APPENDIX TO CHAPTER 4

A4.1 THE LONDON CONGESTION CHARGING SCHEME DATA

A4.1 THE CHALERM MAHANAKORN EXPRESSWAY BANGKOK DATA

This research uses speed and flow survey data from the Chalerm Mahanakorn Expressway, an important toll way in Bangkok. The data were collected on Tuesday 20th Friday 30th and Saturday 31st July 2010 and on Monday 2nd August 2010 by the Expressway Authority of Thailand.

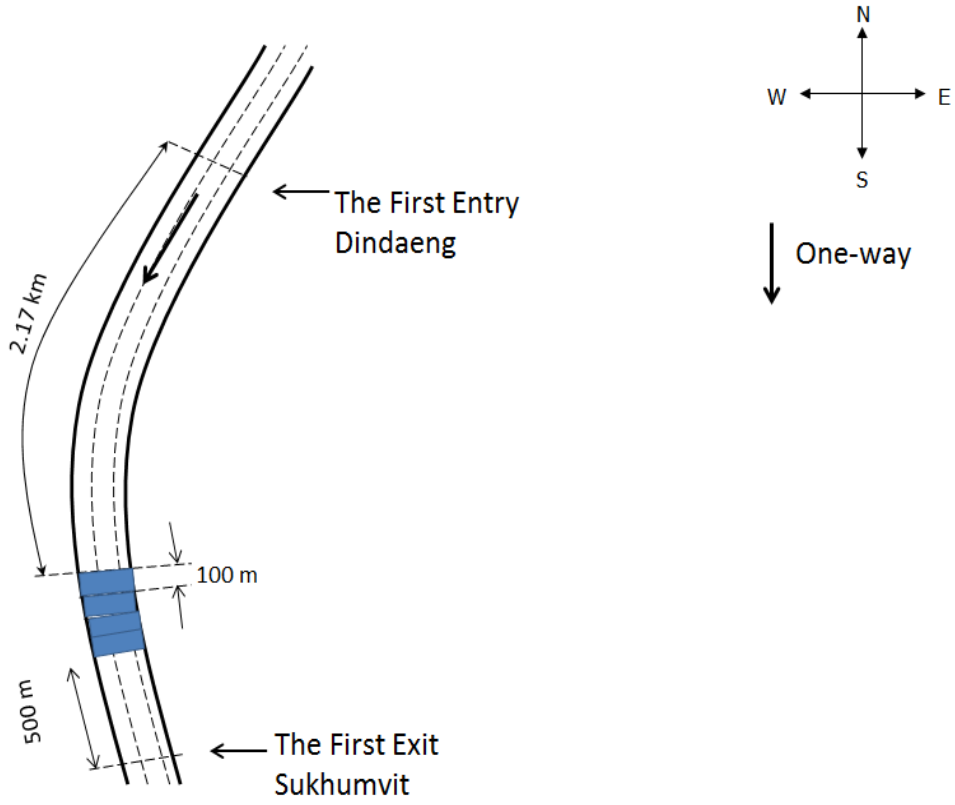

Figure A4.1.1 The Chalerm Mahanakorn Expressway in Bangkok: Outbound Route

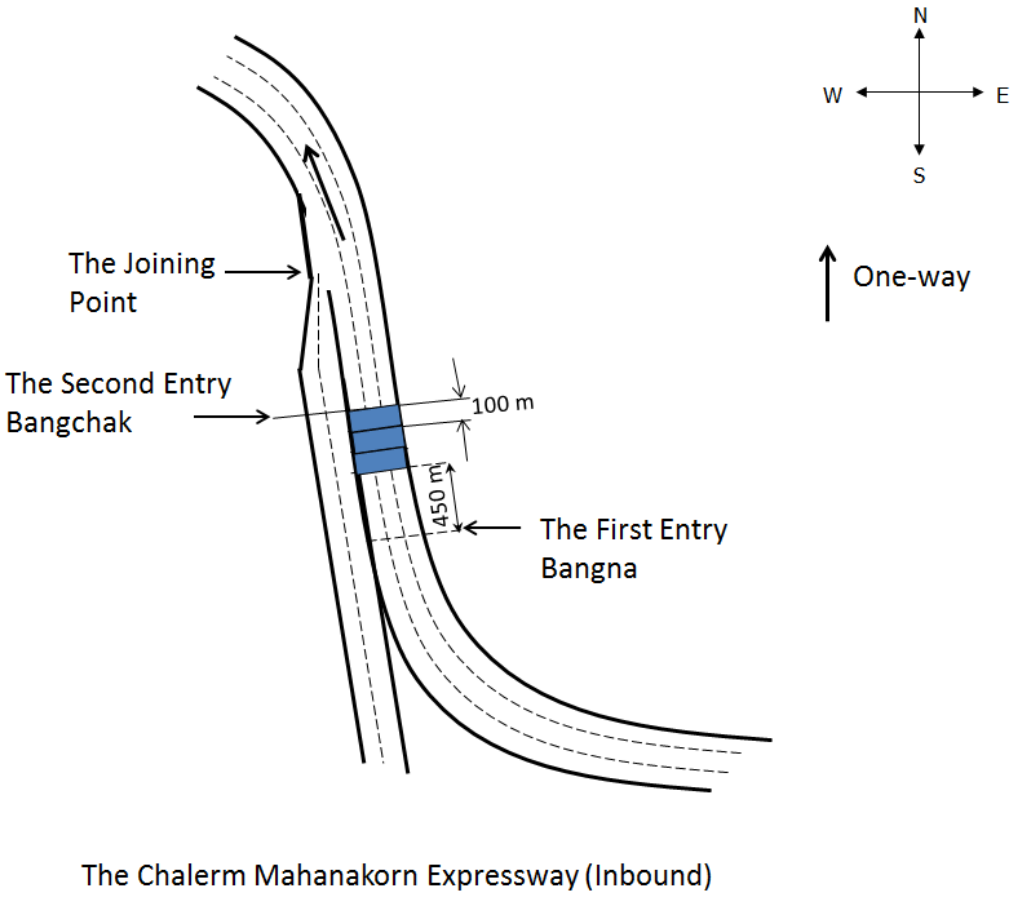

Figure A4.1.2 The Chalerm Mahanakorn Expressway in Bangkok: Inbound Route

The traffic survey observed flows of three vehicle types. The first type was four-wheel passenger vehicles (motorbikes are not allowed on the Expressway). The second type was large vehicles used for transporting goods and buses i.e. vehicles with 6-wheels, 8-wheels, 10-wheels, and more than-10-wheels. The third type was exempt vehicles which had privilege authorization from the Expressway Authority of Thailand and they were exempted from the toll. These exempt vehicles include ambulances, fire engines, police cars, diplomatic and official cars, rescue cars, and those with parades.

The flow data used for this study were based on the total number of toll passes sold in every hour for the different vehicle types collected at the tollbooths and the automatic counters. The collecting points used were at the first entry point at each end of the Chalerm Mahanakorn Expressway, i.e. the Dindaeng and the Bangna, the average data gave the flows up to the second entry point. As the exit data were not collected, flow data could not be constructed for points after the first exits. Meanwhile, the speeds used in this research, were reported by two floating cars with GPRS monitoring. In this survey, these cars were driving on 18 kilometres of road from Dindaeng continuously to Bangna and returned from Bangna back to Dindaeng, from 7.00 a.m. to 21.00 p.m. in the four days. The GPRS on each car simultaneously reported approximately 27 speed observations per minute or almost 1,600 observations per hour.

Our study aims to estimate the equilibrium speed-flow relation on homogenous segments of road. Therefore, we deliberately choose the straight road segments without any immediate post impediment. Consequently, we consider straight road segments which are not too near to the first entries and the exits, and not too near to curved sections of road. Thus, we use speed observations on four 100-metre road segments, 2.17 kilometres from the Dindaeng tollbooth, and three 100-metre road segments, 450 metres from the Bangna tollbooth as shown in Figure A4.1.1 and Figure A4.1.2.

We use as data the average speed of a floating car on each of the different road segments. As discussed earlier, flows are observed every hour, whereas speeds are observed in continuous time. Therefore, we develop a simple method to interpolate flows corresponding to the average speeds. We calculate an average

speed with an associated time for the floating car to get to each midpoint. To do this, we estimate the length of time vehicles take to travel to the midpoints by the dividing the distance from entry to the midpoint by estimated average speed to the midpoint. We take away this length of time from average time of the reported speeds. Finally, we estimate flows which were associated with the average speeds through interpolation of the hourly flow data. The initial observed flow data are flows at the entry point of the Chalerm Mahanakorn Expressway.

A4.2 ADDITIONAL EMPIRICAL INVESTIGATION OF HYPERCONGESTION IN LONDON CONGESTION CHARGING SCHEME

In addition to the empirical investigation of hypercongestion in the London Congestion Charging Scheme discussed in Chapter 4, we estimate log specifications to examine relationships between flow and speed using (A4.2.1).

$$lnF = \delta + \theta\ lnV + \sigma \qquad \text{(A4.2.1)}$$

where *F* and *V* denotes traffic speeds and flows respectively.

The regressions are reported in Table A4.2.1. The results show that only two of slope coefficients are statistically significantly differently from zero at 90% confidence level. None of regressions passed the Normality test and two failed the RESET test. All of them passed the Heteroscedasticity and White tests. The predicted flows corresponding to results in Table A4.2.1 are reported in Figure A4.2.1; they give flat relationships.

Next, we adjust the specification by aggregating all observations of seven streets into a single data set. In order to check whether we can use the same log specification for seven streets, we, therefore, add seven dummy variables to intercept and slope terms. In addition to the diagnostic tests, we apply testing of restrictions for equality for each of the intercept and slope terms. The results in Table A4.2.2 show that we reject the hypothesis of equality in intercept terms.

Table A4.2.1 Log Flow-Speed Specifications : Dependent Variable *lnF*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	6.733***	6.753***	7.916***	7.299***	7.245***	6.846***	6.910***
	(282.21)	(109.04)	(124.40)	(157.33)	(590.37)	(234.82)	(119.18)
lnV	-0.010	0.003	-0.034*	-0.002	0.001	-0.010	-0.032**
	(-1.33)	(0.20)	(-1.96)	(-0.23)	(0.26)	(-1.17)	(-2.01)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	1.77	0.04	3.84	0.05	0.07	1.37	4.04
Adjusted R^2	0.002	0.005	0.027	0.002	0.001	0.002	0.042
Heteroscedasticity :Chi-Squared	0.01	1.25	1.51	0.02	0.09	1.01	0.62
	(0.92)	(0.26)	(0.21)	(0.88)	(0.76)	(0.31)	(0.43)
White Test:Chi-Squared	0.20	2.21	2.43	1.23	0.87	3.14	3.91
	(0.90)	(0.33)	(0.29)	(0.54)	(0.64)	(0.20)	(0.14)
RESET:F-Statistics	1.69	0.53	0.27	5.03	3.71	0.05	0.04
	(0.16)	(0.66)	(0.84)	(0.00)	(0.01)	(0.98)	(0.98)
Normality:Chi-Squared	66.05	4.78	5.57	16.40	14.03	5.50	7.79
	(0.00)	(0.09)	(0.06)	(0.00)	(0.00)	(0.06)	(0.02)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’

Table A4.2.2 Log Flow-Speed Specification: Dependent Variable *lnF*

Variables	Coefficients
BFBN	3.733***
	(328.27)
BFBS	6.753***
	(131.39)
PKLN	7.916***
	(102.08)
EMBE	7.299***
	(184.25)
EMBW	7.245***
	(439.04)
LDBN	6.846***
	(215.96)
LDBS	6.910***
	(91.02)
BFBN_lnV	-0.101
	(-1.40)
BFBS_lnV	0.003
	(0.28)
PKLN_lnV	-0.034**
	(-2.32)
EMBE_lnV	-0.002
	(-0.22)
EMBW_lnV	-0.001
	(-0.25)
LDBN_lnV	-0.010
	(-1.18)
LDBS_lnV	-0.032***
	(-3.79)

Diagnostic Statistics	
Observations	1812
F-Statistics	1434.45
Adjusted R^2	0.911
Heteroscedasticity :Chi-Squared	22.63
	(0.00)
White Test:Chi-Squared	14.04
	(0.00)
RESET:F-Statistics	2.45
	(0.06)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions: *F-Statistics*	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	103.24
	(0.00)
(2) $H_0 : \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7$	0.86
	(0.52)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results whic failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'

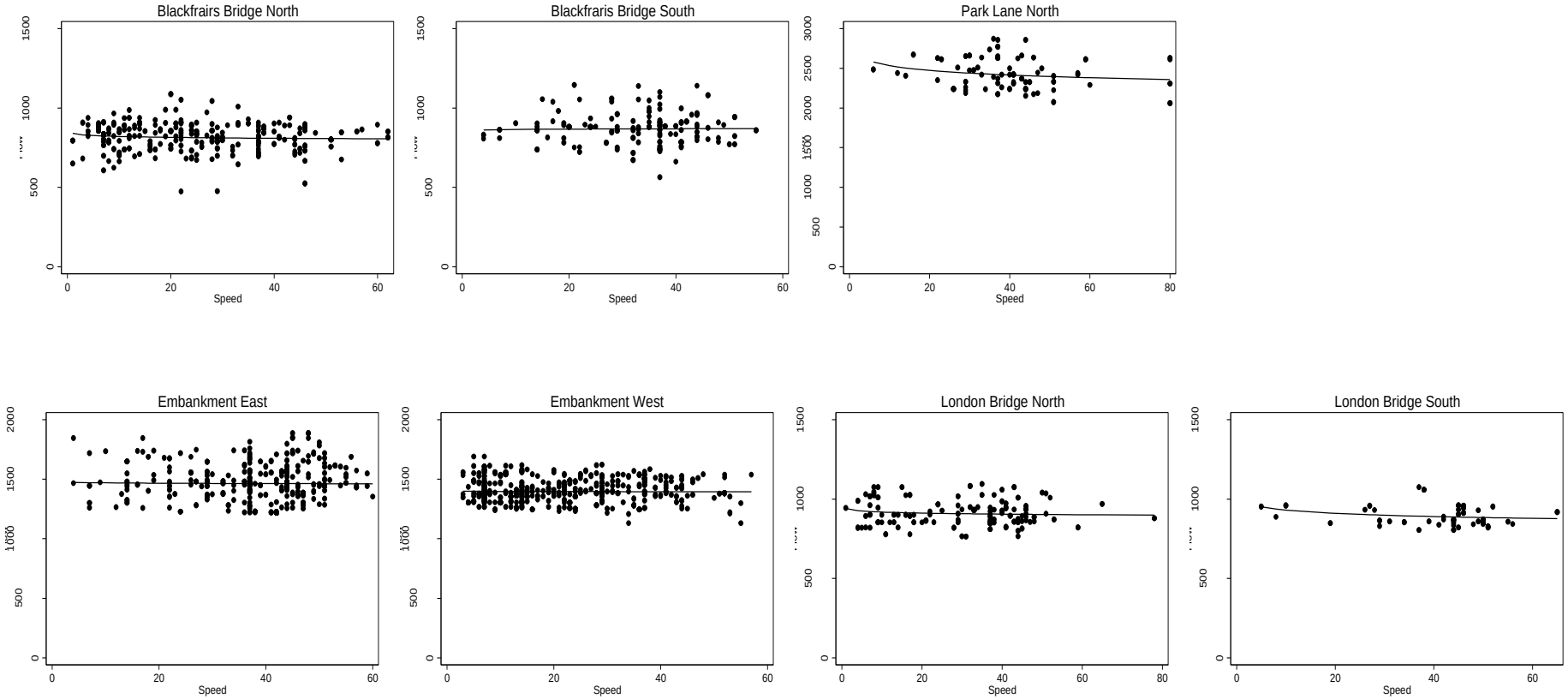

Figure A4.2.1 Flow-Speed Observations with Predicted Flows Corresponding to Table A4.2.1 [lnF vs lnV]

Secondly, we employ SPLINE with a knot at 30kmph. The results and diagnostic tests are reported in Table A4.2.3. The results suggest only one of both slope coefficients are statistically significantly different from zero at 90% confidence level. However, the magnitudes of these coefficients are very small. Therefore, we conclude that speed and flow have no cause and effect relationship. None of the regressions passed the Normality test whereas one failed the Heteroscedasticity and the White tests and two failed the RESET test. In addition, the predicted flows corresponding to Table A4.2.3 are reported in Figure A4.2.2. Every diagram suggests a nearly flat predicted flow.

Next, we adjust the specification by aggregating all observations of seven streets into a single data set. In order to check whether we can use the same log SPLINE specification for seven streets, we, therefore, add seven dummy variables to intercept and slope terms. In addition to the diagnostic tests, we apply testing of restrictions for equality for each of the intercept and slope terms. The results in Table A4.2.4 show that the hypothesis of equality in intercept terms is rejected.

Table A4.2.3 Log SPLINE Flow-Speed Specifications: Dependent Variable *lnF*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	6.715***	6.728***	7.851***	7.400***	-7.249***	6.855***	6.897***
	(237.82)	(82.80)	(78.81)	(108.40)	(479.96)	(190.23)	(88.91)
lnV1	-0.002	0.013	-0.012	-0.038*	-0.003	-0.014	-0.027
	(-0.21)	(0.49)	(-0.42)	(-1.77)	(-0.54)	(-1.11)	(-1.05)
lnV2	-0.050	-0.024	-0.055	0.059*	0.010	0.004	-0.043
	(-1.45)	(-0.41)	(-1.82)	(1.77)	(0.46)	(0.13)	(-0.91)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	1.59	0.14	2.28	2.05	0.17	0.77	2.02
Adjusted R^2	0.003	0.009	0.024	0.005	0.003	0.002	0.028
Heteroscedasticity :Chi-Squared	2.21	4.90	1.09	0.34	0.01	0.37	0.24
	(0.13)	(0.02)	(0.29)	(0.55)	(0.93)	(0.54)	(0.62)
White Test:Chi-Squared	0.96	3.38	1.82	2.36	1.65	1.07	5.37
	(0.61)	(0.18)	(0.40)	(0.30)	(0.43)	(0.58)	(0.06)
RESET:F-Statistics	1.62	0.30	0.44	3.83	2.82	0.62	0.26
	(0.18)	(0.82)	(0.72)	(0.01)	(0.03)	(0.60)	(0.85)
Normality:Chi-Squared	68.68	5.06	6.12	20.37	13.74	5.66	7.28
	(0.00)	(0.07)	(0.04)	(0.00)	(0.00)	(0.05)	(0.02)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’

Table A4.2.4 Log SPLINE Flow-Speed Specification: Dependent Variable *lnF*

Variables	Coefficients
BFBN	6.715***
	(276.57)
BFBS	6.728***
	(100.03)
PKLN	7.851***
	(64.79)
EMBE	7.400***
	(126.51)
EMBW	7.249***
	(357.33)
LDBN	6.855***
	(175.44)
LDBS	6.897***
	(68.40)
BFBN_lnV1	-0.002
	(-0.21)
BFBS_lnV1	0.013
	(0.78)
PKLN_lnV1	-0.012
	(-0.83)
EMBE_lnV1	-0.038*
	(-1.67)
EMBW_lnV1	-0.003
	(-0.52)
LDBN_lnV1	-0.141
	(-1.12)
LDBS_lnV1	-0.027
	(-1.62)
BFBN_lnV2	-0.050
	(-1.52)
BFBS_lnV2	-0.024
	(-0.45)
PKLN_lnV2	-0.055
	(-1.66)
EMBE_lnV2	0.059**
	(2.09)
EMBW_lnV2	0.010
	(0.46)
LDBN_lnV2	0.004
	(0.14)
LDBS_lnV2	-0.043
	(-1.04)

Diagnostic Statistics	
Observations	1812
F-Statistics	933.65
Adjusted R^2	0.999
Heteroscedasticity :Chi-Squared	22.62
	(0.00)
White Test:Chi-Squared	13.86
	(0.00)
RESET:F-Statistics	0.30
	(0.82)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions:	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	68.79
	(0.00)
(2) $H_0 : \theta_{11} = \theta_{12} = \theta_{13} = \theta_{14} = \theta_{15} = \theta_{16} = \theta_{17}$	0.82
	(0.55)
(3) $H_0 : \theta_{21} = \theta_{22} = \theta_{23} = \theta_{24} = \theta_{25} = \theta_{26} = \theta_{27}$	1.67
	(0.12)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'

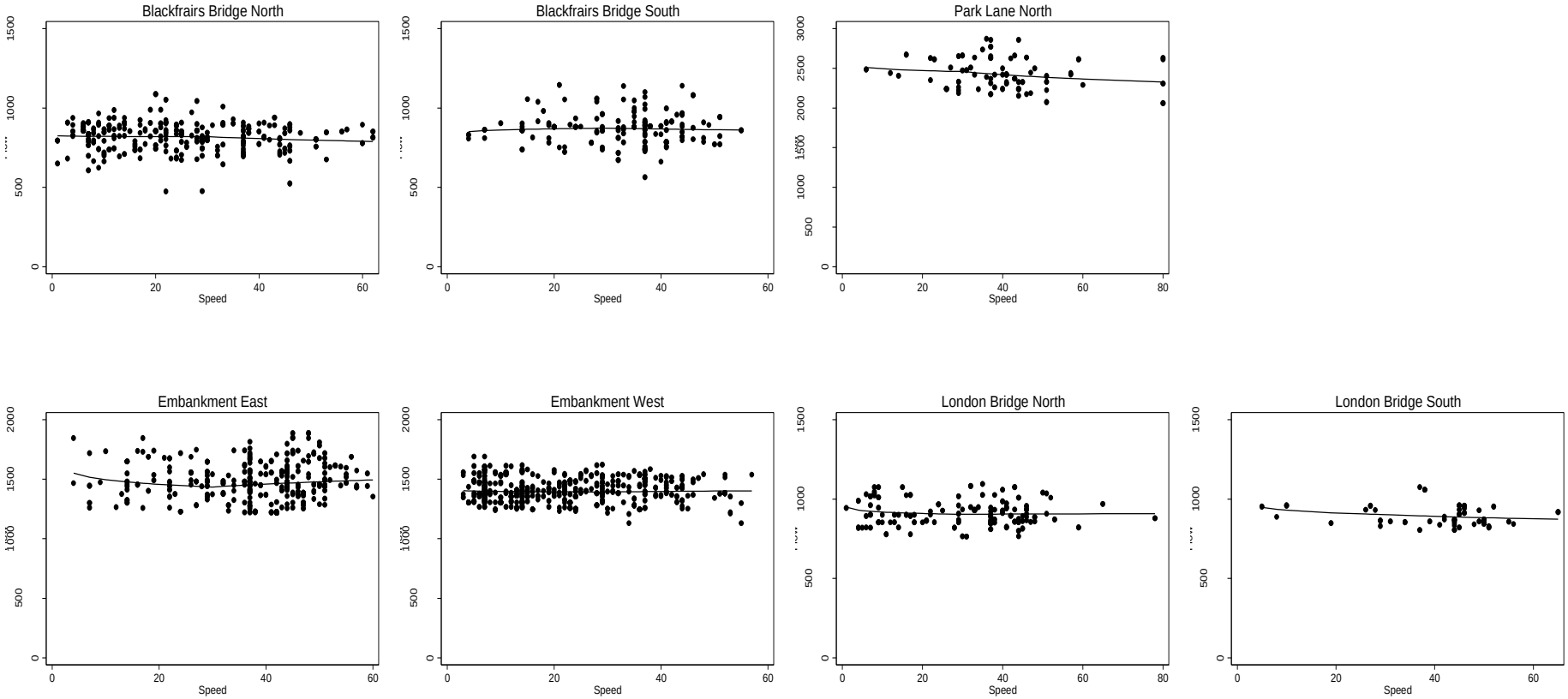

Figure A4.2.2 Flow-Speed Observations with Predicted Flows Corresponding to Table A4.2.3 [lnF vs lnV1 lnV2]

The non-linearity suggested by the theory demands a more complex specification is estimated. We, therefore, do the further analysis applying

$$\ln F = \eta + \gamma \ \ln V + \pi \ \left(\ln V\right)^2 + \mu \qquad \text{(A4.2.2)}$$

The corresponding results are presented in Table A4.2.5. Five coefficients are statistically significantly different from zero at 90% confidence level. None of the regressions passed the Normality test whereas one failed the Heteroscedasticity and the White Tests. In addition, two failed the RESET test. Additionally, the predicted flows are reported in Figure A4.2.3.

Next, we adjust the specification by aggregating all observations of seven streets into a single data set. In order to check whether we can use the same quadratic in logs specification for seven streets, we, therefore, add seven dummy variables to intercept, slope and curvature terms. Correspondingly, the estimation with dummy variables and their diagnostic statistics are shown in Table A4.2.6. The restriction tests of equality of intercept, slope and square term are all rejected.

Table A4.2.5 Quadratic in Logs Flow-Speed Specifications : Dependent Variable *lnF*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	6.656***	6.571***	7.739***	7.571***	7.313***	6.85***	6.884***
	(155.12)	(34.42)	(36.69)	(44.09)	(170.47)	(99.90)	(52.09)
lnV	0.059*	0.134	-0.076	-0.185*	-0.054*	-0.016	-0.013
	(1.79)	(1.03)	(0.60)	(-1.66)	(-1.68)	(-0.32)	(-0.13)
$(lnV)^2$	-0.013**	-0.022	-0.016	0.029	0.009*	0.001	-0.003
	(-2.16)	(-1.01)	(-0.88)	(1.64)	(1.66)	(0.12)	(-0.17)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	3.22	0.53	2.30	1.38	1.41	0.69	2.00
Adjusted R^2	0.013	0.005	0.025	0.001	0.001	0.003	0.028
Heteroscedasticity :Chi-Squared	1.10	2.93	1.29	0.11	0.97	0.80	0.42
	(0.29)	(0.08)	(0.25)	(0.73)	(0.32)	(0.37)	(0.51)
White Test:Chi-Squared	1.29	2.03	2.12	0.26	1.84	3.23	4.79
	(0.52)	(0.36)	(0.34)	(0.87)	(0.39)	(0.19)	(0.09)
RESET:F-Statistics	1.6	0.51	0.04	5.32	6.52	0.93	0.77
	(0.18)	(0.67)	(0.98)	(0.00)	(0.00)	(0.42)	(0.51)
Normality:Chi-Squared	69.58	5.13	6.07	18.97	11.86	5.53	7.55
	(0.00)	(0.07)	(0.04)	(0.00)	(0.00)	(0.06)	(0.02)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'

Table A4.2.6 Quadratic in Logs Flow-Speed Specifications : Dependent Variable *lnF*

Variables	Coefficients
BFBN	6.656***
	(179.75)
BFBS	6.571***
	(41.54)
PKLN	7.739***
	(30.19)
EMBE	7.571
	(51.61)
EMBW	7.313***
	(126.80)
LDBN	6.853***
	(92.29)
LDBS	6.884***
	(26.10)
BFBN_lnV	0.059**
	(2.12)
BFBS_lnV	0.134*
	(1.69)
PKLN_lnV	0.076
	(0.80)
EMBE_lnV	-0.185*
	(-1.63)
EMBW_lnV	-0.054*
	(-1.65)
LDBN_lnV	-0.016
	(-0.52)
LDBS_lnV	-0.013
	(-0.13)
$BFBN(lnV)^2$	-0.013***
	(-2.51)
$BFBS(lnV)^2$	-0.022
	(-1.48)
$PKLN(lnV)^2$	-0.016
	(-1.03)
$EMBE(lnV)^2$	0.029*
	(1.66)
$EMBW(lnV)^2$	0.009*
	(1.64)
$LDBN(lnV)^2$	0.001
	(0.19)
$LDBS(lnV)^2$	-0.003
	(-0.18)

Diagnostic Statistics	
Observations	1812
F-Statistics	936.43
Adjusted R^2	0.999
Heteroscedasticity :Chi-Squared	21.61
	(0.00)
White Test:Chi-Squared	13.16
	(0.00)
RESET:F-Statistics	0.04
	(0.99)
Normality:Chi-Squared	58.94
	(0.00)
Testing Restrictions:	
(1) $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7$	21.7
	(0.00)
(2) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$	1.84
	(0.08)
(3) $H_0: \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \pi_7$	2.08
	(0.05)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'

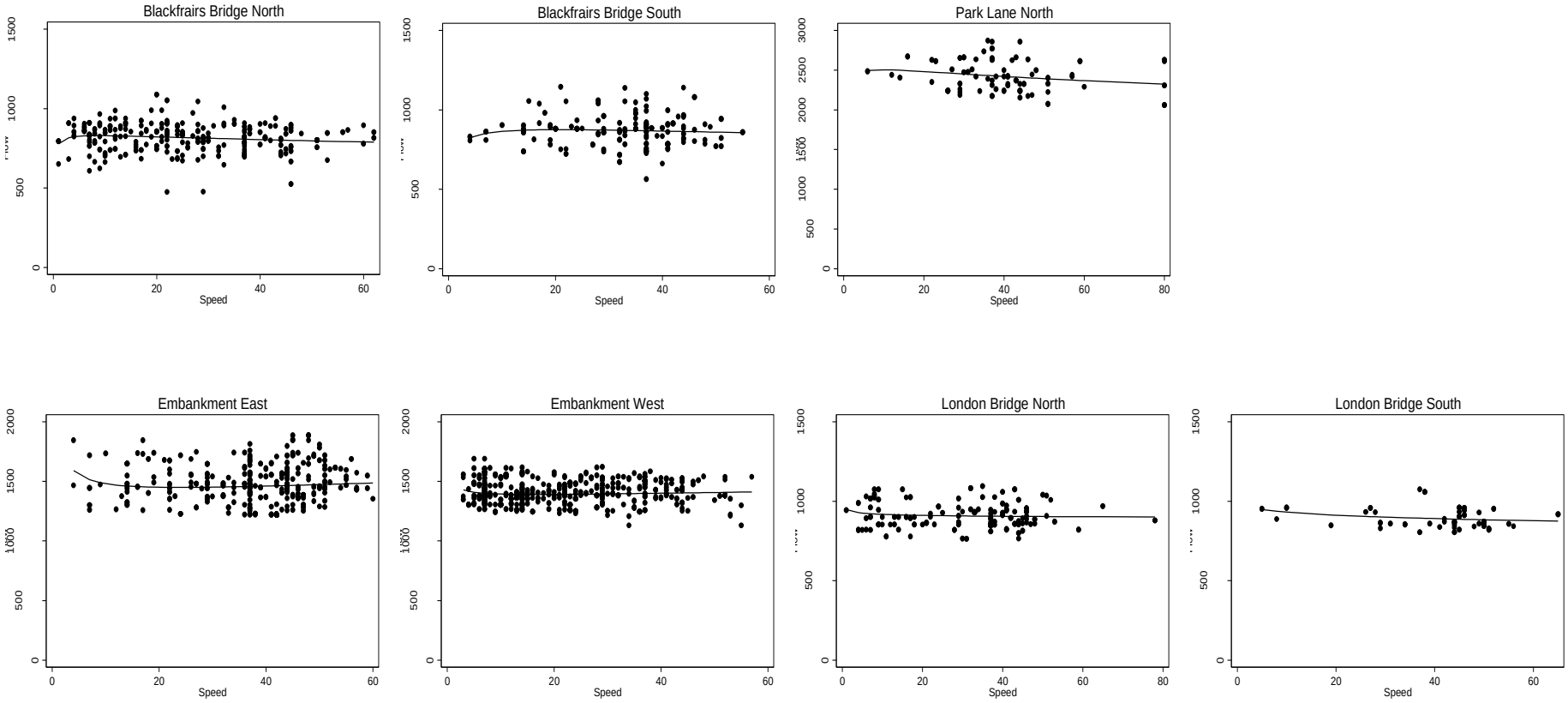

Figure A4.2.3 Flow-Speed Observations with Predicted Flows Corresponding to Table A4.2.5 [lnF vs lnV $(lnV)^2$]

In addition to the analyses of flow against speed (F vs V) as explained in Chapter 4 and the present Appendix, the analyses of speed against flow (V vs F) with the same specifications are also undertaken. Not surprisingly, the error in the measurement of the flow variable, ordinary least square results in a horizontal relation. Thus, it is appropriate to regress the flow variable on speed variable data. However, we provide the reports (without text) of speed against flow (V vs F) regressions and their diagrams for further reference.

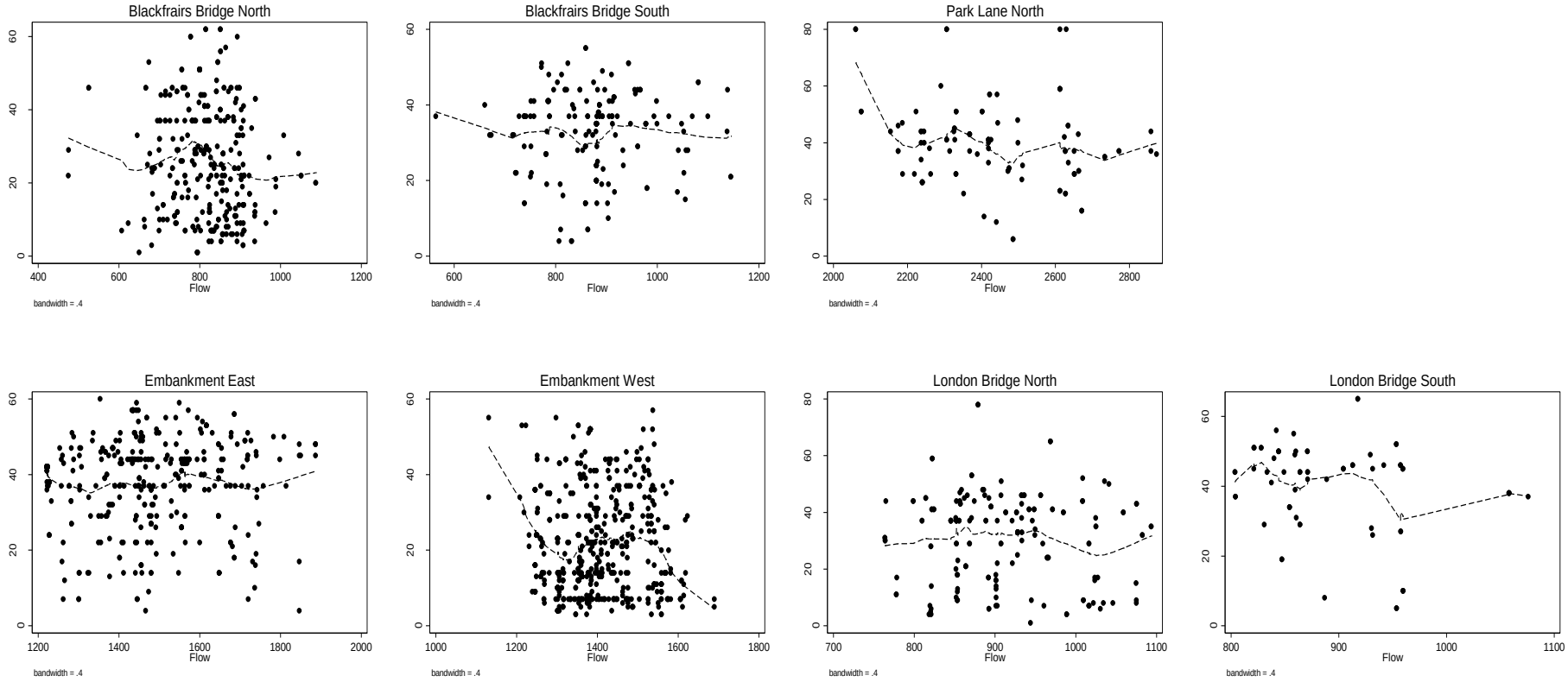

Figure A4.2.4 Speed-Flow Observations [Lowess bandwidth 0.4]

Table A4.2.7 Linear Speed-Flow Specifications: Dependent Variable *V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	43.364***	32.782***	78.339***	35.888***	20.037***	45.356***	80.071***
	(6.11)	(4.44)	(4.15)	(6.98)	(2.45)	(3.35)	(4.98)
F	-0.020**	$5.33x10^{-4}$	-0.015**	0.001	0.001	-0.015	-0.044**
	(-2.44)	(-0.06)	(-2.04)	(0.41)	(0.18)	(-1.08)	(-2.43)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	5.95	0.00	4.18	0.17	0.03	1.17	3.74
Adjusted R^2	0.013	0.005	0.030	0.002	0.001	0.000	0.038
Heteroscedasticity :Chi-Squared	0.85	0.24	0.13	4.70	0.08	0.04	3.00
	(0.35)	(0.62)	(0.72)	(0.03)	(0.78)	(0.83)	(0.08)
White Test:Chi-Squared	7.74	3.04	0.09	4.65	0.114	0.26	9.93
	(0.02)	(0.21)	(0.95)	(0.09)	(0.94)	(0.87)	(0.00)
RESET:F-Statistics	2.23	0.30	2.93	3.31	12.28	1.87	0.91
	(0.08)	(0.82)	(0.03)	(0.02)	(0.00)	(0.13)	(0.44)
Normality:Chi-Squared	28.14	7.13	10.74	32.66	44.07	0.88	8.80
	(0.00)	(0.02)	(0.00)	(0.00)	(0.00)	(0.64)	(0.01)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.8 Linear Speed-Flow Specification: Dependent Variable *V*

Variables	Coefficients
BFBN	43.364***
	(6.00)
BFBS	32.782***
	(3.61)
PKLN	78.339***
	(4.54)
EMBE	35.888***
	(5.74)
EMBW	20.037***
	(2.46)
LDBN	45.356***
	(3.88)
LDBS	80.071***
	(3.70)
BFBN_F	-0.020***
	(-2.44)
BFBS_F	5.33x10-4
	(-0.07)
PKLN_F	-0.015**
	(-2.04)
EMBE_F	0.001
	(0.41)
EMBW_F	0.001
	(0.18)
LDBN_F	-0.015
	(-1.10)
LDBS_F	-0.044***
	(-2.46)

Diagnostic Statistics	
Observations	1812
F-Statistics	655.32
Adjusted R^2	0.834
Heteroscedasticity :Chi-Squared	7.81
	(0.00)
White Test:Chi-Squared	12.78
	(0.00)
RESET:F-Statistics	2.93
	(0.03)
Normality:Chi-Squared	11.02
	(0.00)
Testing Restrictions: *F-Statistics*	
(1) $H_0 : \chi_1 = \chi_2 = \chi_3 = \chi_4 = \chi_5 = \chi_6 = \chi_7$	2.58
	(0.01)
(2) $H_0 : \varsigma_1 = \varsigma_2 = \varsigma_3 = \varsigma_4 = \varsigma_5 = \varsigma_6 = \varsigma_7$	2.11
	(0.04)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

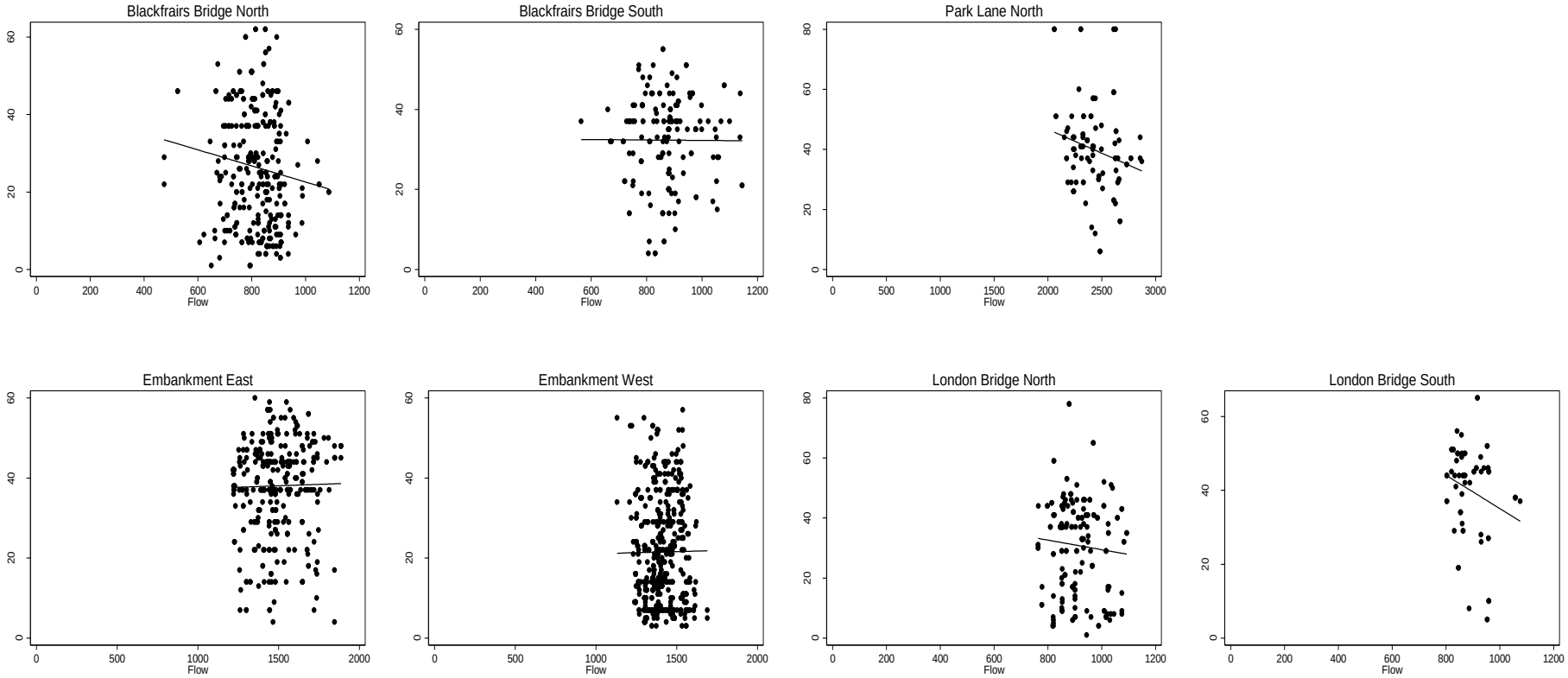

Figure A4.2.5 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.7 [V vs F: using street data]

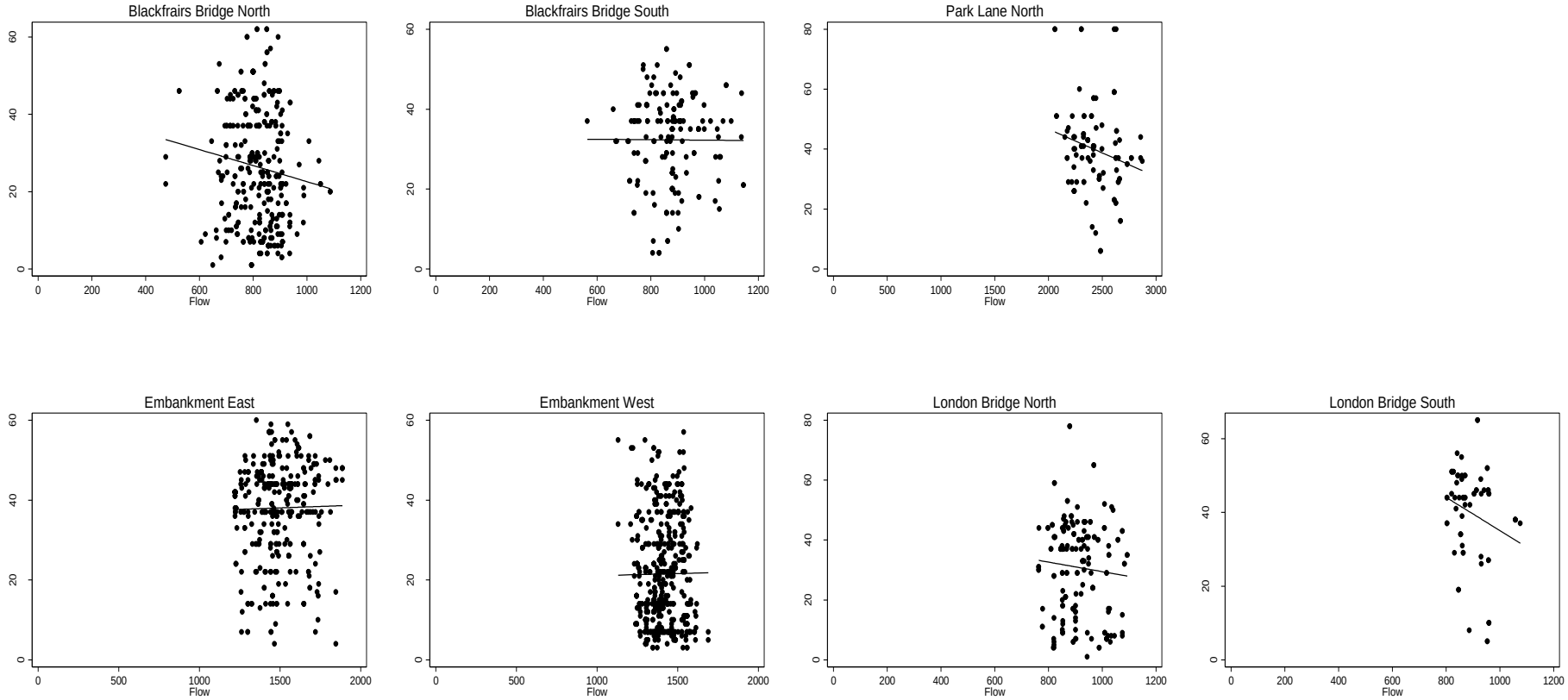

Figure A4.2.6 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.8 [V vs F: using street data aggregation]

Table A4.2.9 SPLINE Speed-Flow Specifications: Dependent Variable *V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	25.687**	41.636***	128.735***	37.706***	11.841	5.102	98.690**
	(2.13)	(3.25)	(3.17)	(3.60)	(0.56)	(0.16)	(1.89)
F1	0.002	-0.011	-0.037**	$9.29x10^{-5}$	0.007	0.031	-0.066
	(0.18)	(-0.74)	(-2.16)	(0.01)	(0.46)	(0.85)	(-1.08)
F2	-0.053***	0.009	$7.82x10^{-4}$	0.002	-0.002	-0.044*	-0.038*
	(-3.35)	(0.65)	(0.06)	(0.39)	(-0.27)	(-1.77)	(-1.72)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	3.90	0.36	3.09	0.10	0.13	1.56	1.88
Adjusted R^2	0.017	0.007	0.040	0.004	0.003	0.006	0.024
Heteroscedasticity :Chi-Squared	3.84	1.37	0.02	1.76	0.66	0.00	3.55
	(0.05)	(0.24)	(0.88)	(0.18)	(0.41)	(0.98)	(0.05)
White Test:Chi-Squared	7.16	3.79	1.444	3.59	19.40	0.03	7.87
	(0.02)	(0.14)	(0.48)	(0.16)	(0.00)	(0.98)	(0.01)
RESET:F-Statistics	0.83	1.59	4.36	2.73	8.69	3.30	0.79
	(0.47)	(0.19)	(0.00)	(0.04)	(0.00)	(0.02)	(0.50)
Normality:Chi-Squared	32.48	6.71	10.13	32.56	44.68	1.32	8.51
	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.51)	(0.01)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

Table A4.2.10 SPLINE Speed-Flow Specifications: Dependent Variable *V*

Variables	Coefficients
BSBN	25.687**
	(2.28)
BFBS	41.636***
	(2.65)
PKLN	128.735***
	(3.45)
EMBE	37.706***
	(3.08)
EMBW	11.841
	(0.63)
LDBN	5.102
	(0.19)
LDBS	98.69
	(1.24)
BFBN_F1	0.002
	(0.18)
BFBS_F1	-0.011
	(-0.97)
PKLN_F1	-0.037**
	(-1.99)
EMBE_F1	9.29x10-5
	(0.01)
EMBW_F1	0.007
	(0.46)
LDBN_F1	0.031
	(0.94)
LDBS_F1	-0.066
	(-1.09)
BFBN_F2	-0.053***
	(-3.35)
BFBS_F2	0.009
	(0.71)
PKLN_F2	7.82x10-4
	(0.07)
EMBE_F2	0.002
	(0.33)
EMBW_F2	-0.002
	(-0.27)
LDBN_F2	-0.044
	(-1.80)
LDBS_F2	-0.038
	(-1.75)

Diagnostic Statistics	
Observations	1812
F-Statistics	438.06
Adjusted R^2	0.835
Heteroscedasticity :Chi-Squared	6.89
	(0.00)
White Test:Chi-Squared	12.73
	(0.00)
RESET:F-Statistics	3.26
	(0.02)
Normality:Chi-Squared	12.20
	(0.00)
Testing Restrictions: F-Statistics	
(1) $H_0 : \chi_1 = \chi_2 = \chi_3 = \chi_4 = \chi_5 = \chi_6 = \chi_7$	1.74
	(0.10)
(2) $H_0 : \varsigma_{11} = \varsigma_{12} = \varsigma_{13} = \varsigma_{14} = \varsigma_{15} = \varsigma_{16} = \varsigma_{17}$	1.22
	(0.29)
(3) $H_0 : \varsigma_{21} = \varsigma_{22} = \varsigma_{23} = \varsigma_{24} = \varsigma_{25} = \varsigma_{26} = \varsigma_{27}$	2.19
	(0.04)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

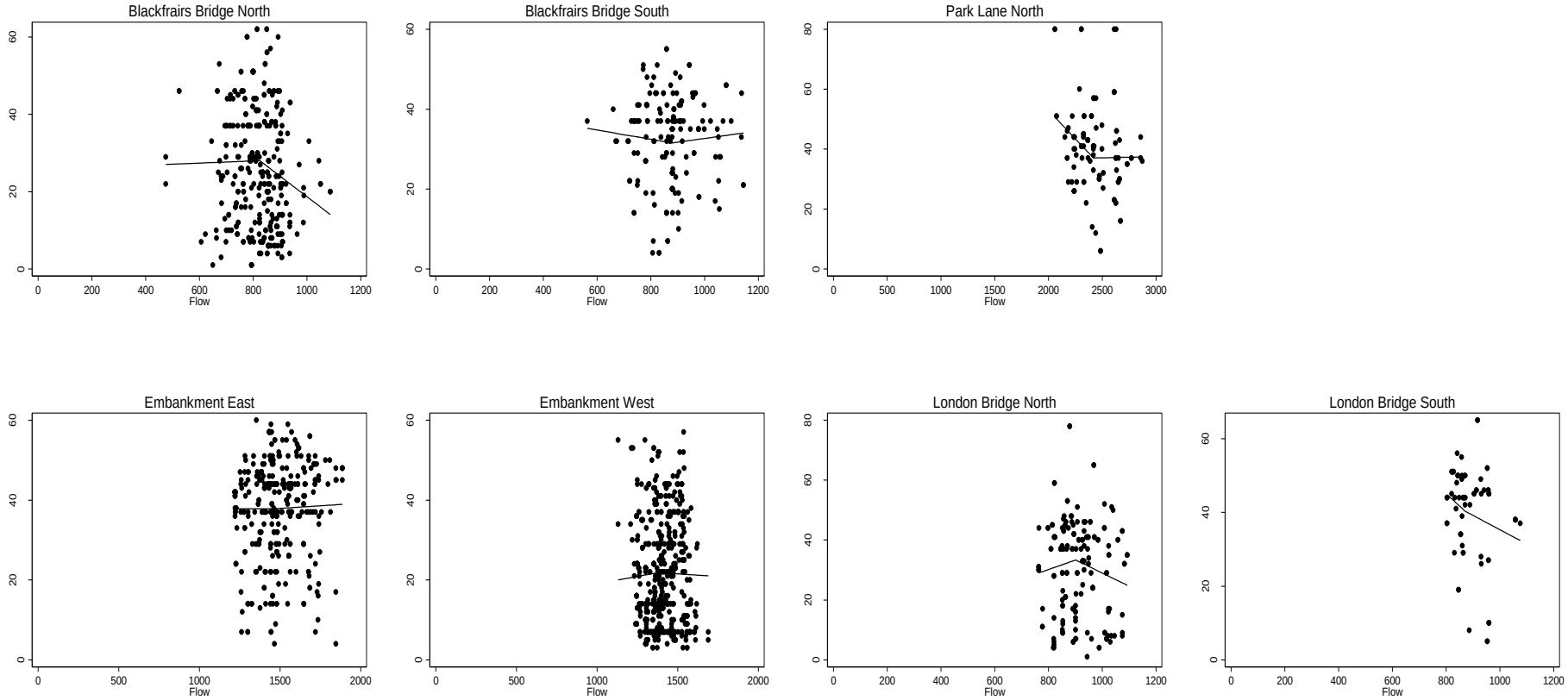

Figure A4.2.7 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.9 [V vs F1 F2: using street data]

Table A4.2.11 Quadratic Speed-Flow Specifications: Dependent Variable *V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	-3.473	45.150	458.617**	40.756	-55.986	-145.228	275.978
	(-0.12)	(1.05)	(2.14)	(0.99)	(-0.47)	(-1.04)	(1.37)
F	0.097	-0.028	-0.327*	-0.005	0.109	-0.398	-0.471
	(1.36)	(-0.30)	(-1.87)	(-0.09)	(0.65)	(1.32)	(-1.10)
F^2	-7.41×10^{-5}*	1.58×10^{-5}	6.36×10^{-5}*	2.22×10^{-6}	-3.83×10^{-5}	-2.23×10^{-4}	2.30×10^{-4}
	(-1.71)	(0.29)	(1.79)	(0.12)	(-0.65)	(-1.37)	(1.03)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	2.99	0.04	3.73	0.09	0.31	1.52	2.18
Adjusted R^2	0.012	0.011	0.051	0.004	0.002	0.005	0.033
Heteroscedasticity :Chi-Squared	2.62	2.03	0.31	3.44	0.03	0.00	7.05
	(0.105)	(0.15)	(0.57)	(0.06)	(0.87)	(0.98)	(0.00)
White Test:Chi-Squared	6.52	2.37	3.30	2.99	15.76	0.97	5.99
	(0.03)	(0.30)	(0.19)	(0.22)	(0.00)	(0.61)	(0.04)
RESET:F-Statistics	2.51	0.29	3.72	3.14	3.45	1.27	2.31
	(0.05)	(0.83)	(0.01)	(0.02)	(0.01)	(0.28)	(0.08)
Normality:Chi-Squared	30.66	6.95	11.46	32.65	43.78	1.27	6.91
	(0.00)	(0.03)	(0.00)	(0.00)	(0.00)	(0.52)	(0.03)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.12 Quadratic Speed-Flow Specification: Dependent Variable *V*

Variables	Coefficients
BSBN	-3.47
	(-0.12)
BFBS	45.150
	(1.12)
PKLN	458.617**
	(2.23)
EMBE	40.756
	(0.91)
EMBW	-55.986
	(-0.43)
LDBN	-145.228
	(-1.16)
LDBS	275.978
	(1.40)
BFBN_F	0.097
	(1.36)
BFBS_F	-0.028
	(-0.39)
PKLN_F	-0.327**
	(-1.99)
EMBE_F	-0.005
	(-0.10)
EMBW_F	0.109
	(0.65)
LDBN_F	0.398
	(0.65)
LDBS_F	-0.471
	(-1.12)
$BFBN(F)^2$	-7.41×10^{-5}*
	(-1.71)
$BFBS(F)^2$	1.58×10^{-5}
	(0.38)
$PKLN(F)^2$	6.36×10^{-5}**
	(1.94)
$EMBE(F)^2$	2.22×10^{-6}
	(0.12)
$EMBW(F)^2$	-3.83×10^{-5}
	(-0.65)
$LDBN(F)^2$	2.23×10^{-4}
	(-1.60)
$LDBS(F)^2$	2.30×10^{-4}
	(1.05)

Diagnostic Statistics	
Observations	1812
F-Statistics	437.92
Adjusted R^2	0.835
Heteroscedasticity :Chi-Squared	8.74
	(0.00)
White Test:Chi-Squared	14.94
	(0.00)
RESET:F-Statistics	3.49
	(0.01)
Normality:Chi-Squared	12.34
	(0.00)
Testing Restrictions: F-Statistics	
(1) $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7$	1.54
	(0.15)
(2) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$	1.51
	(0.17)
(3) $H_0: \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \pi_7$	1.56
	(0.15)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.13 Quadratic Speed-Flow Specification: Dependent Variable *V*

Variables	Coefficients
BFBN	45.966***
	(3.78)
BFBS	36.010**
	(2.36)
PKLN	102.960
	(1.08)
EMBE	44.893
	(1.29)
EMBW	28.212
	(0.88)
LDBN	48.872***
	(2.75)
LDBS	83.572***
	(3.29)
BFBN_F	-0.027
	(-1.06)
BFBS_F	-0.007
	(-0.29)
PKLN_F	-0.036
	(-0.47)
EMBE_F	-0.010
	(-0.25)
EMBW_F	-0.010
	(-0.25)
LDBN_F	-0.023
	(-0.75)
LDBS_F	-0.052
	(-1.57)
$(F)^2$	4.11×10^{-6}
	(0.28)

Diagnostic Statistics	
Observations	1812
F-Statistics	611.32
Adjusted R^2	0.834
Heteroscedasticity :Chi-Squared	8.01
	(0.00)
White Test:Chi-Squared	12.92
	(0.00)
RESET:F-Statistics	2.93
	(0.03)
Normality:Chi-Squared	11.06
	(0.00)
Testing Restrictions: *F-Statistics*	
(1) $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7$	2.47
	(0.02)
(2) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$	2.12
	(0.04)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfriars Bridge North, Blackfriars Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

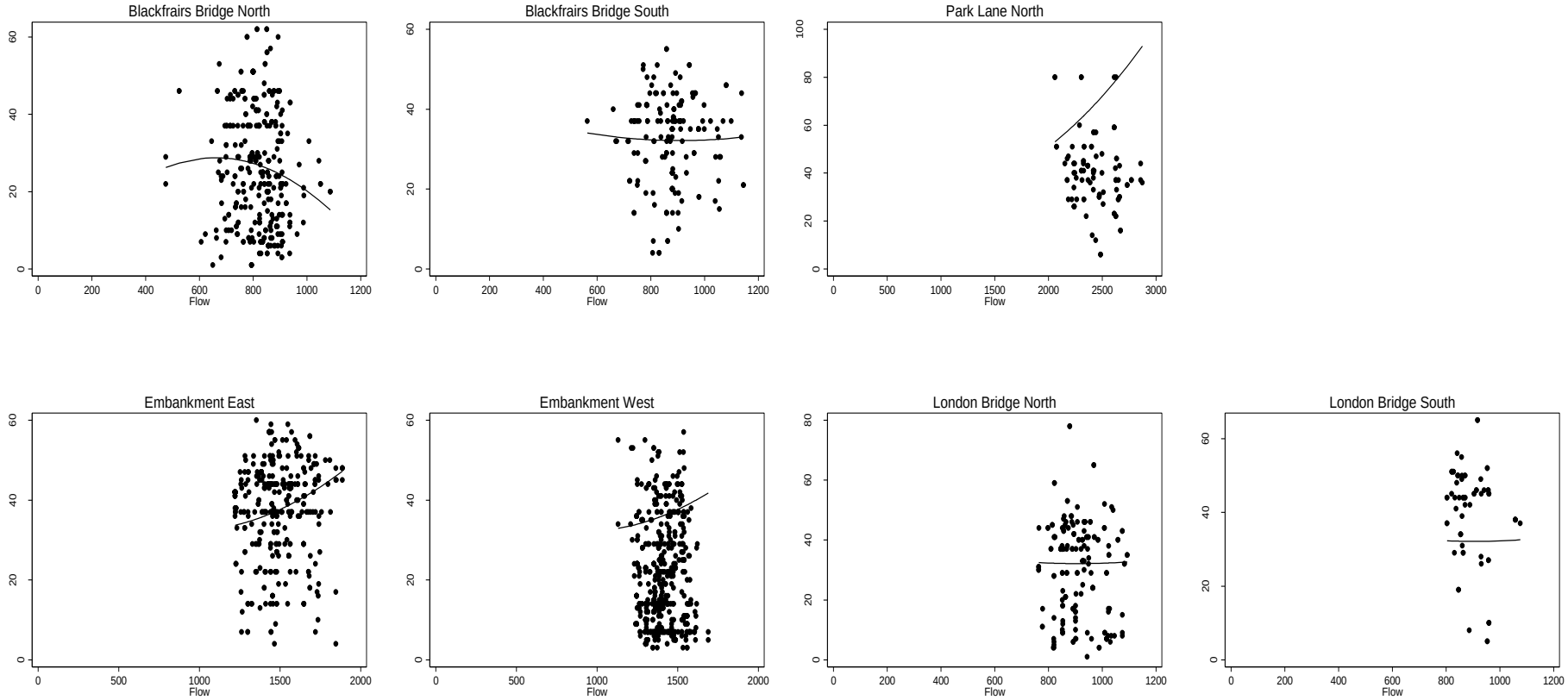

Figure A4.2.8 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.11 [V vs F F^2: using street data]

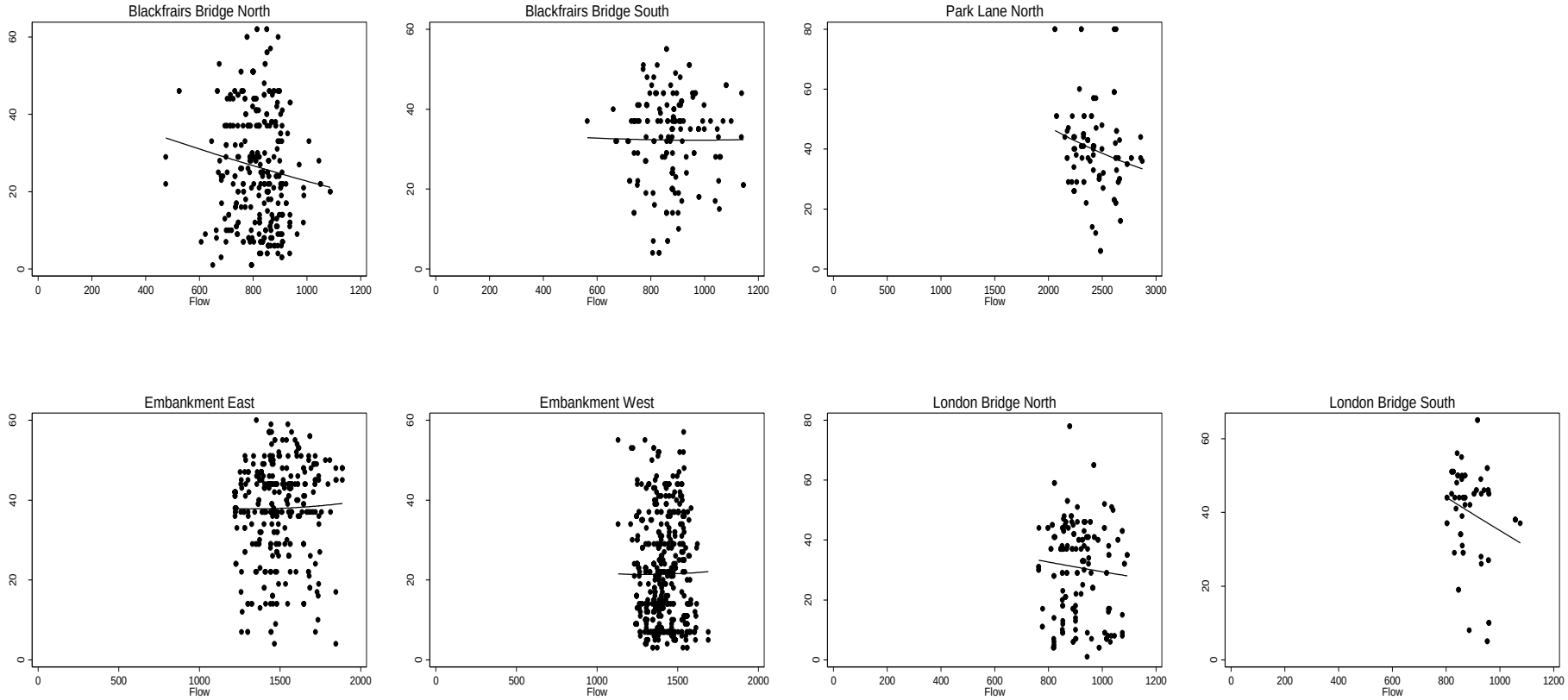

Figure A4.2.9 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.13 [V vs F F^2 : using data aggregation]

Table A4.2.14 Log Speed-Flow Specifications: Dependent Variable ln*V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	6.616***	2.961	12.076***	3.896***	3.633	8.332*	15.424***
	(2.46)	(1.39)	(2.79)	(2.71)	(1.18)	(1.91)	(2.92)
lnF	-0.534	0.063	-1.087*	-0.045	-0.109	-0.749	-1.742**
	(-1.33)	(0.20)	(-1.96)	(-0.23)	(-0.26)	(-1.17)	(-2.23)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	1.77	0.04	3.84	0.05	0.07	1.37	4.04
Adjusted R^2	0.002	0.005	0.027	0.002	0.001	0.002	0.042
Heteroscedasticity :Chi-Squared	1.48	2.41	1.64	5.29	1.53	1.02	12.04
	(0.22)	(0.12)	(0.20)	(0.02)	(0.21)	(0.31)	(0.00)
White Test:Chi-Squared	2.41	2.80	1.96	1.85	3.14	0.61	7.32
	(0.29)	(0.24)	(0.37)	(0.39)	(0.20)	(0.73)	(0.02)
RESET:F-Statistics	1.39	0.82	1.44	4.34	12.08	2.63	1.79
	(0.24)	(0.48)	(0.23)	(0.00)	(0.00)	(0.05)	(0.15)
Normality:Chi-Squared	54.88	60.96	31.10	-	58.35	31.37	29.54
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

Table A4.2.15 Log Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	6.619***
	(3.06)
BFBS	2.961
	(1.03)
PKLN	12.076*
	(1.90)
EMBE	3.896*
	(1.83)
EMBW	3.633
	(1.31)
LDBN	8.332**
	(2.21)
LDBS	15.424**
	(2.17)
BFBN_lnF	-0.534
	(-1.48)
BFBS_lnF	0.063
	(0.27)
PKLN_lnF	-1.087**
	(-2.41)
EMBE_lnF	-0.045
	(-0.22)
EMBW_lnF	-0.109
	(-0.25)
LDBN_lnF	-0.749
	(-1.17)
LDBS_lnF	-1.742**
	(-2.25)

Diagnostic Statistics	
Observations	1812
F-Statistics	3275.67
Adjusted R^2	0.962
Heteroscedasticity :Chi-Squared	119.86
	(0.00)
White Test:Chi-Squared	81.10
	(0.00)
RESET:F-Statistics	0.88
	(0.45)
Normality:Chi-Squared	-
	(0.000)
Testing Restrictions: *F-Statistics*	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	0.94
	(0.46)
(2) $H_0 : \theta_1 = \theta_2 = \theta_3 = \theta_4 = \theta_5 = \theta_6 = \theta_7$	0.96
	(0.44)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

Table A4.2.16 Log Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	5.033***
	(4.71)
BFBS	5.411***
	(5.02)
PKLN	5.931***
	(4.77)
EMBE	5.744***
	(4.95)
EMBW	5.006***
	(4.34)
LDBN	5.261
	(4.84)
LDBS	5.612**
	(5.17)
lnF	-0.298**
	(-2.04)

Diagnostic Statistics	
Observations	1812
F-Statistics	5732.41
Adjusted R^2	0.962
Heteroscedasticity :Chi-Squared	116.43
	(0.00)
White Test:Chi-Squared	77.65
	(0.00)
RESET:F-Statistics	0.72
	(0.54)
Normality:Chi-Squared	-
	(0.000)
Testing Restrictions: *F-Statistics*	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	0.94
	(0.46)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

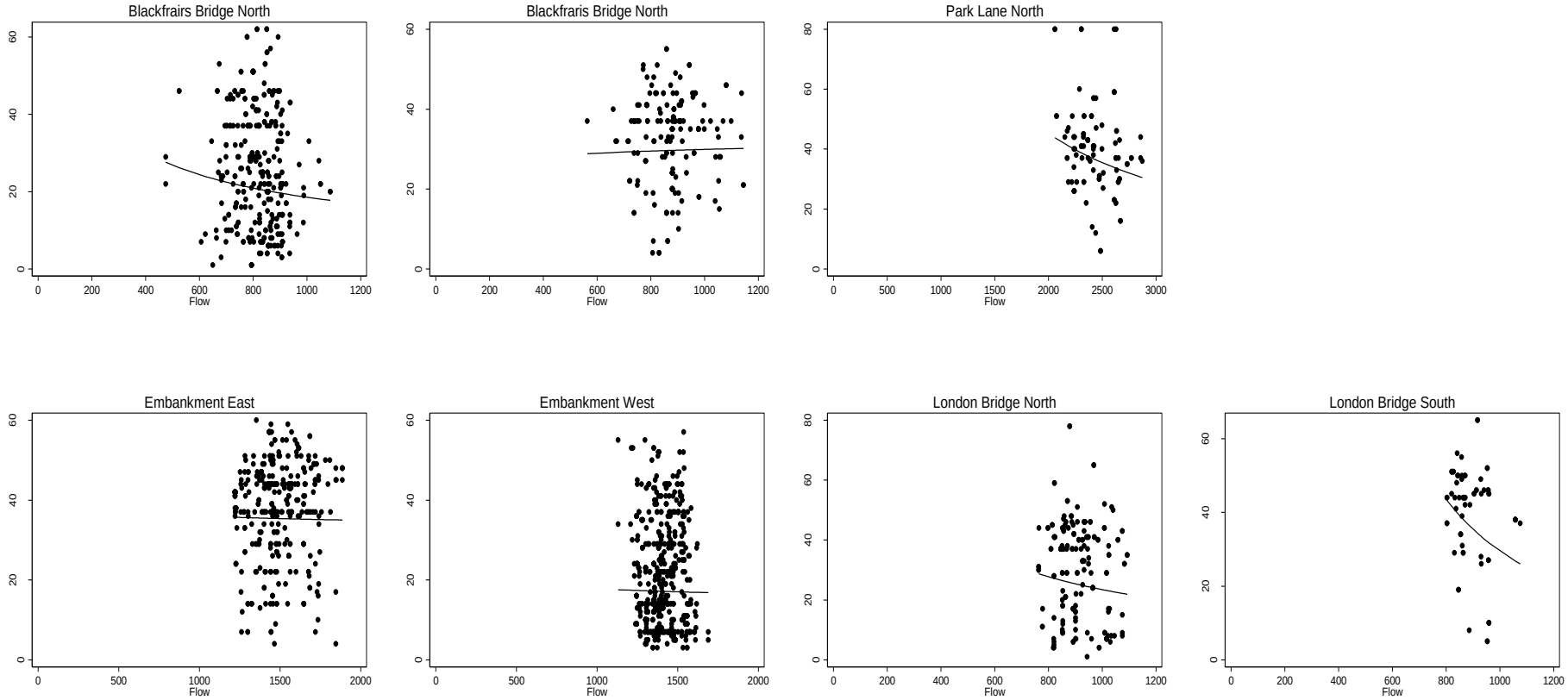

Figure A4.2.10 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.14 [lnV vs lnF: using street data]

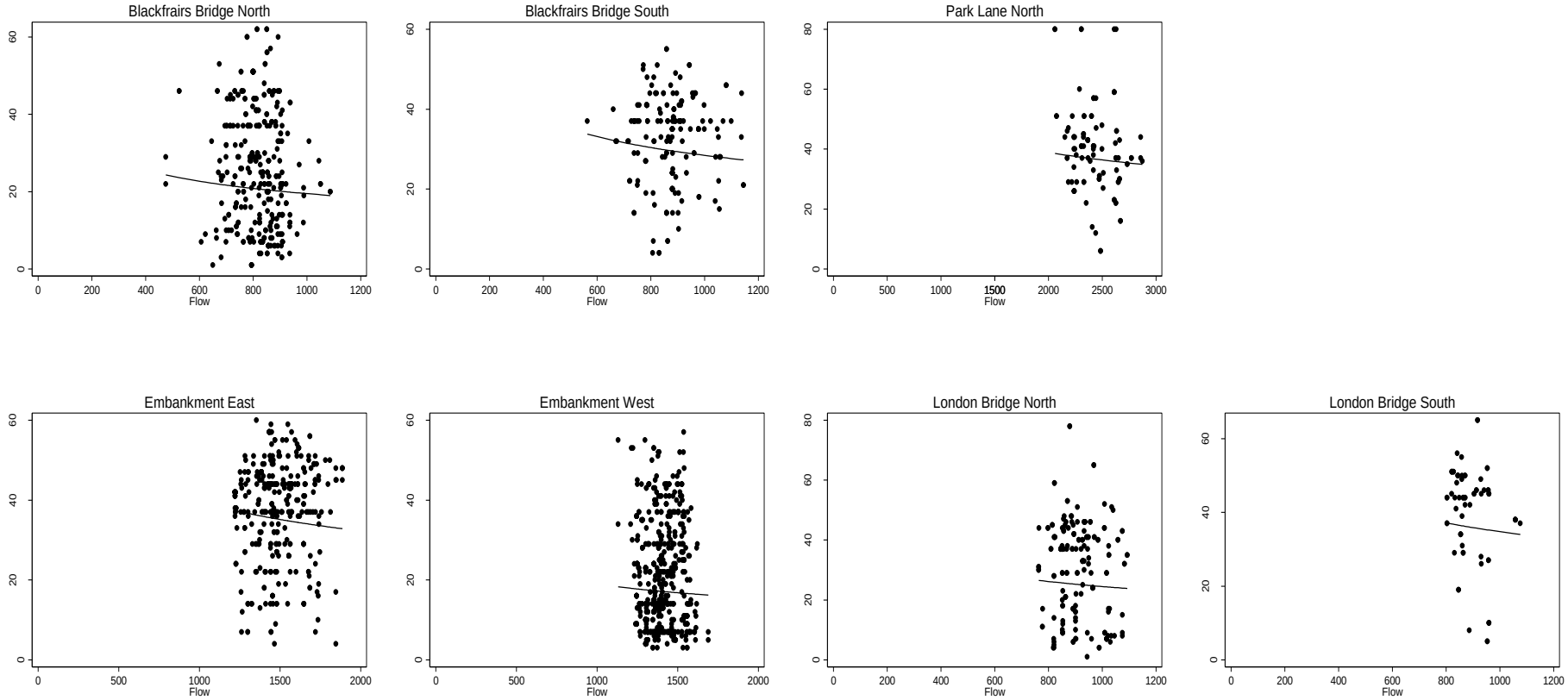

Figure A4.2.11 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.16 [lnV vs lnF: using street data aggregation]

Table A4.2.17 Log SPLINE Speed-Flow Specifications: Dependent Variable ln*V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	3.993	6.139*	23.575***	4.582*	2.056	-3.786	23.905*
	(1.00)	(1.76)	(2.59)	(1.65)	(0.30)	(-0.38)	(1.90)
lnF1	-0.137	-0.411	-2.574**	-0.140	0.11	1.047	-3.001
	(-0.23)	(-0.79)	(-2.19)	(-0.37)	(0.12)	(0.71)	(-1.60)
lnF2	-1.305	0.650	0.225	0.055	-0.264	-2.031*	-1.341
	(-1.37)	(1.09)	(0.21)	(0.14)	(-0.36)	(-1.78)	(-1.33)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	1.28	0.69	2.97	0.07	0.07	1.60	2.08
Adjusted R^2	0.001	0.003	0.037	0.004	0.003	0.006	0.030
Heteroscedasticity :Chi-Squared	3.94	5.23	7.39	1.69	1.03	1.27	12.61
	(0.04)	(0.02)	(0.00)	(0.19)	(0.31)	(0.26)	(0.00)
White Test:Chi-Squared	2.10	1.80	3.72	2.93	3.09	1.94	5.05
	(0.34)	(0.40)	(0.15)	(0.23)	(0.21)	(0.37)	(0.08)
RESET:F-Statistics	0.73	0.57	1.93	8.19	14.35	3.04	1.27
	(0.53)	(0.63)	(0.12)	(0.00)	(0.00)	(0.03)	(0.29)
Normality:Chi-Squared	56.59	59.75	28.12	-	59.19	31.96	29.19
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.18 Log SPLINE Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	3.993
	(1.25)
BFBS	6.139
	(1.31)
PKLN	23.575*
	(1.76)
EMBE	4.582
	(1.12)
EMBW	2.056
	(0.33)
LDBN	-3.786
	(-0.44)
LDBS	23.905
	(0.95)
BFBN_lnF1	-0.137
	(-0.24)
BFBS_lnF1	-0.411
	(-1.22)
PKLN_lnF1	-2.574**
	(-2.38)
EMBE_lnF1	-0.14
	(-0.41)
EMBW_lnF1	0.110
	(0.12)
LDBN_lnF1	1.047
	(0.78)
LDBS_lnF1	-3.001
	(-1.63)
BFBN_lnF2	-1.305*
	(-1.69)
BFBS_lnF2	0.650
	(1.36)
PKLN_lnF2	0.225
	(0.27)
EMBE_lnF2	0.055
	(0.11)
EMBW_lnF2	-0.264
	(-0.34)
LDBN_lnF2	-2.031*
	(-1.83)
LDBS_lnF2	-1.341
	(-1.35)

Diagnostic Statistics	
Observations	1812
F-Statistics	2182.34
Adjusted R^2	0.961
Heteroscedasticity :Chi-Squared	120.22
	(0.00)
White Test:Chi-Squared	82.01
	(0.00)
RESET:F-Statistics	1.46
	(0.00)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions:	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	0.64
	(0.69)
(2) $H_0 : \theta_{11} = \theta_{12} = \theta_{13} = \theta_{14} = \theta_{15} = \theta_{16} = \theta_{17}$	0.61
	(0.72)
(3) $H_0 : \theta_{21} = \theta_{22} = \theta_{23} = \theta_{24} = \theta_{25} = \theta_{26} = \theta_{27}$	1.16
	(0.32)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.19 Linear SPLINE Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	4.273**
	(2.22)
BFBS	4.644**
	(2.39)
PKLN	5.046**
	(2.25)
EMBE	4.919**
	(2.36)
EMBW	4.184**
	(2.10)
LDBN	4.490**
	(2.30)
LDBS	4.843***
	(2.49)
lnF1	-0.184
	(-0.69)
lnF2	-0.423
	(-1.45)

Diagnostic Statistics	
Observations	1812
F-Statistics	5093.31
Adjusted R^2	0.962
Heteroscedasticity :Chi-Squared	115.71
	(0.00)
White Test:Chi-Squared	77.19
	(0.00)
RESET:F-Statistics	0.76
	(0.51)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions:	
(1) $H_0 : \delta_1 = \delta_2 = \delta_3 = \delta_4 = \delta_5 = \delta_6 = \delta_7$	67.68
	(0.00)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

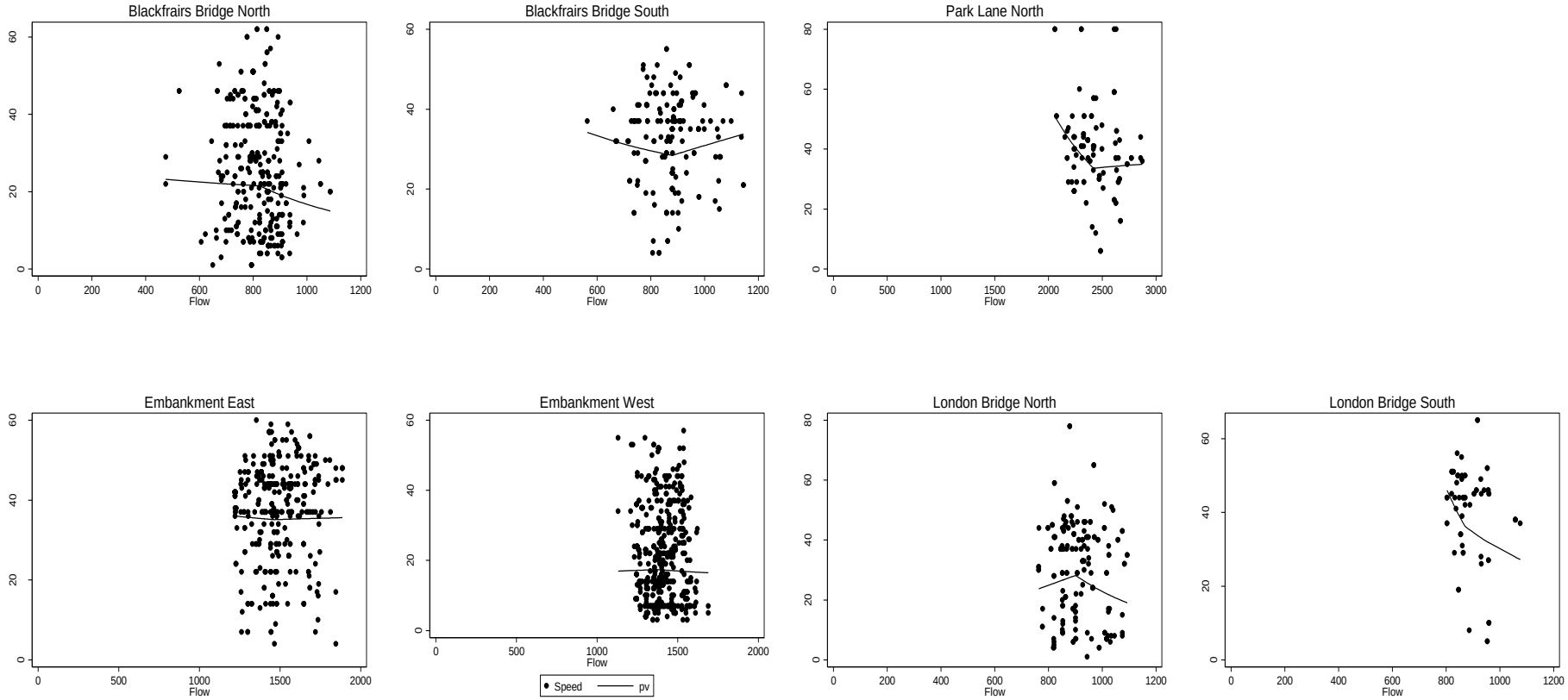

Figure A4.2.12 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.17 [lnV vs lnF1 lnF2 using street data]

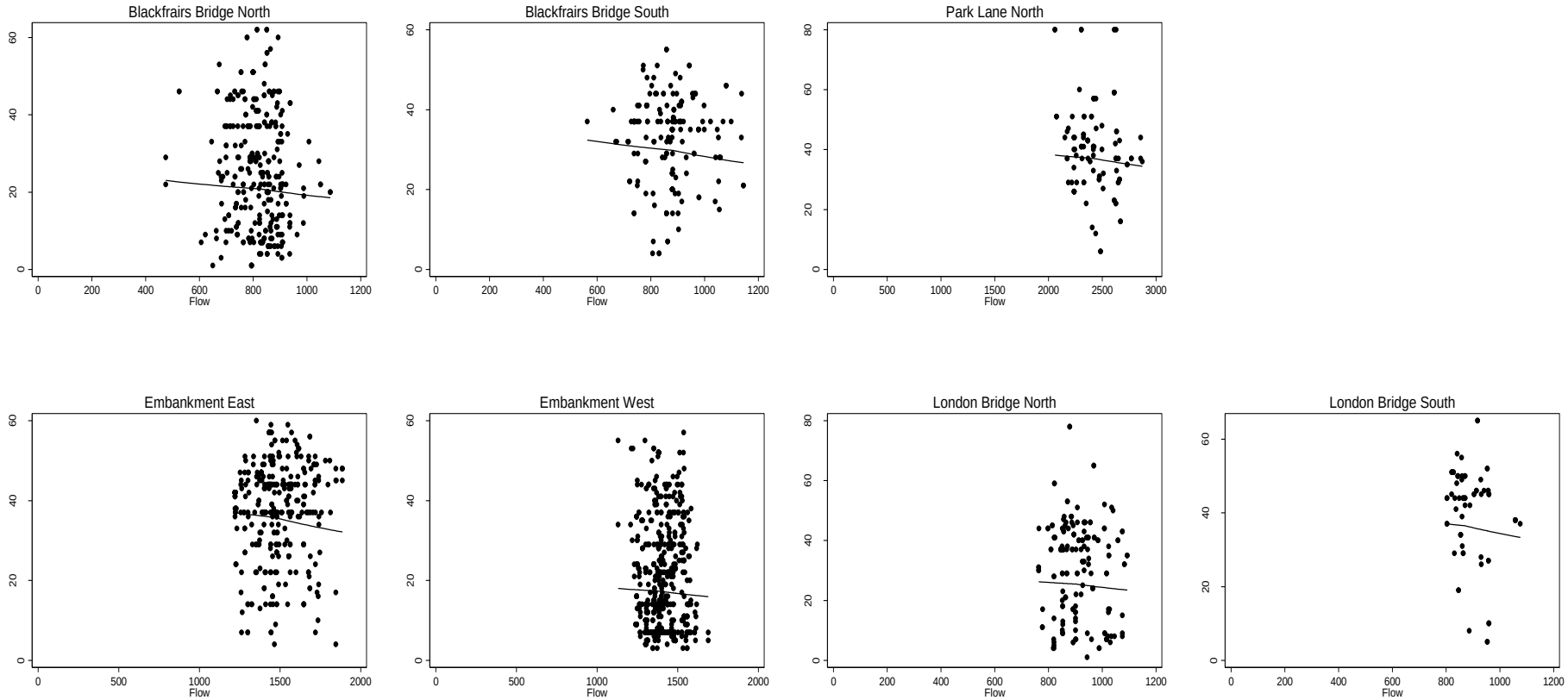

Figure A4.2.13 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.19 [lnV vs lnF1 lnF2: using street data aggregation]

Table A4.2.20 Quadratic in Logs Speed-Flow Specifications: Dependent Variable ln*V*

Variables	BFBN	BFBS	PKLN	EMBE	EMBW	LDBN	LDBS
Constant	-28.684	71.288	696.479***	12.648	-91.322	-336.610	635.901*
	(-0.39)	(0.94)	(2.44)	(0.13)	(-0.34)	(-1.13)	(1.79)
lnF	10.101	-20.154	-176.673**	-2.447	26.103	100.395	-183.685
	(0.45)	(-0.90)	(2.42)	(-0.09)	(0.36)	(1.15)	(-1.77)
$(lnF)^2$	-0.800	1.495	11.260**	0.164	-1.808	-7.413	13.336
	(-0.47)	(0.91)	(2.41)	(0.09)	(-0.36)	(-1.16)	(1.77)
Diagnostic Statistics							
Observations	327	177	101	394	565	178	70
F-Statistics	1.00	0.43	3.63	0.03	0.10	1.35	2.91
Adjusted R^2	0.000	0.006	0.04	0.005	0.003	0.004	0.052
Heteroscedasticity :Chi-Squared	2.96	8.88	9.61	2.59	1.07	0.73	20.04
	(0.08)	(0.00)	(0.00)	(0.10)	(0.30)	(0.39)	(0.00)
White Test:Chi-Squared	2.07	4.05	5.17	5.21	2.94	2.29	9.96
	(0.35)	(0.13)	(0.07)	(0.07)	(0.22)	(0.31)	(0.00)
RESET:F-Statistics	2.19	1.13	1.59	4.81	6.12	1.47	2.29
	(0.08)	(0.33)	(0.19)	(0.00)	(0.00)	(0.22)	(0.08)
Normality:Chi-Squared	55.67	59.33	28.02	-	58.61	32.45	26.37
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are ‘t-statistics’ and under the diagnostic tests are ‘p-values’.

Table A4.2.21 Quadratic in Logs Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	-28.684
	(-0.48)
BFBS	71.288
	(0.70)
PKLN	696.4797
	(1.25)
EMBE	12.648
	(0.10)
EMBW	-91.322
	(-0.38)
LDBN	-336.610
	(-1.30)
LDBS	635.901
	(1.12)
BFBN_lnF	10.101
	(0.73)
BFBS_lnF	-20.154
	(-1.40)
PKLN_lnF	-176.672***
	(-2.44)
EMBE_lnF	-2.447
	(-0.09)
EMBW_lnF	26.103
	(0.32)
LDBN_lnF	100.396
	(1.34)
LDBS_lnF	-183.685
	(-1.80)
BFBN(lnF)^2	-0.800
	(-0.77)
BFBS(lnF)^2	1.495
	(1.40)
PKLN(lnF)^2	11.26**
	(2.43)
EMBE(lnF)^2	0.164
	(0.09)
EMBW(lnF)^2	-1.808
	(-0.32)
LDBN(lnF)^2	-7.413
	(-1.34)
LDBS(lnF)^2	13.336*
	(1.79)

Diagnostic Statistics	
Observations	1812
F-Statistics	2182.15
Adjusted R^2	0.961
Heteroscedasticity :Chi-Squared	124.19
	(0.00)
White Test:Chi-Squared	82.08
	(0.00)
RESET:F-Statistics	1.11
	(0.34)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions:	
(1) $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7$	0.89
	(0.49)
(2) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$	0.90
	(0.49)
(3) $H_0: \pi_1 = \pi_2 = \pi_3 = \pi_4 = \pi_5 = \pi_6 = \pi_7$	0.90
	(0.49)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

Table A4.2.22 Quadratic in Logs Speed-Flow Specification: Dependent Variable ln*V*

Variables	Coefficients
BFBN	-2.274
	(-0.05)
BFBS	-6.258
	(-0.14)
PKLN	-0.185
	(-0.00)
EMBE	-6.814
	(-0.13)
EMBW	-6.957
	(-0.13)
LDBN	-1.055
	(-0.02)
LDBS	6.038
	(0.13)
BFBN_lnF	2.144
	(0.22)
BFBS_lnF	2.791
	(0.28)
PKLN_lnF	2.058
	(0.18)
EMBE_lnF	2.895
	(0.27)
EMBW_lnF	2.814
	(0.26)
LDBN_lnF	2.003
	(0.20)
LDBS_lnF	1.009
	(0.10)
(lnF)^2	-0.201
	(-0.27)

Diagnostic Statistics	
Observations	1812
F-Statistics	3055.66
Adjusted R^2	0.962
Heteroscedasticity :Chi-Squared	119.18
	(0.00)
White Test:Chi-Squared	80.832
	(0.00)
RESET:F-Statistics	0.96
	(0.41)
Normality:Chi-Squared	-
	(0.00)
Testing Restrictions:	
(1) $H_0: \eta_1 = \eta_2 = \eta_3 = \eta_4 = \eta_5 = \eta_6 = \eta_7$	0.93
	(0.47)
(2) $H_0: \gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7$	0.93
	(0.46)

Note

1. BFBN, BFBS, PKLN, EMBE, EMBW, LDBN, and LDBS denote Blackfrairs Bridge North, Blackfrairs Bridge South, Park Lane North, Embankment East, Embankment West, London Bridge North and London Bridge South respectively.
2. ***p<0.01; **p<0.05, and *p<0.10.
3. Any results which failed the White Test, are already adjusted with Heteroscedasticity-Consistency Standard Errors.
4. Figures in parentheses under the coefficients are 't-statistics' and under the diagnostic tests are 'p-values'.

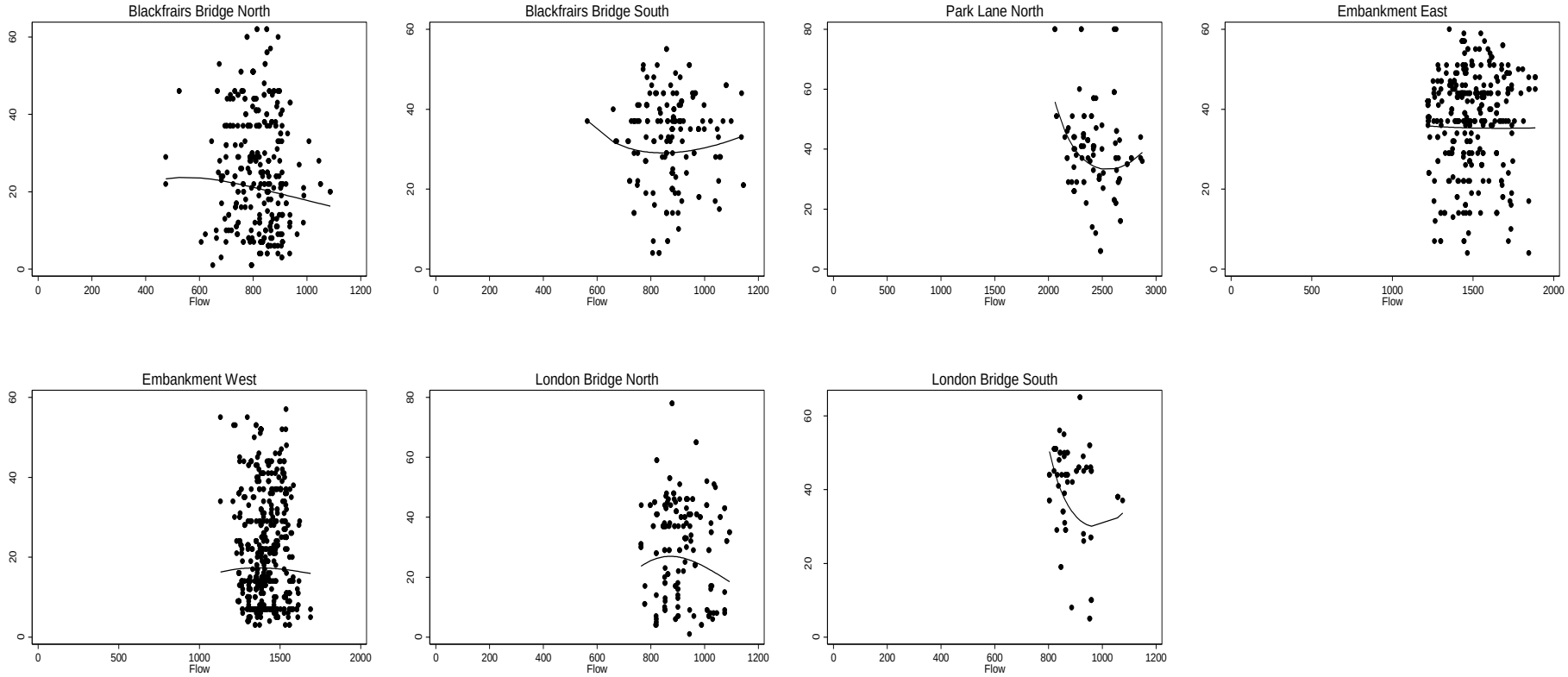

Figure A4.2.14 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.20 [lnV vs lnF (lnF)^2 :using street data]

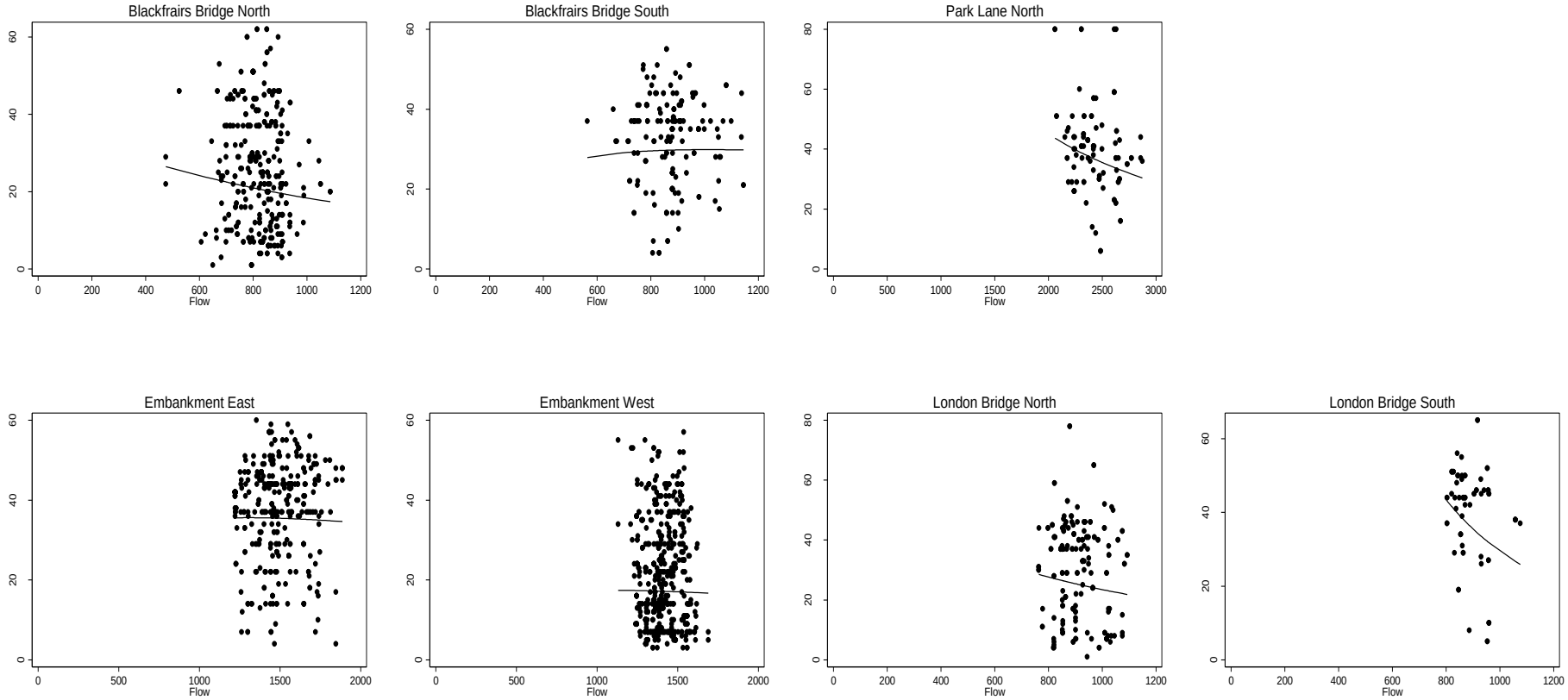

Figure A4.2.15 Speed-Flow Observations with Predicted Speeds Corresponding to Table A4.2.22 [lnV vs lnF (lnF)^2 :using street data aggregation]