REFERENCES

Ahmeti, S., Hoti, A., & Alshiqi, S. (2014). Analysis of Financial Performance in The Banking System in Kosovo-the Period 2006-2012. *Journal of Knowledge Management, Economics, and Information*.

Almanda, S. R. (2019). *The Accuracy of Profitability Determinants for Banking Sector in Indonesia.* Cikarang: Thesis, President University Repository.

Badan Pusat Statistik. (2022). *Inflasi*. Retrieved August 22, 2022 from https://www.bps.go.id/subject/3/inflasi.html#subjekViewTab1

Badan Pusat Statistik. (n.d.). *Produk Domestik bruto*. Retrieved July 14, 2022 from https://www.bps.go.id/subject/11/produk-domestik-bruto--lapangan-usaha-.html

Badawi, A. (2017). Effect of Credit Risk, Liquidity Risk, and Market Risk Banking to Profitability Bank (Study on Devised Banks in Indonesia Stock Exchange). *European Journal of Business and Management* .

Bank Indonesia. (2022). *Produk Domestik Bruto Menurut Lapangan Usaha.* Retrieved July 14, 2022 from https://www.bi.go.id/seki/tabel/TABEL7_1.pdf

Banu, I. M. (2013). The Impact of Credit on Economic Growth in The Global Crisis Context. *Procedia Economics and Finance,*, 25-30.

Basel Committee on Banking Supervision. (1997). Basel Core Principles.

Basel Committee on Banking Supervision. (1997). Principles for The Management of Interest Rate Risk.

Bessis, J. (2002). *Risk Management in Banking 2nd Edition.* Chichester: John Wiley & Sons Ltd.

Brooks, C. (2008). *Introductory Economics for Finance 2nd Edition.* New York: Cambridge University Press.

Corporate Finance Institute. (2022). *Adjusted R-Squared.* Retrieved July 15, 2022 from https://corporatefinanceinstitute.com/resources/knowledge/other/adjusted-r-squared/

Corporate Finance Institute. (2022). *Median.* Retrieved June 5, 2022 from https://corporatefinanceinstitute.com/resources/knowledge/other/median/

Council of Europe Development Bank. (n.d.). *Liquidity Risk.* Retrieved May 23, 2022 from https://coebank.org/en/investor-relations/risk-management/liquidity-risk/

CSA Institute. (n.d.). *Analisa Ekonomi.* Jakarta: Asosiasi Analis Efek Indonesia.

CSA Institute. (n.d.). *Analisa Laporan Keuangan.* Jakarta: Asosiasi Analis Efek Indonesia.

CSA Institute. (n.d.). *Ekuitas dan Valuasi.* Jakarta: Asosiasi Analis Efek Indonesia.

Dwi, T., Silalahi, A. D., & Nasution, M. D. (2019). Beban Operasional Pendapatan Operasional, Loan to Deposit Ratio dan Kinerja Keuangan. *Seminar Nasional Sains & Teknologi Informasi*, 179-181.

Ebenezer, O. O., & Omar, W. A. (2015). The Empirical Effectsof Credit Risk on Profitability of Commercial Banks: Evidence from Nigeria. *International Journal of Science and Research (IJSR).*

El-Faham, K. (202). *Financial Risk and Financial Performance of Banks in Egypt.* Wales: Doctoral Dissertation, Cardiff Metropolitan University.

Glen, S. (n.d.). *Adjusted R2 / Adjusted R-Squared: What is it used for?* Retrieved August 22, 2022 from https://www.statisticshowto.com/probability-and-statistics/statistics-definitions/adjusted-r2/

Gobat, J. (n.d.). *Banks: At the Heart of the Matter*. Retrieved July 14, 2022 from
https://www.imf.org/external/pubs/ft/fandd/basics/bank.htm

Gujarati, D. N. (2004). *Basic Econometrics 4th Edition.* New York: Mc. Graw-Hill
Book Co.

Hawley, F. B. (1893). The Risk Theory of Profit. *The Quarterly Journal of
Economics* , 459-479.

Hayes, A. (2022). *Multiple Linear Regression (MLR)*. Retrieved July 15, 2022 from
https://www.investopedia.com/terms/m/mlr.asp

Imani, A., & Pracoyo, A. (2018). Analysis Of the Effect Of Capital, Credit Risk,
And Liquidity Risk On Profitability In Banks. *Jurnal Ilmu Manajemen &
Ekonomika*, 44-50.

Indonesia. (1998). *Undang-Undang Nomor 10 Tahun 1998 tentang Perubahan
atas Undang-Undang Nomor 7 Tahun 1992 tentang Perbankan.*

Indonesia, P. B. (2012). *Patent No. 14/26/PBI/2012.*

Kasmir. (2014). *Dasar-Dasar Perbankan Edisi Revisi.* RajaGrafindo Persada.

Keshtgar, N., Pahlavani, M., & Mirjalili, S. H. (2020). The Impact of Exchange
Rate volatility on Banking Performance (case of Iran). *International
Journal of Business and Development Studies*, 39-56.

Khan, W. A., & Sattar, A. (2014). Impact of Interest Rate Changes on the
Profitability of four Major Commercial Banks in Pakistan. *International
Journal of Accounting and Financial Reporting*.

Kusumastuti, W. I., & Alam, A. (2019). Analysis of Impact of CAR, BOPO, NPF
on Profitability of Islamic Banks (Year 2015-2017). *Journal of Islamic
Economic Laws*, 30-59.

Lake, E. (2013). *Financial Risks and Profitability of Commercial Banks in Ethiopia.* Addis Ababa: Master Thesis, Addis Ababa University.

Le, T. (2017). The Determinants of Commercial Bank Profitability in Vietnam. *Centre for Economic and Financial Research, University of Economics and Law*.

Miles, J. (2005). R-squared, Adjusted R-squared. *Encyclopedia of Statistics in Behavioral Science*, 1655–1657.

Mudanya, L. E., & Muturi, W. (2018). Effects of Financial Risk on Profitability of Commercial Banks Listed in the Nairobi Securities Exchange. *Int Journal of Social Sciences Management and Entrepreneurship*, 75-93.

Otoritas Jasa Keuangan. (2012-2022). *Statistik Perbankan Indonesia.* Retrieved May 15, 2022 from https://www.ojk.go.id/en/kanal/perbankan/data-dan-statistik/statistik-perbankan-indonesia/default.aspx

Rose, P. S., & Hudgins, S. C. (2006). *Bank management and financial services 7th edition.* McGraw-Hill Companies.

Santomero, A. M. (1997). Commercial bank risk management: an analysis of the process. *Journal of Financial Services Research*.

Shafiq, A., & Nasr, M. (2010). Risk Management Practices Followed by the Commercial Banks in Pakistan. *International Review of Business Research Papers*, 308 – 325.

Siamat, D. (2005). *Manajemen Lembaga Keuangan: Kebijakan Moneter & Perbankan.* Jakarta: Fakultas Ekonomi Universitas Indonesia.

Siregar, P. A. (2020). Risiko Keuangan dan Pengaruhnya Terhadap Profitabilitas Bank Syariah di Indonesia. *AT-TAWASSUTH: Jurnal Ekonomi Islam*, 120-141.

Suhardjono, & Kuncoro, M. (2005). *Manajemen Perbankan Teori dan Aplikasi.* BPFE.

Sukamulja, S. (2021). *Manajemen Keuangan Korporat.* Yogyakarta: Fakultas Ekonomika dan Bisnis UGM.

Susanto, B. (1995). *Manajemen Akuntansi.* Jakarta: Sansu Moto.

Syakhrun, M., Amin, A., & Anwar. (2019). Pengaruh CAR, BOPO, NPF dan FDR Terhadap Profitabilitas Pada Bank Umum Syariah d Indonesia. *Bongaya Journal of Research in Management*, 1-10.

Tafara, F. N. (2020). *The Financial Ratio Analysis Towards Financial Performance of Commercial Banks in Indonesia.* Cikarang: Thesis, President University.

Tafri, F. H., Hamid, Z., Meera, A. K., & Omar, M. A. (2009). The Impact of Financial Risks on Profitability of Malaysian Commercial Banks: 1996-2005. *World Academy of Science, Engineering and Technology International Journal of Economics and Management Engineering*.

The World Bank. (n.d.). *Domestic Credit Provided by Financial Sector (%GDP) - Indonesia.* Retrieved August 20, 2022 from https://data.worldbank.org/indicator/FS.AST.DOMS.GD.ZS?locations=ID

Tripe, D. (1998). Cost To Income Ratios In Australian Banking. *Department of Finance, Banking and Property, College of Business, Massey University*.

Wibowo, E. S., & Syaichu, M. (2013). Analisi Pengaruh Suku Bunga, Inflasi, CAR, BOPO, NPF Terhadap Profitabilitas Bank Syariah. *DIPONEGORO JOURNAL OF MANAGEMENT*.

Wiedermann, W., Artner, R., & Eye, A. v. (2017). Heteroscedasticity as a Basis of Direction Dependence in Reversible Linear Regression Models. *Multivariate Behavioral Research*.

Yuiani, Y. (2007). Hubungan Efisiensi Operasional Dengan Kinerja Profitabilitas Pada Sektor Perbankan yang Go Publik di Bursa Efek Jakarta. *Jurnal Manajemen & Bisnis Sriwijaya*.

Yusuf, L. (2019). *Analisis Implementasi Prinsip - Prinsip Good Corporate Governance (GCG) Terhadap Kinerja Keuangan Pada PT. BNI SYARIAH*. Banda Aceh: Thesis, UNIVERSITAS ISLAM NEGERI AR-RANIRY.

Zamani, M. I., & Moeljadi. (2012). *Kinerja Keuangan Sebelum dan Sesudah Penerapan Good Corporate Governance Dengan Rasio Return on Assets, Return on Equity, Net Profit Margin, dan Capital Adequancy Ratio*. Malang: Thesis, Universitas Brawijaya.

APPENDIX

Appendix 1: R Code.

```
#Input Dataset
DataFinal<- read_excel("Data.xlsx")

#Read Data
ROA = DataFinal$ROA
ROE = DataFinal$ROE
CR = DataFinal$CR
LIQ = DataFinal$LIQ
CAR = DataFinal$CAR
OE = DataFinal$OE
INFL = DataFinal$INF
IR = DataFinal$IR
FX = DataFinal$FX

#Model Fitting
model1 = lm(ROA~ CR+LIQ+CAR+OE+INFL+IR+FX)
model2 = lm(ROE~ CR+LIQ+CAR+OE+INFL+IR+FX)

#Normality Test
jarque.bera.test(model1$residuals)
jarque.bera.test(model2$residuals)

#Autocorrelation Test
dwtest(model1)
dwtest(model2)

#Multiocollinearity Test
ols_vif_tol(model1)
ols_vif_tol(model2)
```

```
#Heteroscedasticity Test
hmctest(model1)
hmctest(model2)

#Test Result
summary(model1)
summary(model2)
```

Appendix 2: Sample Data.

	ROA	ROE	CR	LIQ	CAR	OE	IR	INF	FX
BCA2012	0,036	0,304	0,004	0,686	0,142	0,624	0,916	0,043	0,070
BRI2012	0,052	0,387	0,018	0,799	0,170	0,599	0,857	0,043	0,070
BNI2012	0,029	0,200	0,028	0,775	0,167	0,710	0,860	0,043	0,070
Mandiri2012	0,036	0,272	0,017	0,777	0,155	0,639	0,785	0,043	0,070
Panin2012	0,020	0,154	0,017	0,885	0,147	0,741	0,900	0,043	0,070
Danamon2012	0,027	0,162	0,023	1,007	0,189	0,750	0,816	0,043	0,070
CIMB2012	0,032	0,209	0,023	0,950	0,152	0,717	0,957	0,043	0,070
Permata2012	0,017	0,175	0,014	0,895	0,159	0,831	1,032	0,043	0,070
BTPN2012	0,047	0,265	0,006	0,860	0,215	0,740	0,882	0,043	0,070
OCBC2012	0,018	0,122	0,009	0,868	0,165	0,789	0,896	0,043	0,070
BCA2013	0,038	0,282	0,004	0,754	0,157	0,615	0,912	0,084	0,260
BRI2013	0,050	0,341	0,016	0,885	0,170	0,606	0,852	0,084	0,260
BNI2013	0,034	0,225	0,022	0,853	0,151	0,671	0,846	0,084	0,260
Mandiri2013	0,037	0,273	0,016	0,830	0,149	0,624	0,795	0,084	0,260
Panin2013	0,019	0,146	0,021	0,877	0,153	0,741	0,933	0,084	0,260
Danamon2013	0,025	0,145	0,019	0,951	0,179	0,829	0,831	0,084	0,260
CIMB2013	0,028	0,177	0,022	0,945	0,154	0,738	0,927	0,084	0,260
Permata2013	0,016	0,157	0,010	0,893	0,143	0,850	0,985	0,084	0,260
BTPN2013	0,045	0,262	0,007	0,880	0,231	0,750	0,872	0,084	0,260
OCBC2013	0,018	0,119	0,007	0,925	0,193	0,780	0,866	0,084	0,260
BCA2014	0,039	0,255	0,006	0,768	0,169	0,624	0,904	0,084	0,020
BRI2014	0,047	0,312	0,017	0,817	0,183	0,654	0,865	0,084	0,020
BNI2014	0,035	0,236	0,020	0,878	0,162	0,680	0,851	0,084	0,020
Mandiri2014	0,036	0,258	0,017	0,820	0,166	0,650	0,795	0,084	0,020
Panin2014	0,022	0,092	0,020	0,955	0,173	0,798	0,899	0,084	0,020
Danamon2014	0,019	0,086	0,023	0,926	0,178	0,764	0,829	0,084	0,020
CIMB2014	0,014	0,085	0,039	0,995	0,156	0,879	0,913	0,084	0,020
Permata2014	0,012	0,122	0,017	0,891	0,136	0,898	0,963	0,084	0,020
BTPN2014	0,036	0,186	0,007	0,970	0,232	0,800	0,829	0,084	0,020
OCBC2014	0,018	0,097	0,013	0,936	0,187	0,795	0,860	0,084	0,020

BCA2015	0,038	0,219	0,007	0,811	0,187	0,632	0,885	0,034	0,110
BRI2015	0,042	0,299	0,020	0,869	0,206	0,680	0,856	0,034	0,110
BNI2015	0,026	0,172	0,027	0,878	0,195	0,755	0,865	0,034	0,110
Mandiri2015	0,032	0,230	0,023	0,871	0,186	0,697	0,794	0,034	0,110
Panin2015	0,013	0,061	0,024	0,988	0,175	0,867	0,836	0,034	0,110
Danamon2015	0,017	0,074	0,030	0,875	0,197	0,834	0,826	0,034	0,110
CIMB2015	0,002	0,015	0,037	0,980	0,163	0,974	0,912	0,034	0,110
Permata2015	0,002	0,018	0,027	0,878	0,150	0,989	0,975	0,034	0,110
BTPN2015	0,031	0,141	0,007	0,970	0,238	0,820	0,812	0,034	0,110
OCBC2015	0,017	0,096	0,013	0,981	0,173	0,801	0,870	0,034	0,110
BCA2016	0,040	0,205	0,013	0,771	0,219	0,604	0,875	0,030	-0,030
BRI2016	0,038	0,231	0,020	0,878	0,229	0,689	0,846	0,030	-0,030
BNI2016	0,027	0,155	0,030	0,904	0,194	0,736	0,861	0,030	-0,030
Mandiri2016	0,020	0,111	0,040	0,859	0,214	0,809	0,786	0,030	-0,030
Panin2016	0,017	0,083	0,028	0,944	0,185	0,830	0,867	0,030	-0,030
Danamon2016	0,025	0,080	0,031	0,910	0,209	0,773	0,795	0,030	-0,030
CIMB2016	0,011	0,058	0,039	0,984	0,180	0,901	0,891	0,030	-0,030
Permata2016	-0,049	-0,383	0,088	0,805	0,156	1,508	0,986	0,030	-0,030
BTPN2016	0,031	0,126	0,008	0,950	0,250	0,820	0,803	0,030	-0,030
OCBC2016	0,019	0,099	0,019	0,899	0,183	0,798	0,874	0,030	-0,030
BCA2017	0,039	0,192	0,015	0,782	0,231	0,586	0,863	0,036	0,010
BRI2017	0,037	0,200	0,021	0,881	0,230	0,691	0,840	0,036	0,010
BNI2017	0,027	0,156	0,023	0,856	0,185	0,710	0,873	0,036	0,010
Mandiri2017	0,027	0,145	0,035	0,872	0,216	0,718	0,776	0,036	0,010
Panin2017	0,016	0,075	0,028	0,963	0,192	0,850	0,869	0,036	0,010
Danamon2017	0,031	0,105	0,028	0,933	0,221	0,721	0,777	0,036	0,010
CIMB2017	0,017	0,083	0,038	0,962	0,186	0,835	0,880	0,036	0,010
Permata2017	0,006	0,048	0,046	0,875	0,181	0,948	0,909	0,036	0,010
BTPN2017	0,021	0,082	0,009	0,962	0,241	0,865	0,793	0,036	0,010
OCBC2017	0,020	0,107	0,018	0,934	0,175	0,771	0,872	0,036	0,010
BCA2018	0,040	0,188	0,014	0,816	0,234	0,582	0,851	0,031	0,070
BRI2018	0,037	0,205	0,021	0,896	0,212	0,685	0,846	0,031	0,070
BNI2018	0,028	0,161	0,019	0,888	0,185	0,701	0,846	0,031	0,070

Mandiri2018	0,032	0,162	0,028	0,955	0,210	0,665	0,779	0,031	0,070
Panin2018	0,022	0,092	0,030	1,042	0,201	0,783	0,891	0,031	0,070
Danamon2018	0,031	0,106	0,027	0,950	0,222	0,708	0,792	0,031	0,070
CIMB2018	0,019	0,091	0,031	0,972	0,197	0,810	0,879	0,031	0,070
Permata2018	0,008	0,050	0,044	0,901	0,194	0,925	0,918	0,031	0,070
BTPN2018	0,030	0,116	0,012	0,962	0,246	0,801	0,775	0,031	0,070
OCBC2018	0,021	0,118	0,017	0,935	0,176	0,744	0,878	0,031	0,070
BCA2019	0,040	0,180	0,013	0,805	0,238	0,591	0,844	0,027	0,040
BRI2019	0,035	0,194	0,026	0,886	0,226	0,701	0,843	0,027	0,040
BNI2019	0,024	0,140	0,023	0,915	0,197	0,732	0,848	0,027	0,040
Mandiri2019	0,030	0,151	0,024	0,964	0,214	0,674	0,774	0,027	0,040
Panin2019	0,021	0,089	0,030	1,079	0,208	0,780	0,853	0,027	0,040
CIMB2019	0,019	0,087	0,028	0,978	0,215	0,824	0,873	0,027	0,040
Permata2019	0,013	0,072	0,028	0,863	0,199	0,857	0,894	0,027	0,040
BTPN2019	0,023	0,099	0,008	1,631	0,242	0,845	0,796	0,027	0,040
OCBC2019	0,022	0,116	0,017	0,941	0,192	0,748	0,865	0,027	0,040
BCA2020	0,033	0,165	0,018	0,658	0,258	0,635	0,852	0,017	0,010
BRI2020	0,020	0,111	0,029	0,837	0,206	0,812	0,835	0,017	0,010
BNI2020	0,005	0,029	0,043	0,873	0,168	0,933	0,896	0,017	0,010
Mandiri2020	0,016	0,094	0,033	0,830	0,199	0,800	0,742	0,017	0,010
Panin2020	0,019	0,077	0,030	0,833	0,270	0,795	0,831	0,017	0,010
Danamon2020	0,010	0,027	0,028	0,840	0,250	0,889	0,787	0,017	0,010
CIMB2020	0,011	0,050	0,036	0,829	0,219	0,894	0,864	0,017	0,010
Permata2020	0,010	0,031	0,029	0,787	0,357	0,888	0,786	0,017	0,010
BTPN2020	0,014	0,061	0,012	1,342	0,256	0,895	0,776	0,017	0,010
OCBC2020	0,015	0,075	0,019	0,718	0,220	0,811	0,869	0,017	0,010
BCA2021	0,034	0,183	0,022	0,620	0,257	0,542	0,858	0,019	0,010
BRI2021	0,027	0,169	0,031	0,837	0,253	0,743	0,799	0,019	0,010
BNI2021	0,014	0,104	0,037	0,797	0,197	0,812	0,910	0,019	0,010
Mandiri2021	0,025	0,162	0,028	0,800	0,196	0,673	0,740	0,019	0,010
Panin2021	0,014	0,048	0,035	0,881	0,278	0,861	0,805	0,019	0,010
Danamon2021	0,010	0,041	0,027	0,846	0,267	0,866	0,770	0,019	0,010
CIMB2021	0,019	0,102	0,035	0,744	0,227	0,784	0,854	0,019	0,010

Permata2021	0,007	0,029	0,032	0,690	0,349	0,901	0,821	0,019	0,010
BTPN2021	0,022	0,086	0,017	1,231	0,262	0,805	0,765	0,019	0,010
OCBC2021	0,016	0,083	0,024	0,717	0,231	0,765	0,867	0,019	0,010

Appendix 3: Durbin-Watson Table.

Durbin-Watson Statistic: 5 Per Cent Significance Points of dL and dU

	k'*=1		k'=2		k'=3		k'=4		k'=5		k'=6		k'=7		k'=8		k'=9		k'=10	
n	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU	dL	dU
6	0.610	1.400	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
7	0.700	1.356	0.467	1.896	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
8	0.763	1.332	0.559	1.777	0.367	2.287	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
9	0.824	1.320	0.629	1.699	0.455	2.128	0.296	2.588	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
10	0.879	1.320	0.697	1.641	0.525	2.016	0.376	2.414	0.243	2.822	-----	-----	-----	-----	-----	-----	-----	-----	-----	-----
11	0.927	1.324	0.758	1.604	0.595	1.928	0.444	2.283	0.315	2.645	0.203	3.004	-----	-----	-----	-----	-----	-----	-----	-----
12	0.971	1.331	0.812	1.579	0.658	1.864	0.512	2.177	0.380	2.506	0.268	2.832	0.171	3.149	-----	-----	-----	-----	-----	-----
13	1.010	1.340	0.861	1.562	0.715	1.816	0.574	2.094	0.444	2.390	0.328	2.692	0.230	2.985	0.147	3.266	-----	-----	-----	-----
14	1.045	1.350	0.905	1.551	0.767	1.779	0.632	2.030	0.505	2.296	0.389	2.572	0.286	2.848	0.200	3.111	0.127	3.360	-----	-----
15	1.077	1.361	0.946	1.543	0.814	1.750	0.685	1.977	0.562	2.220	0.447	2.471	0.343	2.727	0.251	2.979	0.175	3.216	0.111	3.438
16	1.106	1.371	0.982	1.539	0.857	1.728	0.734	1.935	0.615	2.157	0.502	2.388	0.398	2.624	0.304	2.860	0.222	3.090	0.155	3.304
17	1.133	1.381	1.015	1.536	0.897	1.710	0.779	1.900	0.664	2.104	0.554	2.318	0.451	2.537	0.356	2.757	0.272	2.975	0.198	3.184
18	1.158	1.391	1.046	1.535	0.933	1.696	0.820	1.872	0.710	2.060	0.603	2.258	0.502	2.461	0.407	2.668	0.321	2.873	0.244	3.073
19	1.180	1.401	1.074	1.536	0.967	1.685	0.859	1.848	0.752	2.023	0.649	2.206	0.549	2.396	0.456	2.589	0.369	2.783	0.290	2.974
20	1.201	1.411	1.100	1.537	0.998	1.676	0.894	1.828	0.792	1.991	0.691	2.162	0.595	2.339	0.502	2.521	0.416	2.704	0.336	2.885
21	1.221	1.420	1.125	1.538	1.026	1.669	0.927	1.812	0.829	1.964	0.731	2.124	0.637	2.290	0.546	2.461	0.461	2.633	0.380	2.806
22	1.239	1.429	1.147	1.541	1.053	1.664	0.958	1.797	0.863	1.940	0.769	2.090	0.677	2.246	0.588	2.407	0.504	2.571	0.424	2.735
23	1.257	1.437	1.168	1.543	1.078	1.660	0.986	1.785	0.895	1.920	0.804	2.061	0.715	2.208	0.628	2.360	0.545	2.514	0.465	2.670
24	1.273	1.446	1.188	1.546	1.101	1.656	1.013	1.775	0.925	1.902	0.837	2.035	0.750	2.174	0.666	2.318	0.584	2.464	0.506	2.613
25	1.288	1.454	1.206	1.550	1.123	1.654	1.038	1.767	0.953	1.886	0.868	2.013	0.784	2.144	0.702	2.280	0.621	2.419	0.544	2.560
26	1.302	1.461	1.224	1.553	1.143	1.652	1.062	1.759	0.979	1.873	0.897	1.992	0.816	2.117	0.735	2.246	0.657	2.379	0.581	2.513
27	1.316	1.469	1.240	1.556	1.162	1.651	1.084	1.753	1.004	1.861	0.925	1.974	0.845	2.093	0.767	2.216	0.691	2.342	0.616	2.470
28	1.328	1.476	1.255	1.560	1.181	1.650	1.104	1.747	1.028	1.850	0.951	1.959	0.874	2.071	0.798	2.188	0.723	2.309	0.649	2.431
29	1.341	1.483	1.270	1.563	1.198	1.650	1.124	1.743	1.050	1.841	0.975	1.944	0.900	2.052	0.826	2.164	0.753	2.278	0.681	2.396
30	1.352	1.489	1.284	1.567	1.214	1.650	1.143	1.739	1.071	1.833	0.998	1.931	0.926	2.034	0.854	2.141	0.782	2.251	0.712	2.363
31	1.363	1.496	1.297	1.570	1.229	1.650	1.160	1.735	1.090	1.825	1.020	1.920	0.950	2.018	0.879	2.120	0.810	2.226	0.741	2.333
32	1.373	1.502	1.309	1.574	1.244	1.650	1.177	1.732	1.109	1.819	1.041	1.909	0.972	2.004	0.904	2.102	0.836	2.203	0.769	2.306
33	1.383	1.508	1.321	1.577	1.258	1.651	1.193	1.730	1.127	1.813	1.061	1.900	0.994	1.991	0.927	2.085	0.861	2.181	0.796	2.281
34	1.393	1.514	1.333	1.580	1.271	1.652	1.208	1.728	1.144	1.808	1.079	1.891	1.015	1.978	0.950	2.069	0.885	2.162	0.821	2.257
35	1.402	1.519	1.343	1.584	1.283	1.653	1.222	1.726	1.160	1.803	1.097	1.884	1.034	1.967	0.971	2.054	0.908	2.144	0.845	2.236
36	1.411	1.525	1.354	1.587	1.295	1.654	1.236	1.724	1.175	1.799	1.114	1.876	1.053	1.957	0.991	2.041	0.930	2.127	0.868	2.216
37	1.419	1.530	1.364	1.590	1.307	1.655	1.249	1.723	1.190	1.795	1.131	1.870	1.071	1.948	1.011	2.029	0.951	2.112	0.891	2.197
38	1.427	1.535	1.373	1.594	1.318	1.656	1.261	1.722	1.204	1.792	1.146	1.864	1.088	1.939	1.029	2.017	0.970	2.098	0.912	2.180
39	1.435	1.540	1.382	1.597	1.328	1.658	1.273	1.722	1.218	1.789	1.161	1.859	1.104	1.932	1.047	2.007	0.990	2.085	0.932	2.164
40	1.442	1.544	1.391	1.600	1.338	1.659	1.285	1.721	1.230	1.786	1.175	1.854	1.120	1.924	1.064	1.997	1.008	2.072	0.952	2.149
45	1.475	1.566	1.430	1.615	1.383	1.666	1.336	1.720	1.287	1.776	1.238	1.835	1.189	1.895	1.139	1.958	1.089	2.022	1.038	2.088
50	1.503	1.585	1.462	1.628	1.421	1.674	1.378	1.721	1.335	1.771	1.291	1.822	1.246	1.875	1.201	1.930	1.156	1.986	1.110	2.044
55	1.528	1.601	1.490	1.641	1.452	1.681	1.414	1.724	1.374	1.768	1.334	1.814	1.294	1.861	1.253	1.909	1.212	1.959	1.170	2.010
60	1.549	1.616	1.514	1.652	1.480	1.689	1.444	1.727	1.408	1.767	1.372	1.808	1.335	1.850	1.298	1.894	1.260	1.939	1.222	1.984
65	1.567	1.629	1.536	1.662	1.503	1.696	1.471	1.731	1.438	1.767	1.404	1.805	1.370	1.843	1.336	1.882	1.301	1.923	1.266	1.964
70	1.583	1.641	1.554	1.672	1.525	1.703	1.494	1.735	1.464	1.768	1.433	1.802	1.401	1.838	1.369	1.874	1.337	1.910	1.305	1.948
75	1.598	1.652	1.571	1.680	1.543	1.709	1.515	1.739	1.487	1.770	1.458	1.801	1.428	1.834	1.399	1.867	1.369	1.901	1.339	1.935
80	1.611	1.662	1.586	1.688	1.560	1.715	1.534	1.743	1.507	1.772	1.480	1.801	1.453	1.831	1.425	1.861	1.397	1.893	1.369	1.925
85	1.624	1.671	1.600	1.696	1.575	1.721	1.550	1.747	1.525	1.774	1.500	1.801	1.474	1.829	1.448	1.857	1.422	1.886	1.396	1.916
90	1.635	1.679	1.612	1.703	1.589	1.726	1.566	1.751	1.542	1.776	1.518	1.801	1.494	1.827	1.469	1.854	1.445	1.881	1.420	1.909
95	1.645	1.687	1.623	1.709	1.602	1.732	1.579	1.755	1.557	1.778	1.535	1.802	1.512	1.827	1.489	1.852	1.465	1.877	1.442	1.903
100	1.654	1.694	1.634	1.715	1.613	1.736	1.592	1.758	1.571	1.780	1.550	1.803	1.528	1.826	1.506	1.850	1.484	1.874	1.462	1.898
150	1.720	1.747	1.706	1.760	1.693	1.774	1.679	1.788	1.665	1.802	1.651	1.817	1.637	1.832	1.622	1.846	1.608	1.862	1.593	1.877
200	1.758	1.779	1.748	1.789	1.738	1.799	1.728	1.809	1.718	1.820	1.707	1.831	1.697	1.841	1.686	1.852	1.675	1.863	1.665	1.874

*k' is the number of regressors excluding the intercept

Appendix 4: Chi-distribution Table.

Chi-square Distribution Table

d.f.	.995	.99	.975	.95	.9	.1	.05	.025	.01
1	0.00	0.00	0.00	0.00	0.02	2.71	3.84	5.02	6.63
2	0.01	0.02	0.05	0.10	0.21	4.61	5.99	7.38	9.21
3	0.07	0.11	0.22	0.35	0.58	6.25	7.81	9.35	11.34
4	0.21	0.30	0.48	0.71	1.06	7.78	9.49	11.14	13.28
5	0.41	0.55	0.83	1.15	1.61	9.24	11.07	12.83	15.09
6	0.68	0.87	1.24	1.64	2.20	10.64	12.59	14.45	16.81
7	0.99	1.24	1.69	2.17	2.83	12.02	14.07	16.01	18.48
8	1.34	1.65	2.18	2.73	3.49	13.36	15.51	17.53	20.09
9	1.73	2.09	2.70	3.33	4.17	14.68	16.92	19.02	21.67
10	2.16	2.56	3.25	3.94	4.87	15.99	18.31	20.48	23.21
11	2.60	3.05	3.82	4.57	5.58	17.28	19.68	21.92	24.72
12	3.07	3.57	4.40	5.23	6.30	18.55	21.03	23.34	26.22
13	3.57	4.11	5.01	5.89	7.04	19.81	22.36	24.74	27.69
14	4.07	4.66	5.63	6.57	7.79	21.06	23.68	26.12	29.14
15	4.60	5.23	6.26	7.26	8.55	22.31	25.00	27.49	30.58
16	5.14	5.81	6.91	7.96	9.31	23.54	26.30	28.85	32.00
17	5.70	6.41	7.56	8.67	10.09	24.77	27.59	30.19	33.41
18	6.26	7.01	8.23	9.39	10.86	25.99	28.87	31.53	34.81
19	6.84	7.63	8.91	10.12	11.65	27.20	30.14	32.85	36.19
20	7.43	8.26	9.59	10.85	12.44	28.41	31.41	34.17	37.57
22	8.64	9.54	10.98	12.34	14.04	30.81	33.92	36.78	40.29
24	9.89	10.86	12.40	13.85	15.66	33.20	36.42	39.36	42.98
26	11.16	12.20	13.84	15.38	17.29	35.56	38.89	41.92	45.64
28	12.46	13.56	15.31	16.93	18.94	37.92	41.34	44.46	48.28
30	13.79	14.95	16.79	18.49	20.60	40.26	43.77	46.98	50.89
32	15.13	16.36	18.29	20.07	22.27	42.58	46.19	49.48	53.49
34	16.50	17.79	19.81	21.66	23.95	44.90	48.60	51.97	56.06
38	19.29	20.69	22.88	24.88	27.34	49.51	53.38	56.90	61.16
42	22.14	23.65	26.00	28.14	30.77	54.09	58.12	61.78	66.21
46	25.04	26.66	29.16	31.44	34.22	58.64	62.83	66.62	71.20
50	27.99	29.71	32.36	34.76	37.69	63.17	67.50	71.42	76.15
55	31.73	33.57	36.40	38.96	42.06	68.80	73.31	77.38	82.29
60	35.53	37.48	40.48	43.19	46.46	74.40	79.08	83.30	88.38
65	39.38	41.44	44.60	47.45	50.88	79.97	84.82	89.18	94.42
70	43.28	45.44	48.76	51.74	55.33	85.53	90.53	95.02	100.43
75	47.21	49.48	52.94	56.05	59.79	91.06	96.22	100.84	106.39
80	51.17	53.54	57.15	60.39	64.28	96.58	101.88	106.63	112.33
85	55.17	57.63	61.39	64.75	68.78	102.08	107.52	112.39	118.24
90	59.20	61.75	65.65	69.13	73.29	107.57	113.15	118.14	124.12
95	63.25	65.90	69.92	73.52	77.82	113.04	118.75	123.86	129.97
100	67.33	70.06	74.22	77.93	82.36	118.50	124.34	129.56	135.81

Appendix 5: F-distribution Table.

Critical Values of the F-Distribution: $\alpha = 0.05$

Denom. d.f.	Numerator Degrees of Freedom									
	1	2	3	4	5	6	7	8	9	10
1	161.448	199.500	215.707	224.583	230.162	233.986	236.768	238.883	240.543	241.882
2	18.513	19.000	19.164	19.247	19.296	19.330	19.353	19.371	19.385	19.396
3	10.128	9.552	9.277	9.117	9.013	8.941	8.887	8.845	8.812	8.786
4	7.709	6.944	6.591	6.388	6.256	6.163	6.094	6.041	5.999	5.964
5	6.608	5.786	5.409	5.192	5.050	4.950	4.876	4.818	4.772	4.735
6	5.987	5.143	4.757	4.534	4.387	4.284	4.207	4.147	4.099	4.060
7	5.591	4.737	4.347	4.120	3.972	3.866	3.787	3.726	3.677	3.637
8	5.318	4.459	4.066	3.838	3.687	3.581	3.500	3.438	3.388	3.347
9	5.117	4.256	3.863	3.633	3.482	3.374	3.293	3.230	3.179	3.137
10	4.965	4.103	3.708	3.478	3.326	3.217	3.135	3.072	3.020	2.978
11	4.844	3.982	3.587	3.357	3.204	3.095	3.012	2.948	2.896	2.854
12	4.747	3.885	3.490	3.259	3.106	2.996	2.913	2.849	2.796	2.753
13	4.667	3.806	3.411	3.179	3.025	2.915	2.832	2.767	2.714	2.671
14	4.600	3.739	3.344	3.112	2.958	2.848	2.764	2.699	2.646	2.602
15	4.543	3.682	3.287	3.056	2.901	2.790	2.707	2.641	2.588	2.544
16	4.494	3.634	3.239	3.007	2.852	2.741	2.657	2.591	2.538	2.494
17	4.451	3.592	3.197	2.965	2.810	2.699	2.614	2.548	2.494	2.450
18	4.414	3.555	3.160	2.928	2.773	2.661	2.577	2.510	2.456	2.412
19	4.381	3.522	3.127	2.895	2.740	2.628	2.544	2.477	2.423	2.378
20	4.351	3.493	3.098	2.866	2.711	2.599	2.514	2.447	2.393	2.348
21	4.325	3.467	3.072	2.840	2.685	2.573	2.488	2.420	2.366	2.321
22	4.301	3.443	3.049	2.817	2.661	2.549	2.464	2.397	2.342	2.297
23	4.279	3.422	3.028	2.796	2.640	2.528	2.442	2.375	2.320	2.275
24	4.260	3.403	3.009	2.776	2.621	2.508	2.423	2.355	2.300	2.255
25	4.242	3.385	2.991	2.759	2.603	2.490	2.405	2.337	2.282	2.236
26	4.225	3.369	2.975	2.743	2.587	2.474	2.388	2.321	2.265	2.220
27	4.210	3.354	2.960	2.728	2.572	2.459	2.373	2.305	2.250	2.204
28	4.196	3.340	2.947	2.714	2.558	2.445	2.359	2.291	2.236	2.190
29	4.183	3.328	2.934	2.701	2.545	2.432	2.346	2.278	2.223	2.177
30	4.171	3.316	2.922	2.690	2.534	2.421	2.334	2.266	2.211	2.165
31	4.160	3.305	2.911	2.679	2.523	2.409	2.323	2.255	2.199	2.153
32	4.149	3.295	2.901	2.668	2.512	2.399	2.313	2.244	2.189	2.142
33	4.139	3.285	2.892	2.659	2.503	2.389	2.303	2.235	2.179	2.133
34	4.130	3.276	2.883	2.650	2.494	2.380	2.294	2.225	2.170	2.123
35	4.121	3.267	2.874	2.641	2.485	2.372	2.285	2.217	2.161	2.114
36	4.113	3.259	2.866	2.634	2.477	2.364	2.277	2.209	2.153	2.106
37	4.105	3.252	2.859	2.626	2.470	2.356	2.270	2.201	2.145	2.098
38	4.098	3.245	2.852	2.619	2.463	2.349	2.262	2.194	2.138	2.091
39	4.091	3.238	2.845	2.612	2.456	2.342	2.255	2.187	2.131	2.084
40	4.085	3.232	2.839	2.606	2.449	2.336	2.249	2.180	2.124	2.077
41	4.079	3.226	2.833	2.600	2.443	2.330	2.243	2.174	2.118	2.071
42	4.073	3.220	2.827	2.594	2.438	2.324	2.237	2.168	2.112	2.065
43	4.067	3.214	2.822	2.589	2.432	2.318	2.232	2.163	2.106	2.059
44	4.062	3.209	2.816	2.584	2.427	2.313	2.226	2.157	2.101	2.054
45	4.057	3.204	2.812	2.579	2.422	2.308	2.221	2.152	2.096	2.049
46	4.052	3.200	2.807	2.574	2.417	2.304	2.216	2.147	2.091	2.044
47	4.047	3.195	2.802	2.570	2.413	2.299	2.212	2.143	2.086	2.039
48	4.043	3.191	2.798	2.565	2.409	2.295	2.207	2.138	2.082	2.035
49	4.038	3.187	2.794	2.561	2.404	2.290	2.203	2.134	2.077	2.030
50	4.034	3.183	2.790	2.557	2.400	2.286	2.199	2.130	2.073	2.026
60	4.001	3.150	2.758	2.525	2.368	2.254	2.167	2.097	2.040	1.993
70	3.978	3.128	2.736	2.503	2.346	2.231	2.143	2.074	2.017	1.969
80	3.960	3.111	2.719	2.486	2.329	2.214	2.126	2.056	1.999	1.951
90	3.947	3.098	2.706	2.473	2.316	2.201	2.113	2.043	1.986	1.938
100	3.936	3.087	2.696	2.463	2.305	2.191	2.103	2.032	1.975	1.927
120	3.920	3.072	2.680	2.447	2.290	2.175	2.087	2.016	1.959	1.910
140	3.909	3.061	2.669	2.436	2.279	2.164	2.076	2.005	1.947	1.899
180	3.894	3.046	2.655	2.422	2.264	2.149	2.061	1.990	1.932	1.884
200	3.888	3.041	2.650	2.417	2.259	2.144	2.056	1.985	1.927	1.878
∞	3.841	2.996	2.605	2.372	2.214	2.099	2.010	1.938	1.880	1.831