751*	*109.5929*	*235.4222*	*488.9735*
LTSGMFA2	*0.690628*	*1.506605*	*2.443009*	*8.574635*	*12.61254*	*29.18436*	*82.08812*	*97.26859*	*240.3693*	*0.967424*	*1.819069*	*3.961949*	*10.73107*	*17.70065*	*29.72983*	*79.29932*	*164.7746*	*326.343*
LTSHMFA2	*0.709048*	*1.615969*	*2.526709*	*11.07612*	*15.80658*	*37.58017*	*117.0401*	*136.6363*	*364.6537*	*1.012371*	*1.955903*	*4.157686*	*14.09048*	*23.9603*	*38.74254*	*124.4343*	*274.0837*	*579.4478*
LTSMINFA1	*0.520805*	*1.123253*	*1.737195*	*7.248075*	*10.19579*	*23.73934*	*76.78327*	*86.81198*	*228.8226*	*0.760777*	*1.413021*	*2.896591*	*9.978511*	*16.86492*	*25.50786*	*87.64943*	*184.134*	*379.367*
LTSMAXFA1	*0.44614*	*0.894097*	*1.340113*	*5.556476*	*7.896558*	*17.90357*	*61.09074*	*66.03539*	*173.0385*	*0.602182*	*1.057644*	*2.097788*	*7.739406*	*12.76879*	*17.86899*	*65.89826*	*136.8309*	*265.6258*
LTSMIDFA1	*0.447678*	*0.898813*	*1.349999*	*5.559331*	*7.90286*	*17.91406*	*61.09343*	*66.04358*	*173.0511*	*0.60406*	*1.062166*	*2.107073*	*7.742896*	*12.77176*	*17.87836*	*65.90042*	*136.8374*	*265.6381*
LTSMFA1	*0.49723*	*0.9796*	*1.556073*	*6.153039*	*8.877086*	*20.62433*	*68.77244*	*75.35333*	*190.0324*	*0.64945*	*1.140717*	*2.389623*	*8.368896*	*13.88478*	*20.76998*	*72.45343*	*148.3651*	*295.5658*
LTSGMFA1	*0.463752*	*0.939446*	*1.434894*	*5.709476*	*8.151815*	*18.48515*	*61.78982*	*67.2547*	*175.4988*	*0.65871*	*1.172413*	*2.401739*	*7.927413*	*13.07951*	*18.62911*	*66.35036*	*137.7079*	*267.6261*
LTSHMFA1	*0.472854*	*0.993459*	*1.473418*	*9.050062*	*12.55332*	*30.51383*	*113.7658*	*130.7121*	*352.2447*	*0.69211*	*1.266379*	*2.604178*	*12.61967*	*21.32198*	*33.56832*	*122.3218*	*270.0554*	*571.5289*

LMS MINFA2	0.746339	1.684832	2.686085	10.77287	15.38108	36.49276	112.8332	131.6283	350.4642	1.031732	1.989354	4.227604	13.69403	23.2646	37.67388	120.4315	264.8831	559.1134
LMS MAXFA2	0.535237	1.123336	1.758418	6.126933	8.534353	19.38931	62.80832	67.80828	180.3656	0.703472	1.297865	2.500731	8.902128	13.78972	19.22784	68.18362	152.1714	290.5042
LMS MIDFA2	0.580042	1.236033	1.968399	6.235618	8.797855	19.81295	62.90802	68.10802	180.8449	0.747822	1.385497	2.740134	9.018464	13.89252	19.58355	68.25698	152.3861	290.9159
LMS MFA2	0.734788	1.593946	2.601984	10.07095	14.60442	34.83555	108.4985	125.2253	319.3335	0.960268	1.781144	3.961659	12.5398	20.90823	35.19702	109.9746	237.7919	494.6557
LMS GMFA2	0.693342	1.51747	2.451161	8.715184	12.74286	29.57615	83.04535	97.81428	244.0833	0.972599	1.835016	3.974731	11.22853	18.14652	30.11646	80.73543	176.0963	346.1079
LMS HMFA2	0.711069	1.619938	2.533079	11.07665	15.80739	37.58194	117.0402	136.6364	364.6539	1.014261	1.959517	4.161857	14.09107	23.96128	38.7434	124.4343	274.0838	579.4479
LMS MINFA1	0.536367	1.161881	1.781497	7.521793	10.47813	24.47669	77.85913	87.52015	233.0692	0.785006	1.479757	2.951902	10.62972	17.36966	26.14951	88.72722	192.7111	394.6141
LMS MAXFA1	0.470627	0.949355	1.410542	6.027635	8.28482	18.99725	62.71279	67.52753	179.9108	0.642206	1.164158	2.187687	8.7134	13.69482	18.90472	68.11331	151.9673	290.1125
LMS MIDFA1	0.471871	0.953729	1.4195	6.030176	8.291237	19.00751	62.71542	67.53512	179.9232	0.643904	1.168332	2.196307	8.794373	13.69748	18.91356	68.11536	151.9733	290.1239
LMS MFA1	0.51517	1.028687	1.611231	6.552918	9.235727	21.56773	70.08179	76.36417	196.1803	0.684968	1.239735	2.464463	9.323338	14.67138	21.67456	74.26306	162.0211	317.834
LMS GMFA1	0.485552	0.99142	1.497929	6.162941	8.53821	19.55657	63.3888	68.66453	182.3009	0.693317	1.268239	2.47606	8.952465	13.96849	19.62952	68.54082	152.7574	291.9716
LMS HMFA1	0.493853	1.040644	1.534694	9.145233	12.66463	30.82113	113.8211	130.7951	352.4044	0.722759	1.344189	2.671146	12.74677	21.49724	33.72519	122.3459	270.1146	571.6264
LAD MINFA2	0.742132	1.676185	2.674302	10.71795	15.3033	36.32644	112.1802	131.0443	348.9344	1.025923	1.977445	4.211177	13.60089	23.1121	37.5308	119.7402	263.3882	556.2442
LAD MAXFA2	0.360846	0.664553	1.068284	2.299382	2.544875	4.467944	22.02542	17.42283	35.26684	0.369127	0.638733	1.137806	2.988403	3.894594	4.1729	24.88439	38.98783	56.92649
LAD MIDFA2	0.455734	0.900852	1.495157	2.519052	3.06962	5.285149	22.20847	17.94694	36.07876	0.471503	0.829661	1.64168	3.278356	4.117658	4.865299	25.0125	39.40891	57.6284
LAD MFA2	0.726997	1.551122	2.567215	9.744394	14.25011	34.14495	106.3027	122.6404	306.1902	0.914574	1.643299	3.85176	11.64259	19.24599	34.21283	104.0398	221.2754	459.2077
LAD GMFA2	0.665518	1.430403	2.350571	7.446691	11.13964	25.4371	62.62054	76.69137	168.2734	0.935849	1.739464	3.870922	8.764587	13.62858	25.84171	49.88595	93.65929	172.0456
LAD HMFA2	0.692661	1.590356	2.471417	11.07266	15.80013	37.57155	117.0397	136.6355	364.6528	1.003279	1.940219	4.132648	14.08922	23.95814	38.73888	124.4341	274.0835	579.4476
LAD MINFA1	0.363308	0.746267	1.116294	5.139946	6.613221	15.18254	52.48892	56.76887	145.295	0.555846	1.033056	2.071057	7.321209	11.94334	18.31868	65.48489	130.8986	270.6235
LAD MAXFA1	0.21084	0.295387	0.341382	2.104394	2.092536	3.784653	21.85209	16.94884	34.52341	0.225943	0.347825	0.477976	2.732269	3.700729	3.593125	24.76327	38.59737	56.2762
LAD MIDFA1	0.214297	0.304301	0.358509	2.109243	2.103042	3.800945	21.85683	16.96146	34.54345	0.229863	0.356178	0.493844	2.738706	3.705906	3.607812	24.76678	38.60856	56.29485

LADMFA1	0.316538	0.462255	0.758071	3.169011	3.97941	8.949034	36.75766	34.28898	66.85526	0.325978	0.511007	1.06004	4.056594	5.902604	9.187574	36.92027	61.1098	112.9177
LADGMFA1	0.248461	0.383014	0.518403	2.371749	2.552326	4.783969	23.1158	18.9568	38.68417	0.345474	0.57374	1.084937	3.112561	4.287072	4.956983	25.52199	40.15725	59.49964
LADHMFA1	0.266736	0.488565	0.5928	8.272077	11.09745	27.8732	113.4333	130.039	351.3216	0.417857	0.756138	1.482654	12.1566	20.49248	32.11267	122.1735	269.8311	571.2379

Table 5: AMSE of the estimators when n = 40 and $\sigma^2_{outlier}$(magnitude of outliers) = 100

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	69.77781	112.5374	295.1251	676.0155	3203.249	2495.643	5789.747	16484.54	35413.41	129.7487	169.4741	325.553	991.3006	1785.619	3365.475	13513.33	22454.33	47946.82
MMINFA2	66.9233	107.4639	283.3556	647.7955	3065.431	2393.237	5545.05	15800.27	33960.12	124.8711	163.4929	314.1539	953.0774	1722.671	3247.351	12999.34	21638.64	46159.47
MMAXFA2	39.61717	76.18051	182.0661	215.1539	1003.27	1047.446	1504.461	5107.556	14086.08	47.33354	90.18819	161.1143	321.0492	624.5571	1462.23	3759.018	7044.433	19271.36
MMIDFA2	47.14306	86.70028	210.1254	228.1781	1034.261	1084.279	1524.893	5157.849	14139.99	55.90886	106.3109	183.8568	334.7155	639.281	1499.791	3772.319	7060.38	19311.52
MMFA2	63.67287	107.0544	276.2531	606.5785	2640.913	2324.882	5340.314	14994.2	31234.65	114.8896	153.3508	289.3837	838.4738	1543.263	2999.633	11112.15	19269.14	39398.9
MGMFA2	60.15658	101.2136	260.2649	485.6154	2033.164	1910.115	3652.806	10435.71	22038.59	113.0564	155.6562	294.0438	683.3642	1253.304	2549.969	5733.575	10479.77	24914.38
MHMFA2	62.08643	99.48376	267.4746	666.6309	3185.794	2459.028	5780.943	16465.6	35378.11	124.2506	159.7258	306.6553	985.2793	1775.203	3343.244	13507.94	22443.45	47924.32
MMINFA1	37.33323	61.89906	170.7838	350.7649	1678.896	1427.329	2773.287	8537.959	20423.32	70.78818	100.5095	200.1185	559.1727	1073.892	2133.742	7540.651	13210.54	29793.78
MMAXFA1	24.20615	46.35586	123.995	203.1622	975.3142	1013.63	1485.499	5060.524	14034.66	37.33987	62.14081	129.7888	308.5339	611.0402	1427.638	3746.346	7029.177	19232.9
MMIDFA1	24.68204	47.35869	125.7685	203.4709	976.0294	1014.512	1486.012	5061.803	14036.08	37.60675	63.02702	130.6996	308.8746	611.4188	1428.597	3746.715	7029.623	19234.02
MMFA1	30.31526	60.74221	153.3614	266.62	1152.783	1269.223	2212.911	6726.737	16305.33	49.63328	77.56678	154.0586	379.4958	753.8793	1683.215	4739.485	9033.643	21765.92
MGMFA1	27.52257	52.23784	137.3046	218.3219	1025.353	1060.699	1562.197	5257.885	14325.27	48.05866	80.5068	158.3587	331.7473	651.8353	1502.553	3808.879	7138.897	19425.4
MHMFA1	28.32067	51.10498	141.7067	475.802	2710.643	1807.302	5488.718	15830.91	34202.56	64.81082	84.45895	169.6998	833.8303	1514.338	2836.853	13328.72	22084.64	47186.75
MMMINFA2	66.87853	107.2641	282.7614	647.277	3061.903	2388.059	5543.308	15785.5	33891.13	124.8026	163.3037	313.6515	952.5394	1720.576	3240.707	12992.7	21617.43	46076.27
MMMAXFA2	37.11085	69.40964	150.965	166.9968	604.0319	435.4148	1215.167	3181.994	5553.456	40.34164	73.53801	100.3662	250.6856	357.7367	621.3744	2902.369	4105.044	7022.9

MMMIDFA2	45.46494	82.84671	190.4092	181.0697	640.7882	490.6953	1239.649	3240.206	5627.545	49.94467	94.58892	135.3356	266.3701	375.6598	681.2468	2916.2	4122.687	7078.701
MMMFA2	63.48656	106.8227	274.8254	603.9247	2592.28	2311.075	5334.964	14930.81	30721.13	114.4112	152.1719	284.8806	832.3081	1519.233	2945.795	11012.43	19008.7	37800.9
MMGMFA2	59.73671	100.3161	255.9527	471.4132	1866.168	1774.782	3576.415	9699.697	17941.07	112.4765	154.7629	290.559	663.8792	1166.238	2332.949	5117.305	8339.468	16267.55
MMHMFA2	61.86075	98.34319	264.7319	666.5806	3185.74	2458.35	5780.94	16465.58	35378.07	124.1736	159.3058	305.4532	985.2637	1775.158	3343.038	13507.94	22443.45	47924.31
MMMINFA1	34.57924	50.57521	134.7856	319.0386	1429.254	1042.027	2636.017	7396.266	15467.12	66.54139	87.07061	160.1063	525.2631	938.781	1707.502	7127.257	11726.86	23902.1
MMMAXFA1	20.2914	29.89447	68.48676	154.5105	571.0881	388.6674	1192.291	3128.386	5484.485	29.33815	36.2857	53.50191	236.9305	342.1629	569.5478	2889.317	4088.308	6970.797
MMMIDFA1	20.78941	31.20324	70.80262	154.8213	571.9273	389.8011	1192.912	3129.83	5486.356	29.61402	37.41149	54.72929	237.2881	342.5808	570.8978	2889.695	4088.794	6972.298
MMMFA1	26.85257	49.03199	109.6625	223.7466	782.855	786.6969	2023.311	5160.992	8982.978	42.91619	56.75332	89.52482	318.7022	523.6861	983.9025	3996.569	6537.308	11100.01
MMGMFA1	23.82022	37.66962	86.69228	170.387	630.2023	454.953	1283.978	3357.896	5892.068	41.15314	60.6825	96.12792	262.9357	391.3714	685.7236	2954.772	4211.321	7242.987
MMHMFA1	24.8357	36.19492	93.20448	462.1027	2676.625	1627.075	5485.381	15818.58	34157.46	59.6203	65.79528	114.2406	826.4805	1490.403	2743.033	13327.95	22081.08	47172.74
SMINFA2	66.98079	107.4456	282.9815	648.5898	3066.658	2389.962	5552.894	15808.04	33912.74	125.0119	163.5114	313.857	954.9717	1722.94	3242.658	13021.02	21644.25	46108.73
SMAXFA2	41.72782	74.97609	164.5449	280.4591	1125	692.1798	2119.306	5726.205	8954.178	60.57766	91.05544	127.7208	410.1185	630.7331	969.6589	5638.038	7527.282	12613.63
SMIDFA2	48.56083	86.07395	198.8518	290.994	1153.736	739.8956	2137.663	5774.504	9021.123	67.41904	107.0985	157.1194	421.4712	644.7137	1019.64	5648.504	7542.411	12664.54
SMFA2	63.87695	107.0326	275.3699	610.3341	2654.337	2316.276	5363.036	15023.37	30891.91	115.8916	153.4591	286.7875	853.4519	1544.545	2963.494	11396.05	19309.41	38512.34
SGMFA2	60.56893	101.1033	257.6734	504.1672	2077.442	1829.783	3911.075	10686.29	19463.95	114.2732	155.7389	292.0271	719.7972	1254.565	2411.835	7172.117	10758.77	20370.09
SHMFA2	62.37552	99.32173	265.7403	666.7266	3185.818	2458.575	5780.955	16465.6	35378.09	124.4027	159.7393	305.9292	985.325	1775.215	3343.103	13507.94	22443.45	47924.32
SMINFA1	39.66537	59.74418	150.5864	391.1364	1746.851	1203.119	3185.088	8911.123	17336.86	79.2708	101.3447	177.9955	613.033	1074.868	1871.911	8574.744	13378.13	26713.82
SMAXFA1	27.86262	43.18918	92.92073	270.7558	1098.442	650.4779	2102.094	5680.585	8890.932	52.4435	62.64072	87.6714	399.9314	618.1514	925.2126	5628.051	7512.794	12565.58
SMIDFA1	28.28995	44.23675	95.01744	271.006	1099.138	651.5205	2102.562	5681.834	8892.663	52.66768	63.54644	88.77886	400.2036	618.4988	926.4013	5628.342	7513.217	12566.98
SMFA1	33.34916	58.5058	128.9429	322.1841	1262.225	989.1219	2722.344	7231.529	11856.68	62.41754	78.35617	118.5885	459.2268	756.5674	1268.405	6400.238	9393.749	16068.86
SGMFA1	30.84071	49.40891	109.0463	283.0209	1145.515	709.163	2170.809	5869.588	9254.746	61.15839	81.32739	124.1533	418.9939	656.7672	1023.351	5677.202	7616.707	12811.97

SHMFA1	*31.58354*	*48.19467*	*114.4987*	*495.7159*	*2722.307*	*1698.135*	*5498.667*	*15838.48*	*34172.01*	*74.12433*	*84.83526*	*139.0814*	*846.8484*	*1517.323*	*2777.555*	*13331.21*	*22086*	*47177.51*
LTSMINFA2	*67.11249*	*107.7531*	*283.7032*	*650.3557*	*3074.261*	*2396.352*	*5564.063*	*15843.24*	*34017.54*	*125.3383*	*163.8175*	*314.4879*	*957.7507*	*1726.835*	*3248.935*	*13056.78*	*21694.41*	*46211.07*
LTSMAXFA2	*46.49095*	*81.35869*	*191.6716*	*350.4765*	*1623.419*	*1180.675*	*2899.663*	*8021.902*	*16928.76*	*75.1645*	*105.294*	*173.9391*	*555.4201*	*890.8003*	*1531.877*	*7214.376*	*11058.01*	*20961.84*
LTSMIDFA2	*51.81294*	*89.99942*	*216.855*	*358.6613*	*1643.934*	*1213.324*	*2913.7*	*8059.378*	*16974.95*	*80.24374*	*117.4702*	*194.4266*	*563.9762*	*900.7762*	*1567.267*	*7222.196*	*11068.79*	*20999.39*
LTSMFA2	*64.34047*	*107.3829*	*277.0137*	*617.0338*	*2731.27*	*2332.316*	*5393.411*	*15149.75*	*31545.7*	*117.6123*	*154.9443*	*291.3463*	*875.4285*	*1575.428*	*3007.674*	*11703.52*	*19728.79*	*39935.12*
LTSGMFA2	*61.51096*	*102.2367*	*262.2356*	*528.7785*	*2300.333*	*1957.822*	*4217.33*	*11701.4*	*23633.77*	*116.2913*	*156.9131*	*295.6602*	*776.8632*	*1346.781*	*2572.068*	*8366.707*	*13320.61*	*26428.45*
LTSHMFA2	*63.01584*	*100.7418*	*268.8969*	*666.9727*	*3185.966*	*2459.473*	*5780.977*	*16465.64*	*35378.16*	*124.7636*	*160.4559*	*307.3328*	*985.4211*	*1775.343*	*3343.352*	*13507.95*	*22443.46*	*47924.33*
LTSMINFA1	*44.8931*	*69.79136*	*181.5757*	*437.5028*	*2064.151*	*1524.87*	*3675.486*	*10380.48*	*22271.1*	*89.11875*	*113.0611*	*209.2426*	*701.2758*	*1210.849*	*2171.883*	*9455.003*	*15214.67*	*31037.34*
LTSMAXFA1	*35.60386*	*57.35383*	*140.0822*	*342.9308*	*1604.442*	*1151.691*	*2886.333*	*7986.184*	*16884.67*	*69.15385*	*84.4917*	*146.4593*	*547.5237*	*881.6735*	*1499.724*	*7206.902*	*11047.66*	*20926.11*
LTSMIDFA1	*35.95257*	*58.14985*	*141.6351*	*343.1259*	*1604.939*	*1152.425*	*2886.699*	*7987.177*	*16885.88*	*69.31856*	*85.15652*	*147.2408*	*547.74*	*881.9288*	*1500.602*	*7207.12*	*11047.96*	*20927.15*
LTSMFA1	*39.9794*	*68.86042*	*166.0345*	*382.9908*	*1721.191*	*1381.204*	*3339.174*	*9146.175*	*18806.45*	*76.52804*	*95.90848*	*167.6599*	*591.7682*	*979.6431*	*1741.722*	*7782.026*	*12355.95*	*23388.47*
LTSGMFA1	*38.00033*	*62.04043*	*151.7915*	*352.4664*	*1638.067*	*1192.339*	*2938.707*	*8132.49*	*17133.2*	*75.59471*	*98.08551*	*171.4817*	*562.1219*	*909.311*	*1569.88*	*7243.595*	*11121.36*	*21106.88*
LTSHMFA1	*38.50346*	*61.12393*	*155.7811*	*522.5745*	*2781.559*	*1859.874*	*5515.188*	*15869.18*	*34239.1*	*85.26927*	*101.3428*	*182.2774*	*868.2147*	*1552.812*	*2856.966*	*13336.64*	*22097*	*47195.41*
LMSMINFA2	*67.16874*	*107.8337*	*283.8985*	*650.8044*	*3075.633*	*2397.334*	*5565.799*	*15853.33*	*34033.86*	*125.4399*	*163.9687*	*314.6743*	*958.1757*	*1728.654*	*3251.822*	*13062.11*	*21710.29*	*46235.61*
LMSMAXFA2	*48.12654*	*82.502*	*196.1795*	*374.2918*	*1697.167*	*1223.343*	*2990.414*	*8343.897*	*17674.94*	*78.37381*	*110.865*	*185.173*	*581.3446*	*966.2135*	*1632.197*	*7461.745*	*11691.97*	*22107.38*
LMSMIDFA2	*52.99188*	*90.75047*	*220.0776*	*381.9045*	*1716.472*	*1254.72*	*3003.6*	*8377.671*	*17718.27*	*83.16645*	*121.7755*	*203.9407*	*589.2513*	*975.7149*	*1664.899*	*7469.45*	*11701.92*	*22143.13*
LMSMFA2	*64.53166*	*107.4735*	*277.4245*	*618.9494*	*2743.431*	*2334.361*	*5398.069*	*15178.79*	*31630.01*	*118.0774*	*155.6451*	*292.6191*	*877.9587*	*1589.63*	*3022.429*	*11746.22*	*19835.75*	*40169.26*
LMSGMFA2	*61.88875*	*102.4927*	*263.2459*	*537.254*	*2333.466*	*1968.055*	*4259.169*	*11857.19*	*24033.42*	*116.8311*	*157.4717*	*296.6802*	*784.4631*	*1386.791*	*2610.541*	*8566.167*	*13831.47*	*27223.07*
LMSHMFA2	*63.23358*	*101.0471*	*269.6233*	*667.0326*	*3186.001*	*2459.661*	*5780.98*	*16465.66*	*35378.17*	*124.874*	*160.7314*	*307.7033*	*985.4662*	*1775.4*	*3343.475*	*13507.95*	*22443.47*	*47924.34*
LMSMINFA1	*46.66217*	*71.48608*	*186.5996*	*454.1797*	*2111.118*	*1550.306*	*3737.731*	*10587.23*	*22730.11*	*91.48801*	*117.8283*	*217.4057*	*714.4856*	*1265.633*	*2230.79*	*9602.415*	*15605*	*31611.91*
LMSMAXFA1	*38.11679*	*59.60037*	*147.2009*	*367.1742*	*1679.366*	*1194.771*	*2977.975*	*8312.067*	*17633.52*	*72.66515*	*92.13184*	*159.4026*	*574.0317*	*957.623*	*1602.241*	*7454.359*	*11682.42*	*22073.25*

LMSMIDFA1	38.43648	60.36927	148.6771	367.3607	1679.83	1195.511	2978.315	8312.941	17634.66	72.82567	92.726	160.1474	574.2317	957.8611	1603.066	7454.575	11682.7	22074.25
LMSMFA1	42.14555	70.5998	171.8502	404.3343	1789.2	1413.739	3413.211	9402.828	19436.48	79.66184	102.4217	179.3607	614.7265	1051.409	1826.187	8007.332	12920.03	24369.58
LMSGMFA1	40.32194	64.099	158.327	376.149	1710.948	1234.611	3027.259	8444.351	17866.48	78.78028	104.3835	182.9027	587.5405	983.8896	1667.31	7490.435	11750.67	22244.89
LMSHMFA1	40.70918	63.22206	162.1274	529.9151	2792.37	1875.852	5517.461	15879.87	34251.29	87.75905	106.9783	191.9348	872.4704	1563.862	2877.699	13337.97	22100.65	47200.61
LADMINFA2	66.79264	107.1049	282.4835	646.502	3058.897	2386.268	5537.088	15769.05	33862.41	124.6585	163.1603	313.4697	951.1844	1719.055	3237.845	12978.03	21598.04	46042.36
LADMAXFA2	27.66218	60.09283	118.6565	12.66696	21.3217	27.05919	28.07618	32.1566	19.41381	13.86992	49.87897	55.34433	15.81956	9.852745	28.54996	60.05906	28.11763	17.31905
LADMIDFA2	40.06984	78.26567	172.7073	28.26545	52.76417	77.32602	40.50259	58.48911	40.71137	27.19884	79.00596	100.9908	33.20758	24.57929	81.68806	66.07406	32.92277	31.98781
LADMFA2	63.09287	106.6363	274.0882	599.2042	2539.728	2305.867	5314.264	14853.06	30461.18	113.1554	151.1179	282.8785	812.3159	1495.992	2916.628	10717.28	18715.11	36915.33
LADGMFA2	58.75714	99.49109	253.2897	436.5143	1636.073	1701.132	3153.908	8467.128	14910.22	110.9074	153.9898	289.0609	590.9996	1058.022	2182.712	2811.772	5101.075	10359.31
LADHMFA2	61.01939	96.80339	262.4681	666.4959	3185.695	2458.113	5780.933	16465.57	35378.06	124.007	158.9054	304.8942	985.2363	1775.126	3342.966	13507.94	22443.44	47924.31
LADMINFA1	23.717	32.41188	95.51006	223.6609	1052.211	774.0101	1846.813	5345.012	11684.79	50.67341	68.70755	133.0367	395.1539	756.5223	1376.617	5581.998	9554.959	19864.26
LADMAXFA1	1.489015	2.270544	2.931348	3.27784	3.37115	1.528381	19.29098	14.97516	5.728753	0.91103	1.202265	0.946314	5.123901	2.112593	1.34575	55.35524	24.53881	8.303695
LADMIDFA1	2.104597	3.934268	5.6502	3.455881	3.835467	2.181061	19.6719	15.93344	6.787844	1.090772	2.148317	1.756035	5.306638	2.259856	1.811443	55.51596	24.69147	8.785069
LADMFA1	11.32832	30.06746	58.91642	85.37015	209.256	438.0066	979.1476	2273.212	3391.289	17.38721	26.39916	41.32713	101.6209	201.117	435.9845	1305.811	2756.514	4126.423
LADGMFA1	6.502273	12.92107	25.98878	16.10997	42.94756	43.1693	70.5777	134.4375	173.7667	14.97191	31.86221	49.84317	29.15823	40.10892	86.14209	88.12972	73.16472	103.0974
LADHMFA1	6.873422	8.605551	29.32818	425.2674	2639.382	1521.128	5476.821	15804.31	34139.87	41.12552	37.8002	70.16983	808.8251	1467.373	2694.81	13326.41	22078.06	47168.14

Table 6: AMSE of the estimators when n = 40 and $\sigma^2_{outlier}$(magnitude of outliers) = 250

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	374.0549	982.4739	2041.234	5597.808	10961.25	18687.53	66509.36	108120.6	157058.7	465.8116	929.9351	2218.028	5497.319	12817.35	22723.94	68555.5	174245.9	326077.3
MMINFA2	359.0695	942.4458	1959.547	5359.071	10500.79	17924.49	63684.43	103651.6	150630.2	449.1817	897.2181	2139.884	5300.378	12327.37	21914.72	66121.81	167861.9	314194.5

MMAXFA2	205.6322	449.0254	1153.965	1763.693	3576.09	7334.506	19561.22	35222.85	61038	192.1464	494.7565	1154.819	1620.635	4225.911	9393.056	19925.54	55801.42	135762
MMIDFA2	246.2277	531.2962	1330.836	1861.625	3776.287	7639.457	19662.98	35474.09	61338.24	228.5383	588.499	1315.482	1720.138	4353.755	9740.063	19992.79	55949.44	135937.4
MMFA2	336.4028	889.5204	1858.027	4763.587	9877.612	16774.41	54666.99	94448.91	140880.2	418.2255	840.8956	1972.242	4773.439	10633.93	19926.63	59903.6	147919.9	275609.2
MGMFA2	319.0992	811.1911	1743.087	3818.057	7904.29	13731.44	35537.49	65225.65	100132.6	421.3174	858.6962	1999.823	3946.072	8437.659	16706.26	32801.29	81960.15	173323.5
MHMFA2	328.7708	887.7145	1853.613	5545.101	10843.59	18467.94	66461.22	108011.4	156830.7	435.1155	869.0482	2090.54	5463.123	12746.07	22585.69	68520.42	174169.3	325937.7
MMINFA1	199.3149	530.0412	1195.093	2868.29	5683.969	10554.44	34693.17	58171.05	89607.18	266.1353	544.9159	1386.234	3093.058	7467.731	14229.54	39499.78	101423.2	206265.2
MMAXFA1	127.2985	342.6578	854.7056	1674.065	3391.771	7051.243	19465.54	34989.18	60753.09	145.4886	325.4555	914.2149	1531.422	4110.014	9069.204	19861.64	55660.06	135593.4
MMIDFA1	129.6754	345.3384	863.472	1676.318	3396.546	7058.593	19468.15	34995.51	60760.9	146.7746	330.7224	921.545	1533.789	4113.183	9078.027	19863.5	55664.18	135598.3
MMFA1	155.3197	423.1752	1006.622	2015.779	4406.706	8510.52	23307.83	42873.78	72605.79	193.5401	412.1456	1079.146	2030.858	5032.264	10812.57	26581.01	68977.37	154442.5
MGMFA1	143.9269	377.5533	932.4932	1777.974	3625.87	7410.119	20056.24	36089.59	62208.39	197.2542	436.96	1104.382	1691.869	4386.808	9589.105	20250.1	56474.43	136789
MHMFA1	146.7626	413.638	985.1734	4310.872	8222.437	14014.07	64804.81	104343.4	149481.6	207.0549	435.4698	1177.272	4590.333	10922.61	19281	67363.77	171638.4	321359.9
MMMINFA2	358.8917	941.4288	1955.518	5355.985	10488.96	17892.43	63638.2	103530.1	150310.4	448.9615	896.2379	2135.898	5297.635	12312.66	21872.89	66077.42	167717.9	313524
MMMAXFA2	195.2679	398.1377	851.9588	1389.59	2061.124	3066.744	14734.13	21851.92	24450.71	170.1345	417.1176	743.9183	1272.249	2649.339	3761.442	14324.1	32671.01	45615.04
MMMIDFA2	239.1253	490.1671	1118.282	1506.005	2310.369	3502.737	14843.07	22148.59	24836.72	210.332	534.3424	995.2092	1383.308	2806.922	4290.916	14399.7	32845.48	45857.59
MMMFA2	335.436	885.4725	1839.18	4733.532	9818.365	16585.98	54065.93	93499.99	139078.3	416.7632	834.8117	1937.724	4746.117	10429.95	19489.68	59491.07	145964.2	265295.1
MMGMFA2	317.2366	800.7553	1696.583	3712.843	7530.278	12632.46	32692.14	58686.71	83493.55	420.0156	854.5974	1972.074	3854.311	7829.003	15025.57	29097.57	66230.96	106601.1
MMHMFA2	327.5359	883.7311	1836.106	5544.889	10842.83	18465.3	66461.21	108011.4	156830.3	434.5453	866.3878	2081.899	5463.049	12745.79	22584.69	68520.41	174169.3	325937.6
MMMINFA1	188.4586	488.7636	914.1958	2661.484	4763.177	7953.273	31733.04	49925.04	67610.82	251.8144	480.1357	1104.313	2917.814	6654.194	11297.65	36746.36	90638.87	160266.9
MMMAXFA1	111.9877	278.9294	413.9344	1283.151	1844.091	2689.456	14632.3	21575.82	24094.06	119.2624	200.2828	367.6586	1174.626	2510.016	3298.409	14252.42	32505.95	45384.58
MMMIDFA1	114.5015	281.9607	425.5809	1285.803	1849.41	2698.61	14635.07	21583.3	24103.69	120.5944	206.9897	378.1205	1177.162	2513.738	3310.095	14254.5	32510.74	45391.28
MMMFA1	141.4407	369.2204	630.4303	1687.666	3119.079	4809.759	18864.14	31008.91	41449.57	171.6734	311.8892	624.2377	1732.858	3655.444	5971.797	21952.35	49547.43	75467.3

MMGMFA1	129.4429	318.1593	521.9816	1406.598	2122.287	3172.907	15268.2	22875.36	25998.88	175.7749	343.6805	664.2163	1351.646	2847.978	4058.5	14690.02	33475	47069.31
MMHMFA1	133.0508	359.2558	606.687	4235.98	7920.983	13055.08	64789.17	104266	149080.3	186.7681	341.6711	781.6578	4554.868	10784.99	18749.38	67355.27	171613.9	321267.4
SMINFA2	359.4268	942.9207	1957.123	5366.229	10504.98	17905.95	63734.63	103700.1	150414.5	449.7483	897.4925	2137.429	5307.057	12326.02	21891.2	66168.84	167924.4	313755.4
SMAXFA2	223.8239	486.1199	983.7882	2206.821	3707.979	5056.776	22457.63	37981.48	39577.11	235.6711	516.9229	928.262	2271.739	4402.117	6620.409	26091.54	58933.6	82454.63
SMIDFA2	258.4742	561.1456	1210.5	2295.225	3904.834	5429.893	22550.71	38224.76	39930.98	264.3105	604.2174	1138.762	2352.513	4523.644	7055.614	26150.3	59073.16	82674.61
SMFA2	338.1634	891.817	1846.891	4821.106	9892.802	16667.91	55137.78	94727.13	139721	421.4807	842.5346	1951.87	4835.01	10632.73	19689.76	60362.31	148406.9	269175.7
SGMFA2	322.3839	817.7475	1716.008	3993.348	7960.112	13132.5	37090.55	66508.97	90387.82	424.2411	859.8028	1983.351	4142.083	8466.858	15832.14	36967.02	84121.44	133622.8
SHMFA2	330.7696	889.5432	1843.06	5545.432	10843.92	18466.35	66461.24	108011.5	156830.4	436.6078	869.6902	2085.185	5463.314	12746.07	22585.13	68520.43	174169.3	325937.7
SMINFA1	218.4511	560.0064	1036.695	3176.008	5783.733	9158.541	36297.8	59731.96	76817.6	294.2179	563.6667	1230.336	3452.051	7521.428	12738.32	42617.48	103021.7	178639.3
SMAXFA1	156.4142	385.3645	605.3173	2125.684	3528.956	4726.456	22369.39	37752.81	39247.48	198.9783	356.2877	609.3834	2197.984	4292.482	6220.774	26035.57	58800.57	82244.36
SMIDFA1	158.5198	388.0544	615.8475	2127.717	3533.532	4734.65	22371.81	37759.04	39256.42	199.998	361.3945	618.7052	2199.977	4295.467	6231.469	26037.2	58804.45	82250.49
SMFA1	180.8763	462.2593	794.7563	2433.101	4527.025	6531.274	25801.69	45185.7	54475.99	236.7645	439.3348	827.905	2602.105	5172.01	8411.907	31735.38	71578.72	107672.6
SGMFA1	171.015	419.4099	700.9968	2219.746	3756.804	5148.158	22905.87	38813.67	40984.1	239.6791	462.7567	861.4545	2329.646	4555.12	6865.827	26373.88	59569.85	83757.79
SHMFA1	172.9969	452.1733	771.2762	4406.07	8270.689	13479.11	64825.78	104376.6	149208.1	247.5421	459.4345	957.2726	4666.474	10933.74	19000.14	67375.03	171647.6	321296.9
LTSMINFA2	360.2477	944.974	1962.119	5381.65	10533.83	17949.97	63910.93	103963.1	150795.9	450.8746	899.5886	2141.617	5318.592	12359.83	21942.07	66320.2	168331.8	314479.6
LTSMAXFA2	252.0174	568.1482	1235.443	2875.931	5420.088	8514.969	33094.01	54824.01	68776.76	286.183	598.7021	1241.833	2998.939	6358.192	10494.9	34867.42	84340.66	144118.1
LTSMIDFA2	278.3678	627.1098	1392.98	2945.214	5560.233	8778.077	33161.37	55000.95	69047.4	307.3007	664.6953	1387.055	3056.688	6448.427	10801.26	34913.07	84449.3	144281
LTSMFA2	341.7419	899.5266	1867.605	4918.668	10009.67	16886.66	56825.87	96321.45	141631	427.0805	852.4783	1983.611	4918.017	10975.8	20089.87	61363.44	152036.9	277719.8
LTSGMFA2	328.6532	836.361	1762.819	4256.687	8503.782	14161.03	43492.29	74994.21	104502.9	429.3291	866.9454	2009.275	4371.917	9339.688	17123.58	43015.22	103336.8	179546.5
LTSHMFA2	335.1408	897.8906	1864.174	5546.431	10846.26	18470.58	66461.31	108011.7	156831	439.2776	875.016	2094.327	5463.758	12746.89	22586.68	68520.48	174169.4	325937.8
LTSMINFA1	247.9559	626.204	1272	3623.701	6910.162	11343.42	42926.64	70172.9	94934.76	329.4799	633.9037	1450.794	3852.116	8642.398	14852.77	47316.46	117423.2	211150.9

LTSMAXFA1	200.5728	492.8099	974.2868	2811.231	5294.058	8273.122	33029.95	54656.59	68521.13	259.1627	479.1686	1020.967	2945.371	6274.557	10211.33	34823.76	84236.83	143961.7
LTSMIDFA1	202.2529	494.7157	981.5679	2812.881	5297.243	8279.345	33031.7	54661.25	68528.12	259.9206	483.0559	1027.719	2946.844	6276.891	10219	34825.03	84239.86	143966.2
LTSMFA1	219.5231	549.781	1105.209	3052.314	6005.838	9538.204	35478.85	59946.55	79382.2	286.9875	540.9002	1172.93	3234.501	6921.808	11757.1	39092.08	93934.47	161629.8
LTSGMFA1	211.9807	517.5026	1040.512	2886.109	5454.759	8579.997	33417.1	55426.7	69836.4	289.1326	558.2755	1195.96	3040.38	6471.602	10667.75	35085.43	84834.14	145072.6
LTSHMFA1	213.2626	543.8456	1088.13	4575.922	8725.102	14403.34	64894.13	104558.9	149685.3	294.8011	556.5657	1259.253	4778.796	11185.12	19499.52	67415.96	171724	321405.8
LMSMINFA2	360.2732	945.9968	1963.149	5385.337	10539.52	17955.75	63983.43	104063.8	150867.2	451.4618	900.4536	2142.807	5324.336	12367.5	21962.78	66382.38	168370.2	314723.2
LMSMAXFA2	251.5201	606.1371	1284.141	3094.956	5825.681	8803.226	35085.53	55501.71	73945.15	300.7442	625.5882	1265.348	3243.211	6605.396	11494.38	37412.96	85131.58	159361.9
LMSMIDFA2	278.0295	659.2659	1427.51	3155.085	5958.043	9055.164	35150.42	55684.42	74193.49	320.0635	684.7804	1406.415	3295.1	6690.967	11773.19	37454.32	85230.71	159511.1
LMSMFA2	341.7488	903.3019	1871.525	4944.839	10034.36	16912.89	57316.4	96663.6	141976.1	429.3138	856.0427	1989.266	4951.366	11028.77	20226.5	61711.17	152084.9	280336.1
LMSGMFA2	328.6058	845.5259	1771.488	4333.038	8632.764	14259.56	44955.27	75717.59	106842.3	431.3918	869.5767	2014.194	4458.216	9452.062	17502.97	44763.28	102776.3	191600.6
LMSHMFA2	335.2884	901.0486	1868.198	5546.743	10846.7	18471.24	66461.36	108011.8	156831.1	440.4498	876.924	2096.606	5464.006	12747.12	22587.33	68520.5	174169.4	325937.8
LMSMINFA1	247.4307	658.4579	1317.271	3757.592	7190.177	11528.04	44429.55	70930.88	97932.24	340.2801	657.1328	1468.641	3998.685	8781.297	15435.8	48692.83	116765.4	220103.3
LMSMAXFA1	199.6614	534.936	1048.171	3038.449	5703.741	8573.042	35024.06	55328.3	73709.81	276.0493	518.231	1054.284	3194.975	6525.95	11233.01	37373.38	85036.67	159218.6
LMSMIDFA1	201.3431	536.8248	1054.944	3039.907	5706.886	8578.931	35025.74	55333.09	73716.25	276.7351	521.7542	1060.544	3196.302	6528.169	11240.17	37374.54	85039.44	159222.8
LMSMFA1	218.7568	589.2571	1166.695	3248.438	6370.033	9785.789	37402.79	60701.59	83602.21	301.4813	573.8264	1198.869	3453.897	7139.149	12636.52	41215.54	93863.97	175345.3
LMSGMFA1	211.1413	558.9498	1108.504	3103.791	5858.644	8865.404	35398.26	56121.88	74914.5	303.4461	589.3932	1221.051	3280.463	6712.927	11651.95	37610.29	85580.61	160236.1
LMSHMFA1	212.333	581.2744	1152.134	4628.22	8820.416	14505.32	64923.64	104627.6	149775.7	308.0964	587.2663	1284.287	4821.296	11230.1	19657.99	67431.85	171736.6	321445.5
LADMINFA2	358.4386	939.8719	1953.943	5348.833	10479.39	17879.62	63552.85	103401.7	150185.5	448.4174	895.4463	2134.474	5291.774	12299.1	21858.53	66008.21	167562	313321.2
LADMAXFA2	141.0576	174.8023	593.4052	80.2582	125.3337	220.6302	52.54941	73.59976	68.62252	67.12918	287.5866	445.7067	66.98899	71.48964	280.9476	35.56532	28.80158	24.11572
LADMIDFA2	207.6499	324.072	956.8145	208.6896	359.2017	627.9362	90.26109	179.7062	174.8102	128.0394	450.4445	771.9129	185.0564	211.2238	793.3266	52.36856	61.2801	56.07789
LADMFA2	332.6212	877.3911	1830.63	4648.035	9764.538	16499.9	52600.83	92327.53	138228.3	412.5034	828.8244	1922.249	4674.799	10158.61	19297.42	58654.33	143347.5	260979.3

LADGMFA2	311.2918	774.3622	1672.293	3339.18	7094.772	11985.73	23629.8	48020.59	71557.09	416.2754	850.7813	1960.027	3562.588	6800.829	14066.55	18499.69	40311.33	67829.76
LADHMFA2	321.3501	874.3303	1823.751	5544.538	10842.22	18464.26	66461.18	108011.3	156830.2	432.8565	863.6244	2077.932	5462.901	12745.57	22584.37	68520.4	174169.3	325937.6
LADMINFA1	130.1803	321.825	679.8174	1839.843	3508.957	6151.018	22248.15	35930.01	50960.33	190.3091	375.7331	912.751	2294.098	5203.771	9423.489	29066.72	72919.87	134529.8
LADMAXFA1	4.065486	3.506942	11.00304	4.365842	4.653199	7.369823	28.55544	11.86756	8.503233	1.3413	4.132444	5.603217	3.897901	2.406464	5.030832	24.6091	9.874913	4.378453
LADMIDFA1	7.555319	6.436853	23.00254	6.113983	7.594507	13.0283	30.19052	17.14448	14.22397	2.220821	9.568069	12.97046	4.933666	3.681261	9.254924	25.24445	11.23746	6.375406
LADMFA1	51.56419	127.9905	282.8711	441.2267	1327.583	2146.666	4364.543	9924.965	17260.28	69.44085	139.9723	291.8592	639.2318	1223.843	2744.608	8698.464	18299.27	29806.15
LADGMFA1	31.12981	49.57086	135.8228	97.1677	176.496	309.5756	346.9086	609.4892	751.3369	75.61958	184.2768	342.9223	148.7907	253.0856	555.393	169.4371	290.1851	430.5142
LADHMFA1	26.16947	96.20336	207.751	4040.122	7581.16	12494.45	64761.17	104184.5	148923.3	88.83494	174.0426	476.0784	4461.865	10623.98	18510.92	67343.17	171593.4	321242.3

Table 7: AMSE of the estimators when n = 100 and $\sigma^2_{outlier}$(magnitude of outliers) = 10

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10%	20%	5%	10%	20%	5%	10%	20%	5%	10%	20%	5%	10%	20%	5%	10%	20%
OLS	0.439532	0.585625	1.293693	2.988969	5.951319	14.20516	38.31908	58.30165	155.2995	0.355797	0.694243	1.558113	4.526178	8.665079	16.04088	51.07222	80.21277	186.2218
MMINFA2	0.432464	0.576257	1.273079	2.939841	5.855588	13.97541	37.67625	57.34968	152.7156	0.35083	0.684828	1.536874	4.463287	8.539679	15.82342	50.35976	79.07451	183.4841
MMAXFA2	0.288532	0.421117	0.93653	1.286969	2.511124	6.291079	13.15131	20.41994	62.42368	0.254361	0.452311	1.008147	1.769234	3.400889	6.891367	18.055	28.27784	76.35895
MMIDFA2	0.329628	0.473059	1.045207	1.468644	2.798956	6.886731	13.33765	20.78144	63.19459	0.286816	0.519032	1.14797	1.920608	3.69173	7.369967	18.22186	28.51642	76.78377
MMFA2	0.424608	0.568522	1.249743	2.875757	5.704316	13.56922	36.50813	55.98662	148.172	0.344239	0.667567	1.494718	4.279237	8.082898	15.34325	47.9924	75.54302	172.0747
MGMFA2	0.408396	0.550922	1.213028	2.632824	5.173362	12.28494	29.01214	45.61463	120.3876	0.349164	0.677501	1.515622	4.012783	7.568379	14.3997	35.92422	57.5543	129.6995
MHMFA2	0.405135	0.530011	1.181033	2.951489	5.883561	14.07201	38.27596	58.22781	155.1496	0.334039	0.655479	1.4781	4.501372	8.617198	15.95516	51.04831	80.16713	186.1298
MMINFA1	0.259567	0.346839	0.793577	1.643402	3.353074	8.193088	20.65081	31.82983	89.46331	0.21536	0.426013	0.983336	2.73777	5.23899	10.01442	31.05684	48.11289	117.0039
MMAXFA1	0.192693	0.259871	0.601597	1.083372	2.199685	5.656719	12.97522	20.08262	61.68621	0.146559	0.274862	0.670901	1.614259	3.093081	6.405654	17.89685	28.0504	75.95117
MMIDFA1	0.194033	0.262547	0.607466	1.085263	2.2026	5.662773	12.977	20.08599	61.69371	0.148439	0.277712	0.676131	1.615745	3.09606	6.410399	17.89849	28.05277	75.95543

MMFA1	0.226707	0.31023	0.698644	1.349802	2.705182	6.683504	16.04223	25.49683	73.08359	0.179658	0.39673	0.798549	2.00504	3.743267	7.857098	22.18997	34.69168	87.00323
MGMFA1	0.207421	0.282539	0.649907	1.151931	2.328528	5.924406	13.33732	20.70188	63.1126	0.201661	0.373897	0.856355	1.779321	3.398548	6.954628	18.31835	28.75679	77.18227
MHMFA1	0.204786	0.270896	0.628102	1.735827	3.579501	9.148082	34.80405	52.4086	143.0646	0.160531	0.308366	0.747604	3.249056	6.212301	11.78778	48.97645	76.27013	178.2831
MMMINFA2	0.432407	0.57616	1.272693	2.939449	5.854452	13.9721	37.67106	57.34056	152.6734	0.350796	0.684727	1.536511	4.462806	8.538258	15.81962	50.35379	79.06226	183.4339
MMMAXFA2	0.270665	0.401452	0.862272	1.062152	1.810571	4.084648	9.680874	13.89717	31.85477	0.246418	0.415284	0.861037	1.378697	2.340738	3.993818	13.41436	17.59156	37.35929
MMMIDFA2	0.31919	0.462636	1.04966	1.277653	2.173479	4.93267	9.890878	14.32875	32.87072	0.28259	0.496699	1.05755	1.561072	2.701378	4.68867	13.60841	17.86909	37.91287
MMMFA2	0.424359	0.568208	1.248079	2.873775	5.697227	13.54529	36.46938	55.93579	147.8646	0.344068	0.666808	1.491711	4.272618	8.055565	15.308	47.8964	75.35693	170.8621
MMGMFA2	0.407368	0.549699	1.207788	2.615997	5.11366	12.09469	28.25861	44.46755	114.2874	0.349104	0.67719	1.514226	3.98771	7.481054	14.23134	34.43772	54.42682	114.801
MMHMFA2	0.403847	0.527136	1.171662	2.951276	5.883017	14.07087	38.27594	58.22775	155.1494	0.333468	0.654204	1.474099	4.501311	8.61704	15.95469	51.04831	80.16711	186.1297
MMMINFA1	0.236048	0.312258	0.669091	1.484751	2.883753	6.777209	18.53449	27.94552	71.12959	0.202168	0.382933	0.825417	2.535898	4.648165	8.4976	28.78278	42.67147	96.33992
MMMAXFA1	0.160773	0.214672	0.430964	0.828745	1.446398	3.224668	9.486144	13.5	30.92216	0.124963	0.203277	0.380779	1.196606	1.976618	3.331604	13.23199	17.33308	36.84141
MMMIDFA1	0.161989	0.21713	0.436752	0.830718	1.449426	3.231958	9.488086	13.50394	30.93139	0.126888	0.206181	0.387155	1.198268	1.979864	3.337423	13.23386	17.33573	36.84674
MMMFA1	0.197241	0.268908	0.543813	1.136562	2.054231	4.642831	13.06436	20.11852	47.04657	0.161417	0.277465	0.55718	1.657462	2.765789	5.402147	18.32313	25.61659	52.41514
MMGMFA1	0.175563	0.2376	0.4837	0.904461	1.589411	3.573137	9.890497	14.23337	32.76112	0.186517	0.318965	0.641178	1.390804	2.337868	4.084647	13.72118	18.15364	38.44209
MMHMFA1	0.173469	0.226201	0.462123	1.595899	3.186455	8.064722	34.68167	52.13834	142.2784	0.139845	0.241463	0.484617	3.137631	5.911991	10.96721	48.94055	76.1635	177.9712
SMINFA2	0.432514	0.576287	1.272848	2.940387	5.856493	13.97427	37.68459	57.35959	152.7003	0.350902	0.684917	1.536787	4.46431	8.540853	15.82259	50.36896	79.08481	183.4775
SMAXFA2	0.294414	0.422471	0.892973	1.422999	2.682085	5.350416	15.54339	22.91588	48.86416	0.265239	0.464637	0.960678	2.107754	3.816971	6.282253	21.79356	30.87611	66.06232
SMIDFA2	0.333784	0.474153	1.021629	1.585656	2.958561	6.067363	15.70541	23.25216	49.71623	0.293056	0.527319	1.119782	2.237135	4.071554	6.807165	21.93308	31.09629	66.49745
SMFA2	0.424804	0.56861	1.248759	2.878169	5.709466	13.56085	36.56298	56.03717	148.0564	0.344576	0.668122	1.49397	4.290584	8.100104	15.33598	48.11405	75.66222	171.8607
SGMFA2	0.409086	0.551198	1.209949	2.648379	5.206503	12.21565	29.70666	46.36207	117.8159	0.349286	0.67775	1.515282	4.048818	7.614016	14.36628	37.21834	58.56081	126.1695
SHMFA2	0.405547	0.530274	1.175566	2.951792	5.883871	14.07156	38.276	58.22786	155.1495	0.334943	0.656349	1.477025	4.501503	8.617368	15.95506	51.04832	80.16714	186.1298

SMINFA1	0.266676	0.348649	0.720822	1.743313	3.491276	7.619858	22.20601	33.64351	81.30053	0.232445	0.440139	0.932157	2.938372	5.45977	9.706691	32.9375	49.58195	111.8897
SMAXFA1	0.209668	0.270257	0.509292	1.246911	2.399948	4.613642	15.39107	22.60608	48.07387	0.178583	0.308565	0.579799	1.977576	3.553727	5.76538	21.66173	30.66689	65.65504
SMIDFA1	0.210288	0.271961	0.514284	1.248431	2.402292	4.620016	15.3926	22.60915	48.08175	0.179762	0.310598	0.584956	1.978787	3.55619	5.770203	21.66309	30.66906	65.65923
SMFA1	0.235889	0.313071	0.609337	1.479029	2.86819	5.822834	18.09253	27.70903	61.40407	0.203202	0.36175	0.719317	2.305614	4.16951	7.344345	25.28972	36.87548	77.85264
SGMFA1	0.219301	0.287676	0.555753	1.304406	2.511155	4.914519	15.70512	23.17788	49.62462	0.221101	0.392303	0.785675	2.116346	3.814936	6.35123	22.0139	31.3187	66.91323
SHMFA1	0.218215	0.279143	0.536626	1.827254	3.686481	8.689564	34.96674	52.61282	142.7564	0.188202	0.33556	0.662148	3.372642	6.371423	11.6167	49.03756	76.34713	178.2371
LTSMINFA2	0.432667	0.576597	1.273537	2.942224	5.859444	13.98121	37.71292	57.38485	152.7727	0.35101	0.685114	1.537303	4.465767	8.543433	15.8277	50.38775	79.11014	183.5551
LTSMAXFA2	0.310286	0.45604	0.978308	1.773172	3.336835	7.418743	21.73064	30.06133	73.30402	0.276997	0.497638	1.074117	2.482041	4.590736	8.104671	27.35392	40.98133	93.71683
LTSMIDFA2	0.344495	0.493645	1.070845	1.893362	3.546771	7.919074	21.83968	30.31609	73.93315	0.299992	0.548332	1.194162	2.584835	4.790387	8.504562	27.46722	41.14579	94.03927
LTSMFA2	0.425367	0.569533	1.251495	2.885909	5.724701	13.60354	36.72625	56.15738	148.5096	0.345035	0.669318	1.497717	4.30436	8.136433	15.37654	48.33423	75.958	173.224
LTSGMFA2	0.410924	0.554308	1.217833	2.694219	5.295779	12.47383	31.47824	47.99057	123.8093	0.349466	0.678295	1.517129	4.088599	7.709534	14.52724	39.46927	61.8555	137.2717
LTSHMFA2	0.407722	0.536809	1.188823	2.952769	5.885237	14.07382	38.27615	58.22804	155.1498	0.336208	0.658537	1.481982	4.501722	8.617739	15.9558	51.04834	80.16718	186.1299
LTSMINFA1	0.286165	0.404523	0.859105	2.009807	3.951149	9.016874	26.23953	38.05431	96.57349	0.250474	0.478134	1.052883	3.149768	5.904918	10.7436	36.15196	54.93719	126.6467
LTSMAXFA1	0.236138	0.352513	0.714639	1.643818	3.115915	6.891588	21.62795	29.8219	72.70968	0.207063	0.374345	0.794487	2.377425	4.382049	7.706957	27.24653	40.82455	93.41053
LTSMIDFA1	0.236661	0.353501	0.718072	1.644907	3.1179	6.896505	21.62898	29.82431	72.71567	0.208054	0.376025	0.798359	2.378422	4.38407	7.710744	27.24764	40.82618	93.41371
LTSMFA1	0.25922	0.380352	0.783113	1.814582	3.478267	7.748263	23.44565	33.60754	82.29348	0.227049	0.416465	0.896441	2.639283	4.826085	8.914491	30.15898	45.42126	102.0984
LTSGMFA1	0.244573	0.363453	0.746535	1.685677	3.205312	7.112216	21.83949	30.26013	73.86593	0.24138	0.440407	0.944881	2.488876	4.589141	8.157267	27.53273	41.31149	94.34408
LTSHMFA1	0.243511	0.358245	0.733156	2.065314	4.091688	9.808762	35.39415	53.17318	143.8548	0.215109	0.396433	0.854721	3.514353	6.662287	12.27046	49.13196	76.55029	178.6904
LMSMINFA2	0.432691	0.576563	1.273487	2.941976	5.859073	13.98186	37.70471	57.38921	152.7618	0.351003	0.685155	1.537275	4.46557	8.543331	15.82914	50.38423	79.11436	183.5513
LMSMAXFA2	0.314514	0.450951	0.968943	1.755972	3.288603	7.641002	21.27792	31.19685	72.88525	0.274659	0.502686	1.061359	2.442556	4.499366	8.34819	26.73987	40.87059	91.23934
LMSMIDFA2	0.347202	0.490687	1.065996	1.877155	3.49964	8.125513	21.39074	31.44511	73.53526	0.298906	0.552221	1.185871	2.547394	4.711894	8.735074	26.85458	41.03805	91.57506

LMS MFA2	0.425465	0.569421	1.251297	2.884927	5.72277	13.60822	36.68772	56.17845	148.4469	0.345012	0.669602	1.497443	4.303252	8.133416	15.38608	48.29846	75.99008	173.1503
LMS GMFA2	0.411284	0.553878	1.217223	2.689333	5.285324	12.50563	31.26871	48.29764	123.32	0.349456	0.678418	1.517009	4.086324	7.700922	14.55951	39.08123	61.93714	136.3257
LMS HMFA2	0.408133	0.535779	1.18773	2.952634	5.885085	14.07398	38.2761	58.22805	155.1498	0.336097	0.658771	1.481648	4.501682	8.617691	15.95588	51.04834	80.16719	186.1299
LMS MINFA1	0.291569	0.395955	0.84205	1.994458	3.909666	9.182181	25.92867	38.86546	96.07079	0.246311	0.483511	1.039315	3.12976	5.86967	10.9046	35.61574	54.9901	125.33
LMS MAXFA1	0.245023	0.338062	0.685974	1.625538	3.070375	7.12498	21.17246	30.96301	72.26338	0.199827	0.380426	0.769231	2.336862	4.277812	7.966616	26.63013	40.71078	90.91961
LMS MIDFA1	0.245494	0.339339	0.689714	1.626621	3.072278	7.129866	21.17352	30.96537	72.26971	0.200862	0.382096	0.773308	2.337861	4.279923	7.970209	26.63128	40.71244	90.92294
LMS MFA1	0.266196	0.369767	0.76021	1.797754	3.430589	7.960407	23.06224	34.62298	81.92711	0.221143	0.422421	0.876523	2.603182	4.749761	9.132537	29.52356	45.37752	99.90833
LMS GMFA1	0.252661	0.351031	0.720616	1.667601	3.157708	7.342241	21.39054	31.39063	73.46611	0.236543	0.44622	0.927056	2.449503	4.497665	8.398978	26.92056	41.20664	91.89185
LMS HMFA1	0.251715	0.344583	0.705665	2.052339	4.060474	9.920809	35.31418	53.23311	143.7667	0.208503	0.401915	0.832906	3.500742	6.62094	12.337	49.12642	76.56778	178.6551
LAD MINFA2	0.432363	0.576085	1.272489	2.939256	5.853881	13.97051	37.66893	57.33524	152.6545	0.350759	0.68467	1.536359	4.462543	8.537475	15.81822	50.35103	79.05596	183.4148
LAD MAXFA2	0.254999	0.38045	0.796935	0.903547	1.31984	2.344602	7.702977	8.500271	12.99134	0.237038	0.384291	0.765732	1.103863	1.587569	2.173135	10.89987	10.60115	16.4493
LAD MIDFA2	0.310382	0.452431	0.973593	1.145757	1.751484	3.400944	7.928546	8.972841	14.0852	0.277671	0.479418	1.002728	1.306686	2.003341	3.007089	11.10054	10.90583	17.03469
LAD MFA2	0.424167	0.567958	1.247145	2.872768	5.693523	13.53286	36.4529	55.90512	147.7222	0.343876	0.666351	1.490348	4.268657	8.03928	15.29354	47.85048	75.25604	170.3551
LAD GMFA2	0.406559	0.548677	1.204598	2.606723	5.07997	11.97885	27.88456	43.66309	110.9589	0.349039	0.677009	1.513615	3.971455	7.426114	14.15226	33.68483	52.53077	107.5091
LAD HMFA2	0.402493	0.523401	1.163281	2.951135	5.882675	14.0703	38.27593	58.22772	155.1494	0.332879	0.653162	1.472	4.501275	8.616948	15.9545	51.0483	80.1671	186.1297
LAD MINFA1	0.214658	0.270307	0.541618	1.377745	2.583066	5.697891	17.37715	24.89603	59.95778	0.186321	0.345769	0.721994	2.39109	4.242754	7.58551	27.59944	39.27998	85.97278
LAD MAXFA1	0.12645	0.143896	0.208091	0.644312	0.886836	1.309855	7.494877	8.082532	12.03291	0.096881	0.128528	0.167399	0.904226	1.176488	1.414856	10.71449	10.32135	15.9207
LAD MIDFA1	0.127726	0.147047	0.215706	0.646418	0.890332	1.317912	7.496945	8.086547	12.04208	0.099034	0.131883	0.174678	0.906004	1.17997	1.420913	10.71638	10.3242	15.92602
LAD MFA1	0.168763	0.214706	0.366881	0.987185	1.610123	3.03901	11.38533	15.71842	30.75001	0.138982	0.218095	0.386492	1.414128	2.077691	3.86948	16.21236	19.76588	33.98881
LAD GMFA1	0.143119	0.173804	0.281258	0.727147	1.055578	1.717675	7.928137	8.86721	13.96538	0.16819	0.268632	0.492529	1.117288	1.58427	2.281287	11.21835	11.22144	17.60833
LAD HMFA1	0.140397	0.157806	0.246508	1.496065	2.913294	7.276645	34.62196	51.96244	141.9004	0.113881	0.173447	0.292251	3.063495	5.710859	10.51965	48.92229	76.10675	177.8463

Table 8: AMSE of the estimators when n = 100 and $\sigma^2_{outlier}$(magnitude of outliers) = 100

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	25.80884	52.30896	137.3368	305.8619	609.7793	1103.938	4171.171	5545.409	12033.18	35.00569	71.06927	132.4001	349.3951	676.9734	1479.634	4243.158	8610.668	15416.05
MMINFA2	25.39251	51.43892	135.0847	300.8182	599.5959	1085.857	4100.8	5454.015	11833.06	34.52082	70.07621	130.5726	344.541	667.5847	1459.042	4181.636	8485.965	15199.33
MMAXFA2	16.68377	37.92897	95.36627	86.52639	196.6124	461.5249	1059.011	1652.888	4359.771	20.16766	40.85522	82.39412	106.7166	230.9035	588.4949	1153.8	2614.736	5810.102
MMIDFA2	19.45288	42.85163	108.8662	99.49201	227.501	506.8511	1081.057	1693.149	4425.026	24.32997	48.72558	95.22648	122.0331	256.3286	627.8932	1169.163	2637.398	5853.13
MMFA2	24.71018	50.87549	132.2437	289.9976	583.4483	1067.142	3945.549	5328.235	11666.69	33.62505	68.52187	126.1324	332.6345	640.9069	1409.428	3969.925	8003.338	14598.81
MGMFA2	23.89552	49.34745	128.2611	254.3292	520.284	962.8067	3039.186	4314.91	9564.169	34.11657	69.27684	128.6657	313.737	606.8337	1314.586	2849.03	5717.065	11207.38
MHMFA2	23.25685	46.70793	125.8976	302.763	602.9952	1090.496	4167.799	5538.379	12019.07	33.07313	67.20738	125.0087	347.3013	672.7928	1471.128	4240.977	8606.413	15407.76
MMINFA1	14.00716	28.57568	76.25669	149.2911	303.6639	617.8342	2037.752	2863.311	6568.47	19.17068	40.48179	80.78947	192.0188	387.6709	898.2145	2352.632	4936.97	9474.071
MMAXFA1	9.596633	19.97803	52.19725	73.90137	165.6906	416.2487	1038.694	1615.713	4298.352	10.22469	23.48391	51.25054	91.57238	205.479	549.4438	1139.403	2593.242	5769.252
MMIDFA1	9.689934	20.26589	52.88686	74.01307	165.9647	416.6684	1038.896	1616.082	4298.971	10.3553	23.70226	51.70733	91.70959	205.7196	549.8217	1139.551	2593.465	5769.676
MMFA1	11.31416	25.37497	63.49286	101.4944	225.2059	524.014	1394.553	2206.764	5638.828	13.92972	31.29165	61.83584	129.1912	267.263	682.9601	1517.035	3267.8	7081.454
MGMFA1	10.47331	22.31008	57.91295	80.43869	179.3821	438.0199	1081.262	1682.263	4423.761	15.83696	34.29469	68.62024	107.6607	234.3752	599.6743	1176.653	2660.074	5895.424
MHMFA1	10.14904	20.85349	55.87897	171.6535	339.3146	656.1307	3877.21	4973.377	10904.18	12.32074	27.53548	57.61529	236.4854	462.9081	1059.515	4050.457	8235.701	14702.16
MMMINFA2	25.39086	51.43073	135.0566	300.8036	599.5424	1085.517	4100.489	5453.089	11829.4	34.51933	70.06685	130.5407	344.5184	667.5035	1458.678	4181.228	8484.792	15194.77
MMMAXFA2	16.25868	36.58789	88.61794	75.83052	155.8026	240.2406	856.5446	994.8659	1829.869	19.44224	36.6843	69.32989	84.51611	159.1127	282.4719	783.4994	1617.139	2089.224
MMMIDFA2	19.20886	42.1729	105.3919	89.60678	190.3042	307.3305	880.2229	1039.174	1912.952	23.90056	46.07163	87.07974	101.5841	190.1661	340.3949	800.2847	1642.981	2145.435
MMMFA2	24.69936	50.85391	132.1045	289.8658	583.1108	1065.784	3942.676	5323.238	11654.81	33.61388	68.4642	125.7904	332.3866	639.8327	1405.549	3962.851	7979.239	14539.18
MMGMFA2	23.86497	49.26187	127.8383	253.2226	517.0046	945.6667	2991.533	4194.394	9148.763	34.11176	69.24739	128.5382	312.7313	603.2228	1295.819	2726.941	5361.441	10072.74
MMHMFA2	23.20024	46.44627	125.3089	302.7574	602.9719	1090.322	4167.799	5538.375	12019.05	33.05195	67.10309	124.617	347.2978	672.7792	1471.077	4240.977	8606.412	15407.75

MMMINFA1	13.39511	25.79351	64.11351	142.5916	276.709	472.4956	1913.025	2443.273	4985.022	18.36868	36.23673	67.07198	179.89	350.0027	739.0027	2158.01	4426.214	7521.797
MMMAXFA1	8.687659	16.02741	34.20552	62.38675	122.5009	176.4641	834.6773	955.139	1754.766	8.711229	16.09143	25.00177	67.87212	129.4021	228.7952	768.0204	1593.086	2037.58
MMMIDFA1	8.787331	16.34819	35.00633	62.50673	122.7816	177.0088	834.8947	955.5253	1755.504	8.849923	16.337	25.61119	68.01978	129.661	229.2638	768.1779	1593.333	2038.106
MMMFA1	10.51668	22.11478	47.86131	91.73565	187.7208	332.9331	1217.228	1642.374	3629.467	12.70399	25.23281	40.00418	109.5873	203.5913	422.6168	1196.055	2403.143	3934.673
MMGMFA1	9.621109	18.63533	40.98314	69.36171	136.9673	206.2974	880.4425	1027.093	1911.316	14.76816	28.81993	49.7574	85.56453	163.3232	298.7324	808.5403	1669.2	2202.035
MMHMFA1	9.283844	17.02948	38.76843	166.3985	317.9261	530.6279	3872.995	4947.551	10813.55	10.95382	20.86476	33.90197	229.7474	440.0053	969.0701	4047.548	8227.956	14668.39
SMINFA2	25.39962	51.44298	135.0756	300.9086	599.7142	1085.685	4101.555	5454.559	11831.39	34.53089	70.08439	130.5645	344.6101	667.659	1458.935	4182.862	8487.96	15197.74
SMAXFA2	17.94012	38.50365	93.33784	133.8531	251.5738	363.0352	1410.849	1909.034	3514.778	22.94393	43.38141	78.99986	152.0685	269.2356	511.8557	1798.644	3531.377	4928.628
SMIDFA2	20.21373	43.1456	107.7985	143.4608	276.8579	417.8375	1429.236	1945.528	3586.4	26.12511	50.34826	93.09987	163.4803	291.3699	555.7005	1810.284	3550.717	4973.986
SMFA2	24.7531	50.88595	132.1987	290.7642	584.1334	1066.463	3951.806	5330.921	11661.38	33.6943	68.56863	126.0458	333.3231	641.7427	1408.333	3987.96	8037.166	14578.47
SGMFA2	24.00902	49.38724	128.1255	260.1031	525.8563	954.5619	3122.775	4361.587	9406.545	34.14784	69.30151	128.6335	316.2627	609.3237	1309.546	3076.073	6087.865	10875.5
SHMFA2	23.40423	46.81696	125.7117	302.7945	603.0451	1090.411	4167.801	5538.383	12019.06	33.17174	67.30538	124.9111	347.3133	672.8067	1471.114	4240.979	8606.415	15407.76
SMINFA1	15.74642	29.80749	72.70903	179.9206	339.7059	552.3275	2243.774	3009.196	6024.708	22.18404	43.05359	77.23027	216.6577	407.8417	858.0431	2697.031	5446.783	8939.488
SMAXFA1	12.01021	21.91189	47.24118	124.1653	225.6703	309.461	1393.915	1875.137	3448.091	15.23774	28.33308	44.72984	140.5346	247.383	469.5475	1787.693	3512.9	4885.781
SMIDFA1	12.09006	22.17448	47.9532	124.256	225.9139	309.9411	1394.083	1875.474	3448.759	15.34099	28.52445	45.22106	140.6445	247.5863	469.9428	1787.805	3513.092	4886.224
SMFA1	13.49396	26.85838	59.04153	144.9346	274.9785	438.6603	1692.734	2409.347	4960.59	18.15587	35.05991	56.31667	168.8223	300.9346	617.4761	2070.472	4074.795	6298.934
SGMFA1	12.77039	24.04466	53.16721	129.2653	237.3576	334.9234	1429.407	1935.675	3585.005	19.6319	37.65675	63.79835	152.7732	272.2477	524.2363	1815.945	3569.962	5018.745
SHMFA1	12.44769	22.71528	51.13575	195.391	369.8898	599.824	3887.002	4988.463	10867	16.79249	31.88137	51.7386	251.8983	477.361	1036.191	4058.748	8247.184	14693.58
LTSMINFA2	25.41093	51.46862	135.1526	301.0512	600.057	1086.228	4103.812	5457.482	11838.65	34.5395	70.11397	130.6121	344.7374	667.9133	1459.45	4184.288	8490.237	15204.6
LTSMAXFA2	19.1634	40.9267	103.41	167.2265	346.491	572.4476	2088.42	2900.851	6180.14	24.38591	48.78062	90.55575	191.7575	363.8892	722.3447	2219.058	4191.544	7626.961
LTSMIDFA2	20.98904	44.49068	113.5291	174.4925	363.4804	608.1094	2102.026	2925.743	6225.934	27.05831	54.05331	100.7295	200.5344	380.3606	753.6773	2228.584	4206.926	7659.711

LTSMFA2	24.81385	50.94944	132.5404	291.7803	585.9719	1068.499	3968.866	5344.569	11683.75	33.74491	68.72228	126.4919	334.3707	644.4394	1412.902	4004.701	8067.741	14651.82
LTSGMFA2	24.15491	49.60893	129.055	265.8822	538.4862	975.687	3311.556	4573.756	9957.028	34.17245	69.386	128.8115	319.5898	617.1525	1327.873	3234.417	6332.014	11816.89
LTSHMFA2	23.61877	47.42847	127.0764	302.8476	603.1886	1090.713	4167.807	5538.401	12019.1	33.26137	67.56461	125.4315	347.3342	672.8488	1471.194	4240.981	8606.417	15407.77
LTSMINFA1	17.42236	34.49579	89.591	202.4441	405.8122	695.4168	2675.281	3632.236	7744.909	23.75683	48.53458	89.2933	241.0308	465.6463	974.4565	2929.273	5775.81	10444.43
LTSMAXFA1	14.41078	28.66589	73.13561	159.858	328.7606	536.8463	2075.598	2877.409	6137.013	18.10559	37.55681	66.25626	182.8109	347.3564	691.9215	2210.002	4176.839	7595.895
LTSMIDFA1	14.47966	28.86984	73.58559	159.9285	328.933	537.1745	2075.728	2877.645	6137.448	18.19371	37.70288	66.61911	182.8966	347.5137	692.21	2210.096	4176.992	7596.217
LTSMFA1	15.6307	32.34385	80.68481	175.61	362.2194	621.6033	2288.623	3234.114	7081.451	20.4759	42.57467	74.50582	204.6242	387.4403	798.0078	2434.79	4627.105	8596.421
LTSGMFA1	15.04551	30.27757	76.90727	163.7571	336.8553	553.9436	2102.151	2919.049	6225.046	21.66848	44.50402	79.77591	192.3014	366.1399	731.1907	2233.19	4222.23	7691.918
LTSHMFA1	14.77206	29.27505	75.63355	214.6404	425.6734	725.3181	3911.739	5053.332	11017.16	19.41881	40.19634	71.17575	266.9953	512.2926	1110.644	4067.695	8261.137	14739.78
LMSMINFA2	25.41272	51.4657	135.1443	301.0525	600.0194	1086.212	4103.887	5456.904	11838.46	34.53894	70.10732	130.6117	344.7189	667.8624	1459.535	4184.104	8489.945	15203.8
LMSMAXFA2	19.38381	40.70396	101.8366	173.9987	336.6528	557.8038	2081.807	2824.956	6148.618	24.18631	48.27622	90.1203	185.8785	353.6861	749.5616	2122.331	4137.064	7412.94
LMSMIDFA2	21.12793	44.3565	112.6688	180.8283	354.6564	594.4705	2096.025	2850.786	6195.143	26.95299	53.66848	100.4591	194.8959	370.5442	780.8617	2132.15	4152.738	7445.872
LMSMFA2	24.82286	50.94224	132.4992	291.8072	585.7718	1068.418	3969.507	5342.211	11683.01	33.74149	68.69121	126.4825	334.232	643.9739	1413.67	4002.448	8064.219	14644.03
LMSGMFA2	24.17711	49.58428	128.9336	266.3212	537.1388	974.4056	3317.644	4550.707	9939.567	34.1708	69.36804	128.809	319.159	615.8956	1331.081	3200.373	6309.708	11708.5
LMSHMFA2	23.64375	47.35573	126.8773	302.8454	603.1759	1090.709	4167.807	5538.397	12019.1	33.24962	67.52559	125.3981	347.3315	672.8411	1471.203	4240.98	8606.417	15407.77
LMSMINFA1	17.7137	34.10765	86.81575	206.6677	399.2278	684.8583	2681.646	3580.648	7716.502	23.53053	48.02426	88.83192	237.1566	458.2566	994.6861	2874.623	5747.903	10273.43
LMSMAXFA1	14.80171	28.12985	68.4014	166.9784	318.0408	521.1813	2068.358	2800.583	6104.572	17.60635	36.71913	64.99949	176.7589	336.7222	718.6861	2113.019	4122.096	7381.53
LMSMIDFA1	14.86564	28.33638	68.91792	167.0459	318.217	521.5231	2068.493	2800.829	6105.017	17.69674	36.86958	65.3721	176.8458	336.8841	718.983	2113.116	4122.252	7381.857
LMSMFA1	15.97843	31.89712	76.95403	181.8721	353.3217	608.3894	2288.713	3169.659	7053.08	20.08815	41.90215	73.58406	199.1192	377.7892	824.6083	2347.501	4581.952	8379.668
LMSGMFA1	15.40875	29.77485	72.70323	170.7059	326.4658	538.8194	2096.156	2843.843	6194.243	21.34293	43.88863	79.05507	186.4354	355.9908	758.4371	2136.904	4168.343	7478.133
LMSHMFA1	15.13347	28.74297	71.1733	217.3329	419.8234	717.1638	3911.795	5044.1	11015.28	18.95708	39.4178	70.06182	265.1937	508.2836	1119.317	4066.787	8260.188	14736.75

LAD MINFA2	25.38585	51.42014	135.037	300.7565	599.446	1085.393	4099.835	5452.38	11828.11	34.51434	70.0583	130.5274	344.4786	667.4217	1458.536	4180.716	8483.695	15193.54
LAD MAXFA2	13.74511	33.3672	80.26173	14.78762	34.08013	54.54484	24.60556	19.46121	21.99891	15.8098	28.72664	57.40973	17.78579	26.73303	40.87534	25.60784	13.35441	14.10304
LAD MIDFA2	18.00816	40.82049	101.7482	32.56887	79.92355	136.771	41.47973	48.92327	64.84884	21.93388	41.64376	80.47325	39.8419	65.09981	105.7824	36.78169	26.02351	37.93257
LAD MFA2	24.6644	50.82495	132.0023	289.4068	582.4692	1065.257	3935.984	5319.188	11650.37	33.57484	68.40754	125.626	331.9186	638.6173	1403.819	3952.893	7952.895	14520.5
LAD GMFA2	23.75853	49.13617	127.5048	248.5981	509.7554	937.0262	2831.397	4058.188	8913.747	34.09526	69.21943	128.4813	310.6593	598.6268	1285.649	2495.371	4791.816	9488.283
LAD HMFA2	22.88099	45.76794	124.439	302.7384	602.9248	1090.245	4167.797	5538.371	12019.05	32.96685	66.95347	124.3716	347.2908	672.7652	1471.057	4240.976	8606.411	15407.75
LAD MINFA1	9.110885	16.70567	45.48687	105.7394	200.4088	354.883	1396.845	1822.7	3759.741	14.2726	28.09045	54.40343	145.9258	280.4413	610.5367	1762.645	3557.658	6381.544
LAD MAXFA1	0.685347	0.814945	1.208897	1.713838	1.217759	0.857589	13.94407	4.175723	2.028039	0.453921	0.364557	0.515401	1.538853	0.765757	0.555934	18.34378	6.288182	2.761001
LAD MIDFA1	0.813324	1.154498	2.089308	1.771138	1.356265	1.115712	14.04569	4.346866	2.388956	0.560692	0.505194	0.897693	1.600037	0.84202	0.685591	18.403	6.349797	2.902436
LAD MFA1	3.914646	10.42387	20.52933	35.43126	76.38079	169.9738	439.5015	752.6026	2001.248	5.851383	12.06297	17.82136	50.60651	82.63211	206.5007	501.2746	882.7642	1953.49
LAD GMFA1	2.227653	4.482032	10.03927	7.397063	12.22153	19.56451	41.65543	39.94192	63.844	8.964885	17.33954	31.01367	19.07406	31.64011	58.11627	43.16825	42.73019	70.50644
LAD HMFA1	1.292146	1.592621	4.597915	138.0791	255.7241	428.8095	3862.408	4920.938	10770.45	2.959002	5.258944	8.660746	211.8651	403.5185	908.6856	4043.355	8220.018	14656.94

Table 9: AMSE of the estimators when n = 100 and $\sigma^2_{outlier}$(magnitude of outliers) = 250

ESTIMATORS	NUMBER OF EXPLANATORY VARIABLES																	
	3									5								
	DEGREES OF MULTICOLLINEARITY									DEGREES OF MULTICOLLINEARITY								
	0.900			0.990			0.999			0.900			0.990			0.999		
	% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS			% OF OUTLIERS		
	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %	5%	10 %	20 %
OLS	150.9155	342.5764	805.5294	1747.455	3661.68	6507.255	21475.5	34070.05	84014.76	211.75	442.1087	793.3067	2266.331	4872.686	7977.716	21718	51211.32	117027.6
MMINFA2	148.434	336.3298	792.3168	1719.232	3600.971	6400.734	21113.36	33507.06	82611.43	208.8449	436.0362	782.306	2234.572	4803.683	7868.349	21415.25	50460	115290.3
MMAXFA2	103.786	239.2512	538.5801	619.7178	1277.538	2741.251	4866.444	10579.11	29001.89	114.2552	256.2302	498.9544	639.1698	1575.281	3305.445	5336.408	14099.93	42173.47
MMIDFA2	119.2766	273.8753	619.1946	750.0659	1515.759	3072.099	4978.069	10775.94	29355.61	137.1415	303.5812	577.9537	709.4389	1758.337	3589.239	5408.031	14264.8	42407.22
MMFA2	145.7652	335.2143	777.7909	1681.171	3508.162	6260.545	20571.5	32525.23	80230.37	201.3512	422.9719	760.3847	2150.86	4571.36	7581.342	20508.36	46892.58	106638.2
MGMFA2	141.1875	323.2846	750.6791	1533.685	3176.202	5688.037	15863.24	25884.92	63448.54	205.1142	430.0247	771.5187	1999.66	4287.633	7205.44	14979.85	33042.73	76220.24

MHMFA2	135.2069	309.1866	738.1661	1726.801	3620.928	6424.388	21454.25	34027.9	83927.64	200.2011	417.2353	747.5393	2253.319	4846.323	7926.781	21705.27	51186.01	116973.4
MMINFA1	81.24555	177.9495	453.0746	875.5121	1840.845	3631.316	10032.55	17821.52	45372.52	121.5101	257.7307	477.9888	1247.775	2740.029	4895.6	11866.55	28622.21	70446.53
MMAXFA1	56.19779	123.2935	319.6475	475.3028	1018.218	2395.384	4762.921	10394.6	28668.18	66.41342	147.617	295.3556	573.4708	1392.803	3011.578	5269.421	13945.54	41949.89
MMIDFA1	56.85678	125.0039	322.703	476.5549	1020.587	2398.474	4763.956	10396.45	28671.55	67.01511	149.07	298.5173	574.0725	1394.482	3014.435	5270.11	13947.13	41952.22
MMFA1	68.52617	170.4076	386.7183	664.1667	1381.739	2981.996	7119.881	13474.36	35587.08	85.91567	190.7517	370.898	820.7416	1801.755	3685.861	7517.374	17652.61	48849.61
MGMFA1	61.92987	139.604	349.8264	522.7984	1111.892	2532.285	4996.626	10757.66	29419.82	96.31011	213.8847	405.8404	668.3526	1579.884	3325.963	5483.529	14360.7	42691.75
MHMFA1	58.98199	130.8942	340.896	951.2624	2048.652	3789.067	19646.74	30639.62	76844.52	78.74499	171.6331	332.8784	1547.54	3419.197	5589.493	20597.48	48971.07	112291.7
MMMINFA2	148.4233	336.29	792.1341	1719.128	3600.57	6398.811	21112.73	33502.13	82592.52	208.833	435.9767	782.1285	2234.441	4803.115	7866.251	21414	50454.25	115258.9
MMMAXFA2	101.6507	232.8474	489.105	541.0222	1000.322	1498.049	4306.928	6570.945	13906.88	108.4501	227.6627	430.94	529.7751	1034.729	1650.818	4089.296	8481.547	17176.46
MMMIDFA2	118.126	270.5782	592.2522	684.3703	1274.863	1975.077	4425.259	6798.825	14375.1	133.134	285.0816	536.1527	606.8984	1254.333	2078.65	4171.092	8667.421	17479.91
MMMFA2	145.7212	335.1596	777.0117	1680.621	3505.741	6250.6	20567.81	32490.11	80099.14	201.2117	422.4181	758.9024	2149.362	4561.454	7556.735	20491.09	46726.67	105673
MMGMFA2	141.042	322.9411	747.7956	1528.709	3155.565	5591.415	15761.49	25138.57	60438.27	205.0549	429.7963	770.8465	1993.126	4253.619	7122.044	14667.81	30986.68	65971.95
MMHMFA2	134.873	308.2861	734.0419	1726.745	3620.76	6423.332	21454.25	34027.87	83927.57	200.0706	416.5347	745.3019	2253.302	4846.258	7926.432	21705.27	51186	116973.4
MMMINFA1	77.6232	165.0986	376.5207	821.8658	1650.956	2788.914	9710.117	15500.76	36645.67	116.2798	229.4878	402.5938	1194.161	2441.105	4021.743	11315.15	25740.64	57889.52
MMMAXFA1	51.03943	104.8843	205.2067	379.4609	709.0089	1020.681	4196.602	6364.661	13476.06	56.89088	96.51608	154.6374	458.0386	821.411	1235.591	4012.532	8310.531	16896.52
MMMIDFA1	51.76398	106.7337	208.8688	380.9361	711.5338	1024.64	4197.708	6366.682	13480.35	57.54306	98.22171	158.6459	458.6919	823.2844	1239.127	4013.323	8312.268	16899.38
MMMFA1	64.14994	156.7368	289.342	589.9693	1120.128	1844.402	6669.269	10118.41	23062.82	77.88503	148.1814	256.4256	729.1628	1306.654	2225.036	6541.09	12657.29	26835.6
MMGMFA1	57.18596	122.6895	242.211	433.6204	812.0391	1204.162	4444.885	6777.415	14461.03	89.08633	176.1899	304.2681	561.7801	1040.22	1681.447	4257.08	8776.631	17860.25
MMHMFA1	54.14979	113.1878	231.6753	904.3154	1898.435	3049.091	19630.33	30492.09	76416.95	70.36636	125.972	205.3163	1515.821	3277.221	5042.189	20584.2	48930.38	112113.3
SMINFA2	148.4688	336.3781	792.2476	1719.725	3601.528	6399.828	21119.14	33509.27	82606.35	208.9003	436.0784	782.2711	2235.229	4804.516	7867.818	21421.4	50471.04	115284.4
SMAXFA2	109.4724	246.0163	517.3191	818.5601	1514.652	2255.538	8308.84	11289.85	24329.04	131.3557	268.0541	486.2035	1011.889	2045.371	2926.171	8702.747	19412.75	38253.77

SMIDFA2	122.417	277.405	607.8817	922.603	1723.107	2638.815	8395.226	11470.76	24712.37	149.1783	311.1325	570.0392	1062.73	2196.165	3243.97	8760.328	19554.38	38496.52
SMFA2	145.9038	335.2804	777.4897	1683.593	3511.274	6255.918	20604.05	32538.69	80195.25	201.9128	423.3063	760.092	2157.708	4583.714	7575.406	20583.01	47144.1	106459.7
SGMFA2	141.6276	323.6797	749.5369	1552.094	3198.556	5644.931	16596.38	26034.4	62618.96	205.3685	430.1739	771.386	2027.312	4325.068	7186.042	16047.06	35212.19	74496.85
SHMFA2	136.0007	310.1752	736.3603	1727.029	3621.145	6423.891	21454.27	34027.91	83927.62	200.7685	417.8082	747.1028	2253.409	4846.433	7926.702	21705.28	51186.02	116973.4
SMINFA1	90.88157	191.5807	419.4242	1021.74	2006.807	3291.419	12123.23	18148.82	42796.24	136.9963	269.4069	463.896	1450.649	3001.395	4697.772	13650.82	31508.87	68356.82
SMAXFA1	69.27468	143.2637	268.1114	701.3612	1284.654	1858.515	8226.996	11119.82	23974.14	93.89406	172.0976	270.7416	962.8604	1890.961	2606.971	8647.932	19278.47	38023.08
SMIDFA1	69.88994	144.8076	271.3948	702.3842	1286.794	1862.061	8227.825	11121.53	23977.68	94.37427	173.3685	273.966	963.3295	1892.439	2609.884	8648.501	19279.86	38025.48
SMFA1	80.20776	184.9399	343.1855	854.1983	1605.988	2534.124	9975.821	13979.03	31747.47	109.263	209.82	350.0411	1142.597	2231.734	3352.35	10364.39	22374.87	45336.81
SGMFA1	74.481	157.8055	301.3447	740.1381	1368.456	2015.338	8409.453	11453.97	24782.53	117.3871	230.2197	387.1329	1033.088	2049.19	2949.053	8820.22	19636.15	38793.59
SHMFA1	71.64627	150.0373	291.3721	1072.197	2184.467	3494.182	19757.14	30695.25	76705.96	103.3719	193.5297	309.8617	1665.009	3567.607	5466.674	20652.71	49033.02	112260.2
LTSMINFA2	148.54	336.5809	792.6376	1720.459	3603.477	6403.005	21128.65	33526.43	82652.54	208.9656	436.2557	782.5713	2236.211	4806.47	7870.764	21428.42	50489.72	115332.6
LTSMAXFA2	115.5006	263.977	581.1619	1016.39	2036.025	3440.035	11405.55	16869.21	42032.65	145.9243	306.4507	554.3267	1222.996	2533.513	4079.896	11577.08	25986.85	54970.2
LTSMIDFA2	126.1314	287.6692	645.3535	1091.359	2181.863	3687.692	11468.41	17003.57	42302.14	159.6414	337.6939	614.3151	1262.492	2654.122	4305.742	11619.14	26095.93	55148.5
LTSMFA2	146.1597	335.5539	779.0351	1686.859	3521.232	6270.965	20652.69	32642.09	80481.3	202.5115	424.6708	762.3056	2165.241	4606.52	7604.233	20659.63	47503.95	107485.7
LTSGMFA2	142.3424	325.141	754.7004	1572.726	3260.302	5764.283	17396.58	27439.79	67172.46	205.6506	430.7906	772.4474	2050.899	4384.822	7271.265	17010.66	37941.02	82050.99
LTSHMFA2	137.4454	313.6596	743.7367	1727.416	3621.986	6425.717	21454.31	34028.01	83927.8	201.4405	419.5158	750.4574	2253.563	4846.667	7927.241	21705.29	51186.03	116973.4
LTSMINFA1	100.2911	224.3455	514.0667	1163.434	2381.272	4112.087	14125.99	21756.42	54010.1	150.2557	307.4286	538.5261	1570.455	3304.041	5352.199	15220.15	35101.78	77374.43
LTSMAXFA1	82.51428	189.6015	412.1902	930.6387	1874.342	3181.316	11345.75	16742.15	41776.28	116.8726	236.3711	400.4696	1184.978	2410.742	3847.113	11537.04	25882.38	54800.66
LTSMIDFA1	83.01717	190.7295	414.4485	931.4336	1875.873	3183.662	11346.35	16743.44	41778.88	117.2585	237.3285	402.884	1185.343	2411.921	3849.35	11537.46	25883.47	54802.42
LTSMFA1	91.52147	219.579	462.7455	1042.031	2099.895	3620.038	12599.68	18816.7	46918.02	128.9227	264.2132	457.8766	1324.901	2682.685	4382.687	12796.55	28210.99	60171.58
LTSGMFA1	86.79797	200.1244	434.7012	959.6609	1933.629	3284.184	11478.74	16991.13	42350.86	135.1931	279.0654	484.232	1239.446	2536.556	4096.216	11662.9	26158.53	55366.59

LTSHMFA1	84.41126	194.4806	427.9327	1201.084	2503.475	4244.284	19906.7	31050.35	77511.31	124.2248	251.7506	428.3072	1749.793	3747.874	5915.101	20713.36	49138.69	112498.8
LMSMINFA2	148.533	336.5678	792.6467	1720.475	3603.22	6402.563	21127.72	33526.78	82654.07	208.9625	436.2471	782.5786	2236.035	4805.95	7870.407	21426.99	50487.42	115325.8
LMSMAXFA2	115.8805	261.8823	582.1956	1009.797	1966.841	3343.939	10548.45	17312.62	40853.67	142.1911	302.0548	550.8432	1222.103	2523.843	3962.825	10881.83	25296.84	53984.4
LMSMIDFA2	126.1835	286.5832	645.7491	1084.96	2117.528	3603.654	10613.45	17442.84	41129.24	156.9265	334.556	611.8596	1262.521	2642.707	4196.704	10926.89	25408.32	54167.94
LMSMFA2	146.1378	335.5359	779.0597	1686.92	3519.9	6268.981	20646.12	32645.59	80481.89	202.4308	424.5591	762.2871	2164.643	4601.688	7600.488	20641.34	47460.17	107373.3
LMSGMFA2	142.2957	325.0273	754.7476	1572.562	3251.674	5750.856	17198.51	27552.16	66880.03	205.6226	430.7492	772.453	2050.757	4374.666	7260.093	16728.77	37647.33	81461.66
LMSHMFA2	137.4504	313.3222	743.8157	1727.416	3621.898	6425.506	21454.3	34028.01	83927.8	201.3682	419.368	750.5247	2253.527	4846.634	7927.211	21705.29	51186.03	116973.4
LMSMINFA1	101.5082	220.1268	516.0218	1157.637	2326.449	4044.944	13544.1	22066.8	53184.34	146.8308	303.0697	534.8657	1573.928	3286.179	5280.023	14768.19	34735.78	76708.63
LMSMAXFA1	84.99018	183.3642	414.6675	923.356	1802.691	3065.094	10487.21	17190.21	40591	111.6791	230.0515	398.0024	1183.004	2403.439	3724.758	10838.73	25190.84	53809.3
LMSMIDFA1	85.4731	184.5577	416.9687	924.1867	1804.233	3067.751	10487.83	17191.45	40593.67	112.0737	231.0367	400.3585	1183.38	2404.584	3726.994	10839.18	25191.94	53811.12
LMSMFA1	93.3806	215.0836	465.3156	1035.459	2032.557	3532.958	11834.76	19213.69	45851.14	124.1807	258.4882	454.2613	1326.102	2670.88	4276.485	12166.76	27612.23	59272.01
LMSGMFA1	89.0158	194.4942	437.3875	952.9787	1862.523	3178.083	10624.18	17430.76	41179.03	130.7797	273.738	480.4049	1238.958	2526.839	3979.69	10973.58	25472.59	54391.81
LMSHMFA1	86.85218	188.5119	430.57	1197.963	2465.778	4176.654	19883.29	31067.03	77490.67	119.5764	245.9661	426.1775	1745.669	3737.604	5870.898	20700.89	49129.33	112477.2
LADMINFA2	148.3902	336.19	792.0179	1718.845	3600.045	6398.081	21109.45	33497.07	82581.79	208.7993	435.9252	782.048	2234.113	4802.62	7865.445	21411.35	50448.25	115246.4
LADMAXFA2	89.26526	205.3336	427.2357	180.5663	300.3883	445.5382	34.17985	58.19381	90.24972	77.4076	178.7971	362.4434	55.02931	179.4175	341.8542	23.14991	38.63211	45.72445
LADMIDFA2	112.6399	258.4311	564.0047	386.8854	674.1539	1048.924	92.69545	183.4619	294.707	113.9757	257.2978	499.4153	145.2265	445.5247	844.8888	58.7087	124.3736	154.4613
LADMFA2	145.5786	335.0207	776.4881	1679.075	3502.379	6246.575	20547.52	32451.58	80018.89	200.7875	421.9009	758.1528	2145.108	4551.924	7545.596	20449.86	46530.63	105186
LADGMFA2	140.5323	321.9871	745.6697	1513.034	3121.869	5542.972	15024.64	24015.24	57784.24	204.8807	429.5913	770.5244	1971.304	4217.566	7077.911	13552.31	27831.19	57945.83
LADHMFA2	132.5699	304.5931	728.7069	1726.575	3620.482	6422.834	21454.24	34027.85	83927.54	199.5127	415.5739	743.6269	2253.258	4846.188	7926.291	21705.26	51185.99	116973.3
LADMINFA1	49.77633	96.49729	262.8081	587.0339	1199.987	2119.461	6928.583	11257.29	27239.54	89.23185	181.3597	324.3993	941.5311	1999.42	3318.378	9152.264	21137.36	47713.43
LADMAXFA1	1.809921	2.52858	4.341807	2.393228	2.832594	3.350547	5.665392	2.863001	3.495699	0.912854	1.202611	2.387619	1.286419	1.236613	1.636882	5.858872	2.131191	1.588929

LADMIDFA1	2.724184	4.472444	8.518476	3.19604	4.442963	5.736039	6.174899	3.953248	5.616899	1.341618	2.230748	5.295597	1.439788	1.830999	2.797681	6.021685	2.584906	2.304091
LADMFA1	24.7796	82.22032	125.8394	249.8882	460.5061	879.4674	2680.945	3920.898	9461.757	29.69546	64.65179	124.424	304.6369	512.1119	1025.737	2760.812	4461.581	9601.283
LADGMFA1	11.61115	25.547	52.26944	43.75301	76.75648	124.4567	104.6292	169.5538	341.8803	47.3881	105.1721	190.0682	90.63556	185.6233	375.7109	110.0421	190.6546	353.5844
LADHMFA1	4.064405	8.225837	23.10628	698.6453	1525.496	2434.707	19551.95	30315.4	76147.11	15.23506	28.62787	47.21161	1395.291	3073.23	4666.117	20556.34	48887.27	112038.7