Measuring Performance and Predicting Time and Cost Using Owner's Data

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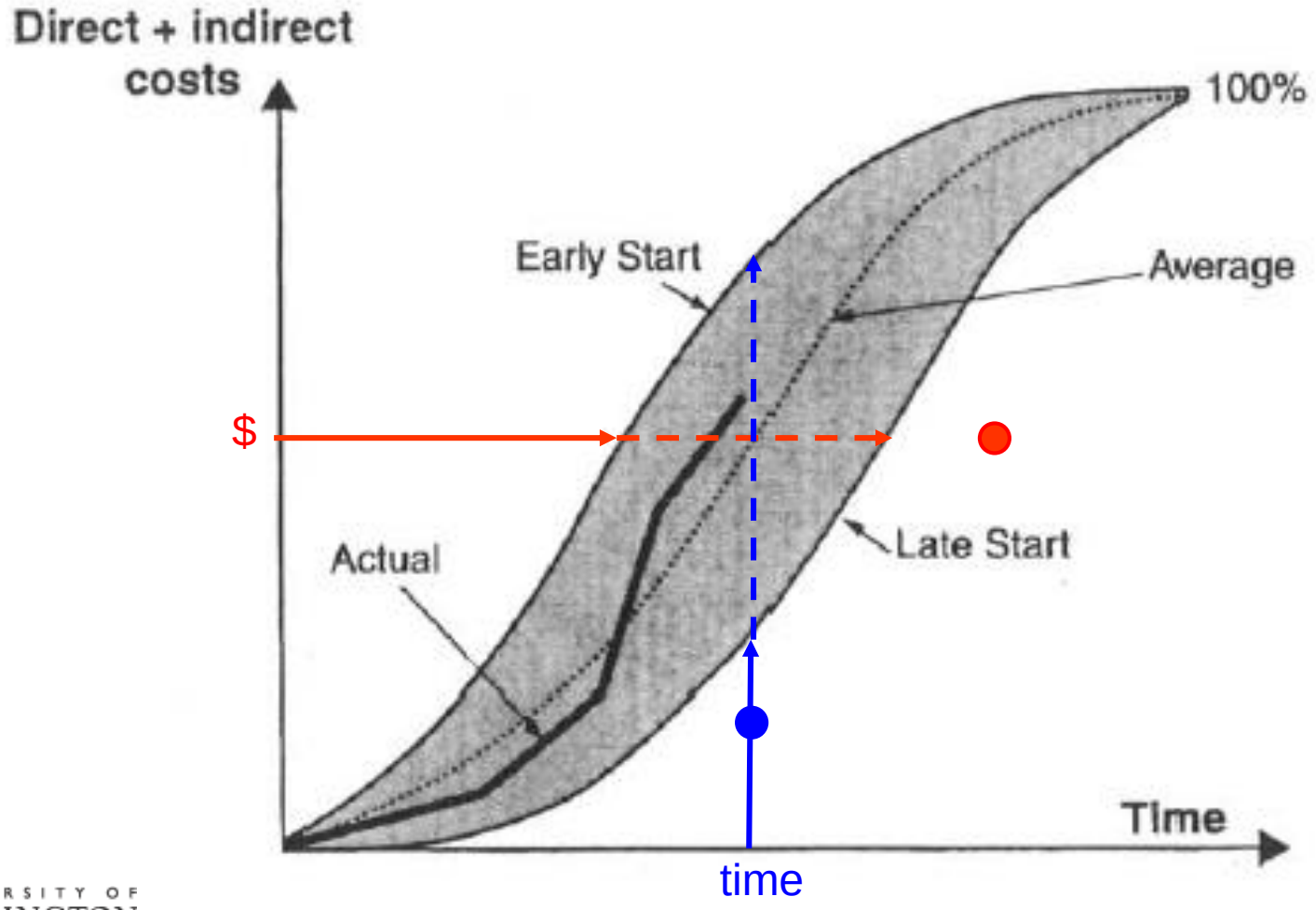
Outline

- Performance evaluation by comparing the actual and the planned work:
  - Construction Schedule, Material Schedules, and Budgets
  - Time-Cost Curves
  - Earned Value Analysis
- Performance evaluation using generalized benchmark:
  - Non-Project-Specific Performance Bounds
- Predicting Time & Cost using Owner's Records

Time-Cost Curves

- Measuring performance using Time-Cost Curves



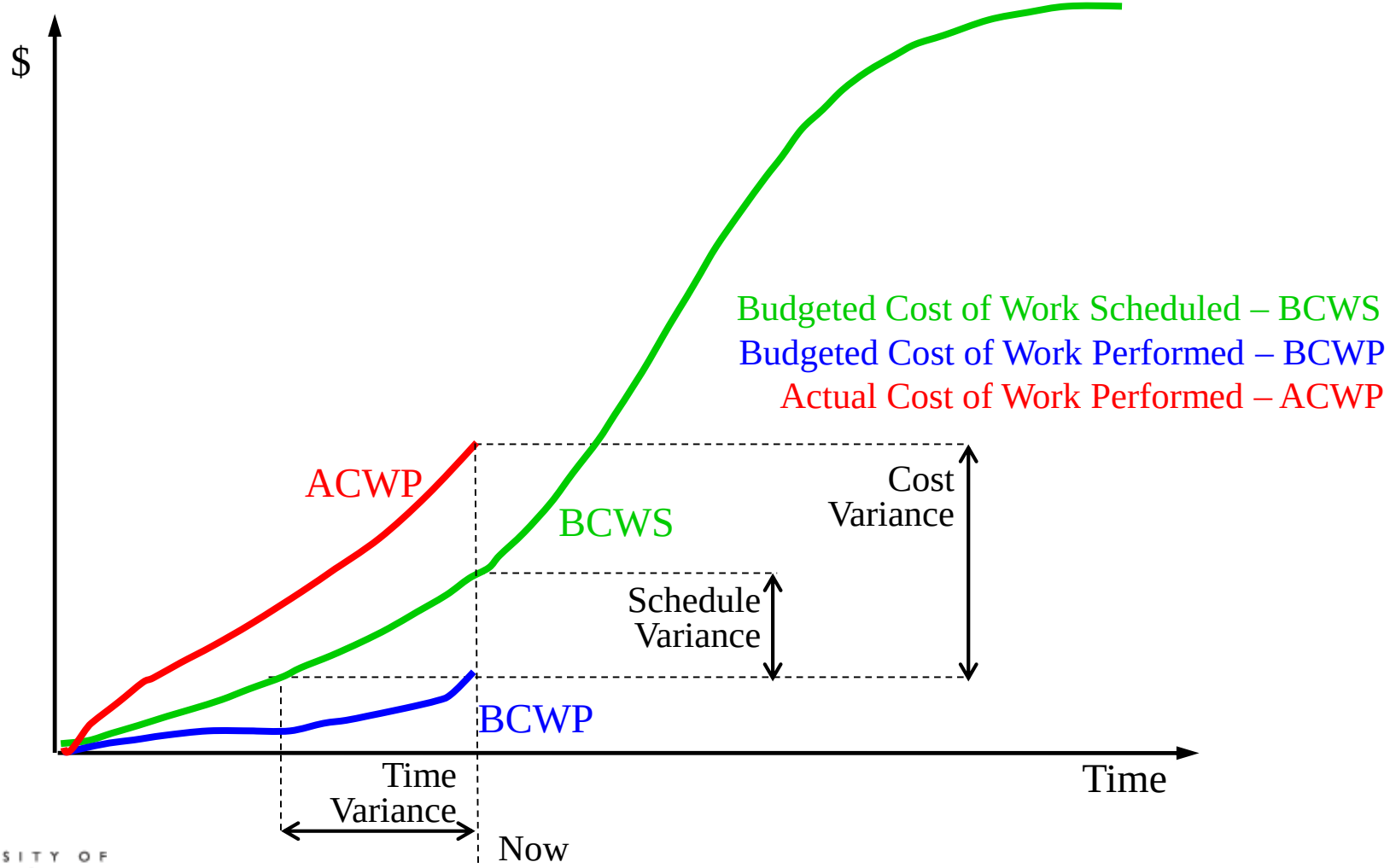
Time-Cost Curves

To Carry Out Cost Curves:

1. Cost and/or Resource-loaded Construction Schedule (Time-Cost cash flow Charts submitted by contractor!)
2. Updating Schedule with Actual Time and Cost
3. Software (Primavera; or, export to Excel)
4. Charting the actual time-cost curve along with the ES and LS time-cost Curves

Earned Value Analysis

Measuring Performance using Actual and Planned Work.



Earned Value Analysis

Cost & Schedule Performance Measurement

Cost Variance (CV)

= BCWP – ACWP (> 0 +ve performance)

Cost Performance Index (CPI)

= BCWP / ACWP (> 1 +ve performance)

Schedule Variance (SV)

= BCWP – BCWS (> 0 +ve performance)

Schedule Performance Index (SPI)

= BCWP / BCWS (>1 +ve performance)

Earned Value Analysis

Estimate at Completion

- **EAC** = BAC + (ACWP – BCWP)
- **EAC (Trend) #1** = ACWP + (BAC-BCWP)/CPI
- **EAC (Trend) #2** = ACWP + (BAC-BCWP)/(CPI*SPI)

Time Prediction

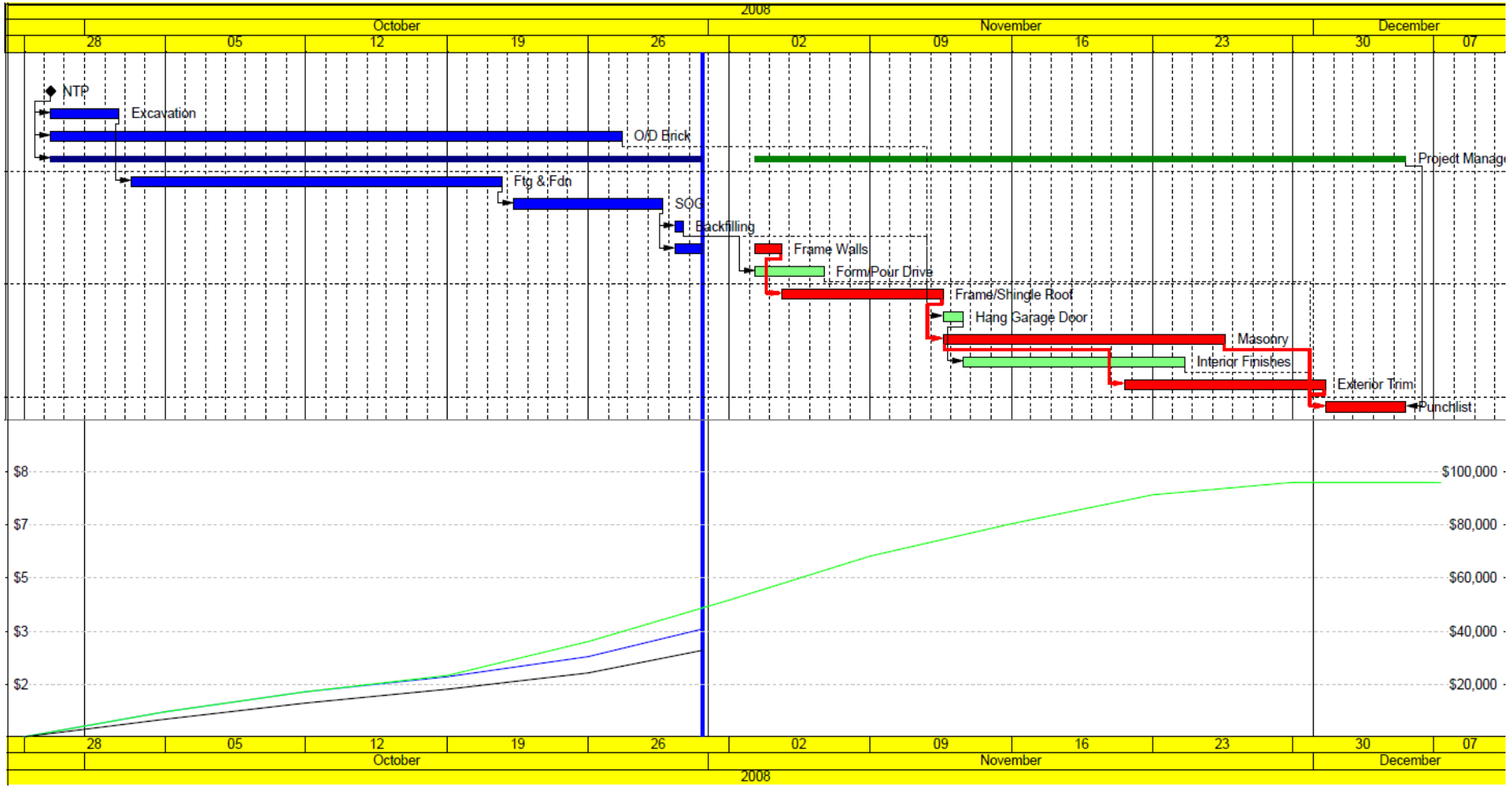
- **Duration** = Original duration / SPI
- **Time Variance** = Time at BCWP – Time at BCWS

Earned Value Analysis

To Carry Out EVA:

1. Develop WBS
2. Cost and/or Resource-loaded Construction Schedule (Plan & Budget - BCWS)
3. Updating Schedule with Actual Time and Cost. (cost coding, accounting, reporting – ACWP, BCWP)
4. Software (Primavera) with Layout Design for EVA
5. Staff Familiar with EVA Measures (Training!)

Earned Value Analysis



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Earned Value Analysis

Activity ID	Activity Name	Budgeted Total Cost	BL Project Total Cost (BAC)	Planned Value Cost (BCWS)	Actual Total Cost (ACWP)	Earned Value Cost (BCWP)	Cost Variance CV (BCWP-ACWP)	Cost Performance Index CPI (BCWP/ACWP)	Cost Variance Index CVI (CV/BCWJP)	Schedule Variance SV (BCWP-BCWS)	Schedule Performance Index SPI	Schedule Variance Index SVI (SV/BCWS)	Estimate To Complete	Estimate At Completion Cost
Garage Project		**$96,515**	**$96,515**	**$51,708**	**$40,898**	**$32,948**	**($7,950)**	**0.81**	**-0.24**	**($18,761)**	**0.64**	**-0.36**	**$63,567**	**$104,465**
A	NTP	$0	$0	$0	$0	$0	$0	0.00	0.00	$0	0.00	0.00	$0	$0
B	Excavation	$1,304	$1,304	$1,304	$1,650	$1,304	($346)	0.79	-0.27	$0	1.00	0.00	$0	$1,650
C	O/D Brick	$1,380	$1,380	$1,380	$2,000	$1,380	($620)	0.69	-0.45	$0	1.00	0.00	$0	$2,000
P	Project Manage...	$50,584	$50,584	$29,610	$26,925	$22,454	($4,470)	0.83	-0.20	($7,156)	0.76	-0.24	$28,130	$55,054
D	Ftg & Fdn	$3,073	$3,073	$3,073	$4,175	$3,073	($1,102)	0.74	-0.36	$0	1.00	0.00	$0	$4,175
E	SOG	$1							-0.55	$0	1.00	0.00	$0	$2,350
G	Backfilling								-0.35	$0	1.00	0.00	$0	$1,100
F	Frame Walls	$5							-0.12	($3,598)	0.40	-0.60	$3,598	$6,296
H	Form/Pour Drive	$1							0.00	($1,677)	0.00	-1.00	$1,677	$1,677
I	Frame/Shingle ...	$7							0.00	($6,330)	0.00	-1.00	$7,913	$7,913
L	Hang Garage D...	$3												
J	Masonry	$4												
M	Interior Finishes	$8												
k	Exterior Trim	$4												
N	Punchlist	$1												

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Measuring Performance using Owner's Historical Data

(WSDOT Research 675.1)

"Performance Analysis and Forecasting for WSDOT Highway Projects"

- Current States Practices (24 States)
- Data Collection and Analysis
- Development of Minimum Performance Bounds
- Time & Cost Prediction Models

Current States' Practices on Progress Measurement (24 State DOTs)

Measuring Progress during Construction

Progress Measurement			
#	Description	# of DOTs	%
1	**Schedule** – Comparing the actual project schedule to the original/revised schedules	23	96%
2	**Quantities** – Comparing the actual project quantities to the planned quantities of work	20	83%
3	**Cash Flow** – Comparing the actual project cash flow to the planned cash requirements	15	63%

Some States & Methods Combinations (24 States total)

- 12 (50%) All three methods
- 8 (33%) Schedule and quantity
- 2 (8%) Schedule and cash flow
- 1 (4%) Schedule only
- 1 (4%) Cash flow only

Progress during Construction

Consequence for Unsatisfactory Time Progress (milestones):			
#	Description	# of DOT	%
1	**Charge liquidated damages** or performance penalties	11	46%
2	Increase communication: event documentation, correspondences, and meetings	6	25%
3	Request updated schedules and plans on how to meet project completion	4	17%
4	Do nothing	3	13%
5	Limit or disqualify contractor from future bidding	2	8%

Progress during Construction

Consequence for Unsatisfactory Cost/Cash Flow Progress:			
#	Description	# of DOT	%
1	**Do Nothing**	16	67%
2	Charge performance penalties or increase retainage	5	21%
3	Increase communication: event documentation, correspondences, and meetings	1	4%
4	Request updated schedules and plans on how to meet project completion	1	4%
5	Limit or disqualify contractor from future bidding	1	4%
6	Apply default clauses	1	4%

Performance at Completion

Methods for Performance Measuring at Completion:			
#	Description	# of DOT	%
1	**Cost Growth**: (Final Contract Amount – Original Amount) / Original Amount	16	67%
2	**Time Growth:** (Final Contract Days – Original Days) / Original Days	12	50%
3	**Construction Placement**: Final Contract Cost / Final Contract Days	4	17%
4	**Award Growth:** (Orig. Contract Amount – Eng. Estimate) / Engineers ' Estimate	2	8%

Some States & Methods Combinations

- 7 (29%) Cost growth and time growth
- 6 (25%) Cost growth only
- 3 (13%) Construction placement only
- 2 (8%) Time growth only
- 1 (4%) All four methods

Administration

Tools for Measuring Progress:			
#	Description	# of DOT	%
1	**Progress reports**	16	67%
2	Progress charts (or curves) (those continue the survey!)	8	33%
3	Other	5	21%

Notes:

- 11 (46%) use reports only
- 4 (17% use charts only
- 4 (17%) use both reports and charts
- Others use the contractor schedule

Progress Charts

For the 8 DOTs reported using Progress Charts (curves)

Progress Chart (curve) Development/Generation:			
#	Description	# of DOT	Group / total
1	A progress chart/curve **submitted by the contractor**	6	75% / 25%
2	A specific progress profile developed internally, e.g. 0.5% work in 1st month, 1% in 2nd month, etc	1	13% / 4%
3	Other, please specify	1	13% / 4%

Notes:

- CALTRANS was the only state that has a formal progress chart developed based on historical records of CA highway projects

Progress Charts

Consequence of Continued Unsatisfactory Performance:			
#	Description	# of DOT	Group / Total
1	**Declare the contractor in default**	**5**	**63% / 21%**
2	Charge performance penalties to the contractor	3	38% / 13%
3	Inform the surety company	3	38% / 13%
4	Rank contractor down in future pre-qualifications	2	25% / 8%
5	Retain a higher percentage of the progress payment	1	13% / 4%

Others mentioned:

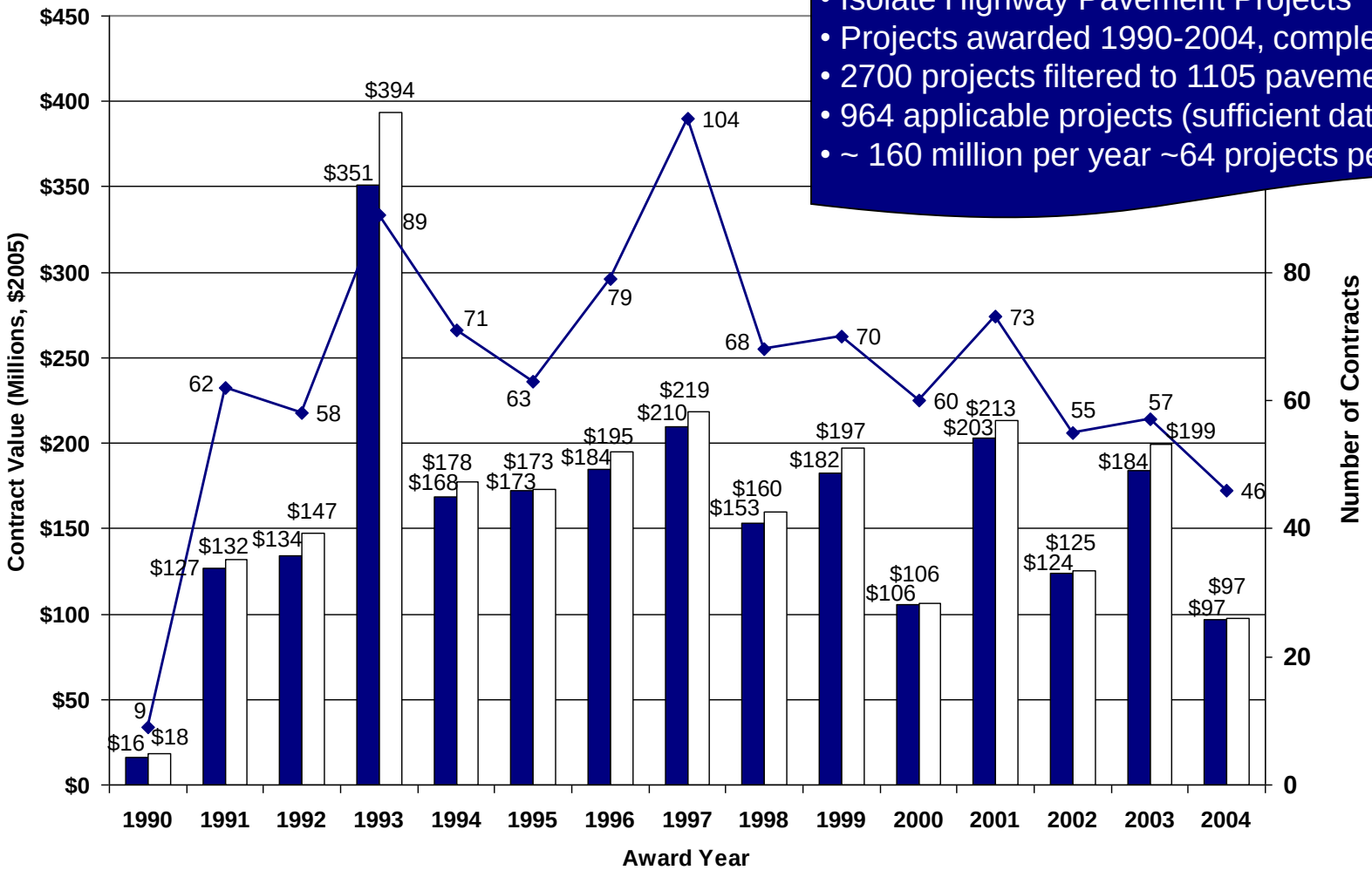
- Request a revised schedule
- Choose action suitable for how far the contractor is behind

States Practice Summary

- Generally DOTs measure progress not performance
- Apparent lack of formal evaluation during construction
- Apparent lack of a sensible use of the historical records

Data Collection & Analysis

- Isolate Highway Pavement Projects
- Projects awarded 1990-2004, completed 2006
- 2700 projects filtered to 1105 pavement projects
- 964 applicable projects (sufficient data)
- ~ 160 million per year ~64 projects per year



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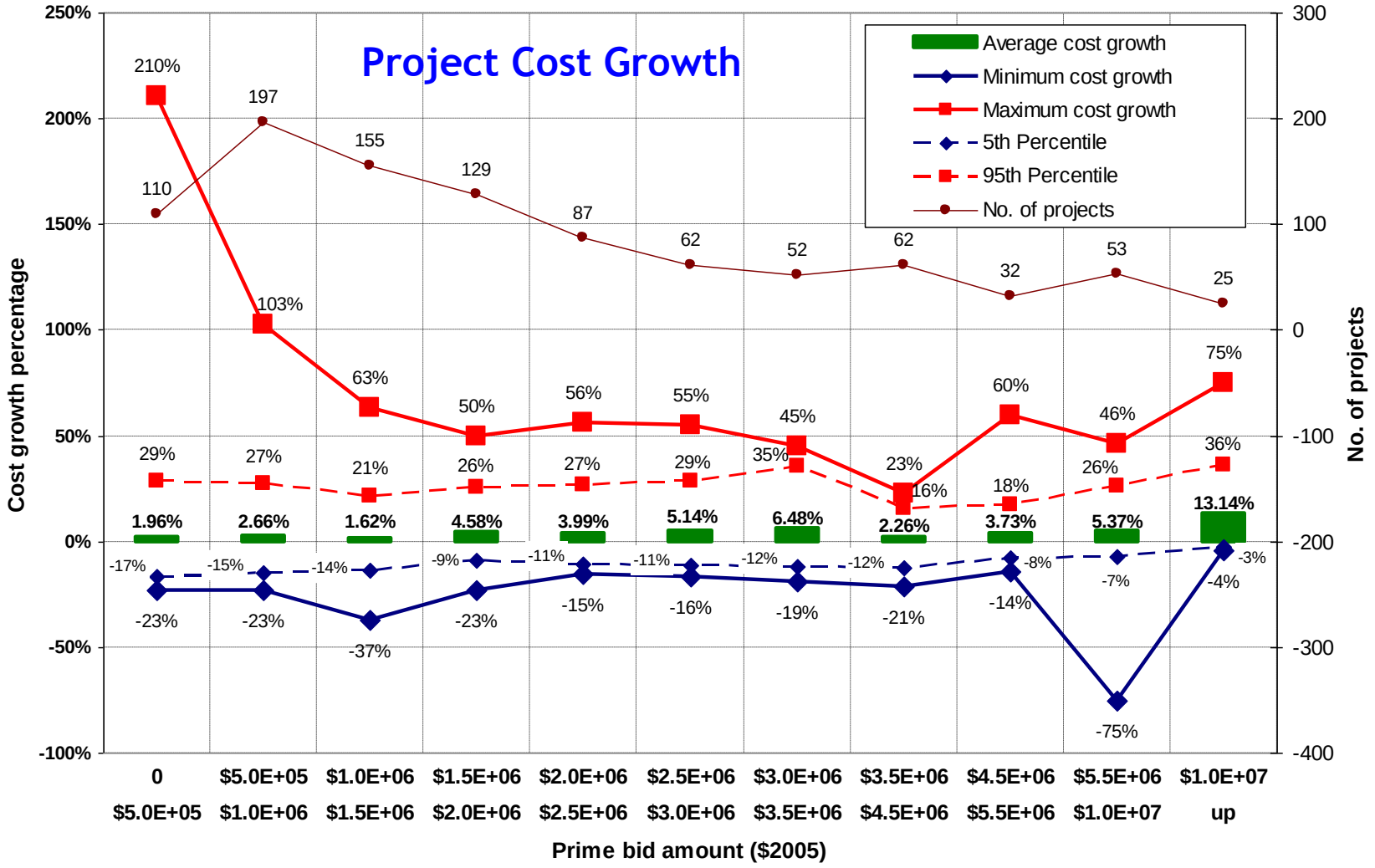
Data Collection & Analysis

- Major variables in the Agency databases
  - Workable Charged Days (actual)
  - Original Contract Days (planned)
  - Contract Values (paid-to-contractor dollars)
  - Quantities of ACP/HMA (tons; metric and English)
  - Quantities of Grading (tons/cy) and Surfacing (tons)
  - Length of projects (miles)

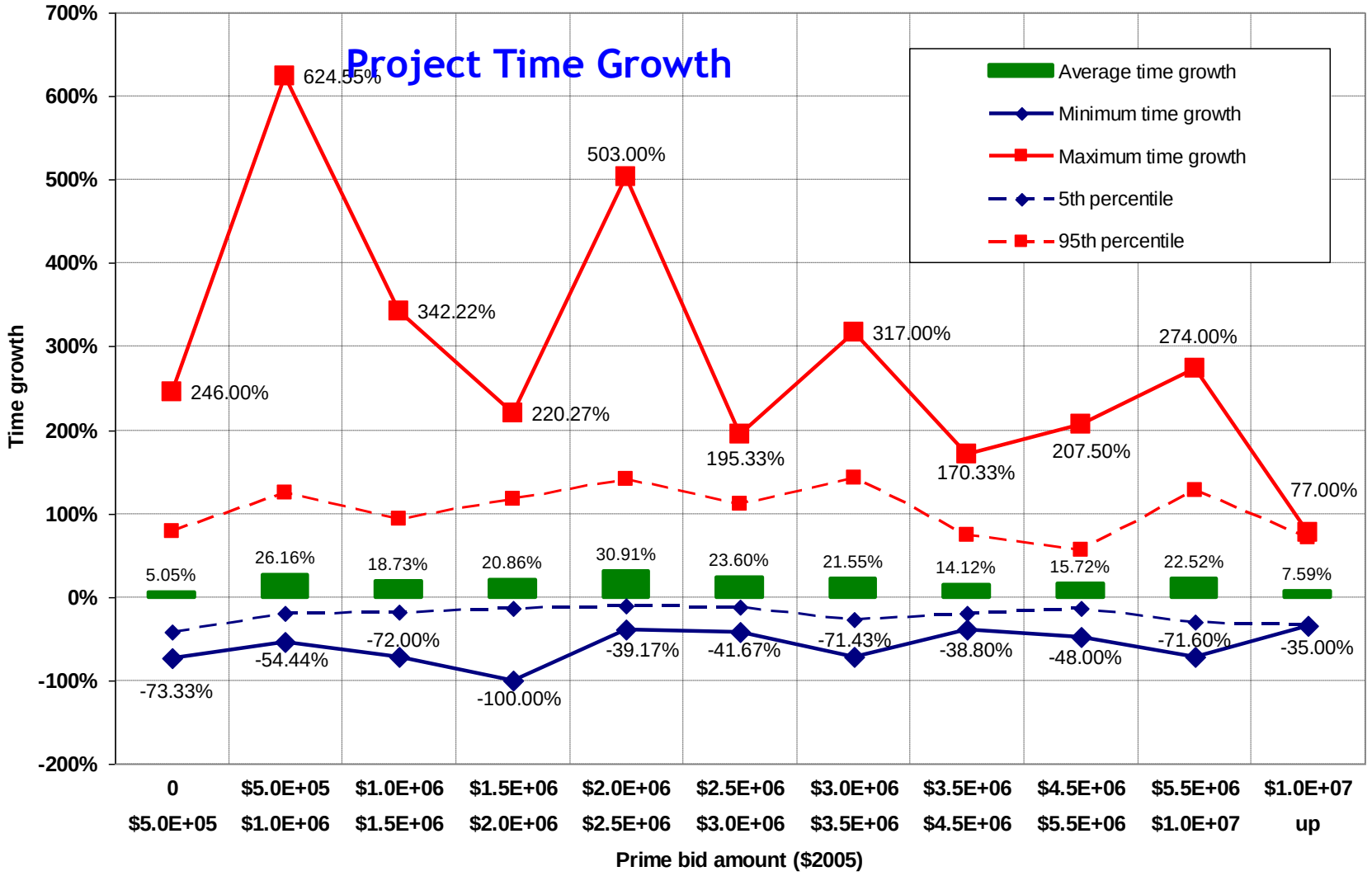
- Standard Bid Items (E/M)
  - SBIs HMA (24 HMA classes; 13 Leveling; 5 Approaches)
  - SBIs Grading (10 codes); SBIs Surfacing (5)

Data Collection & Analysis



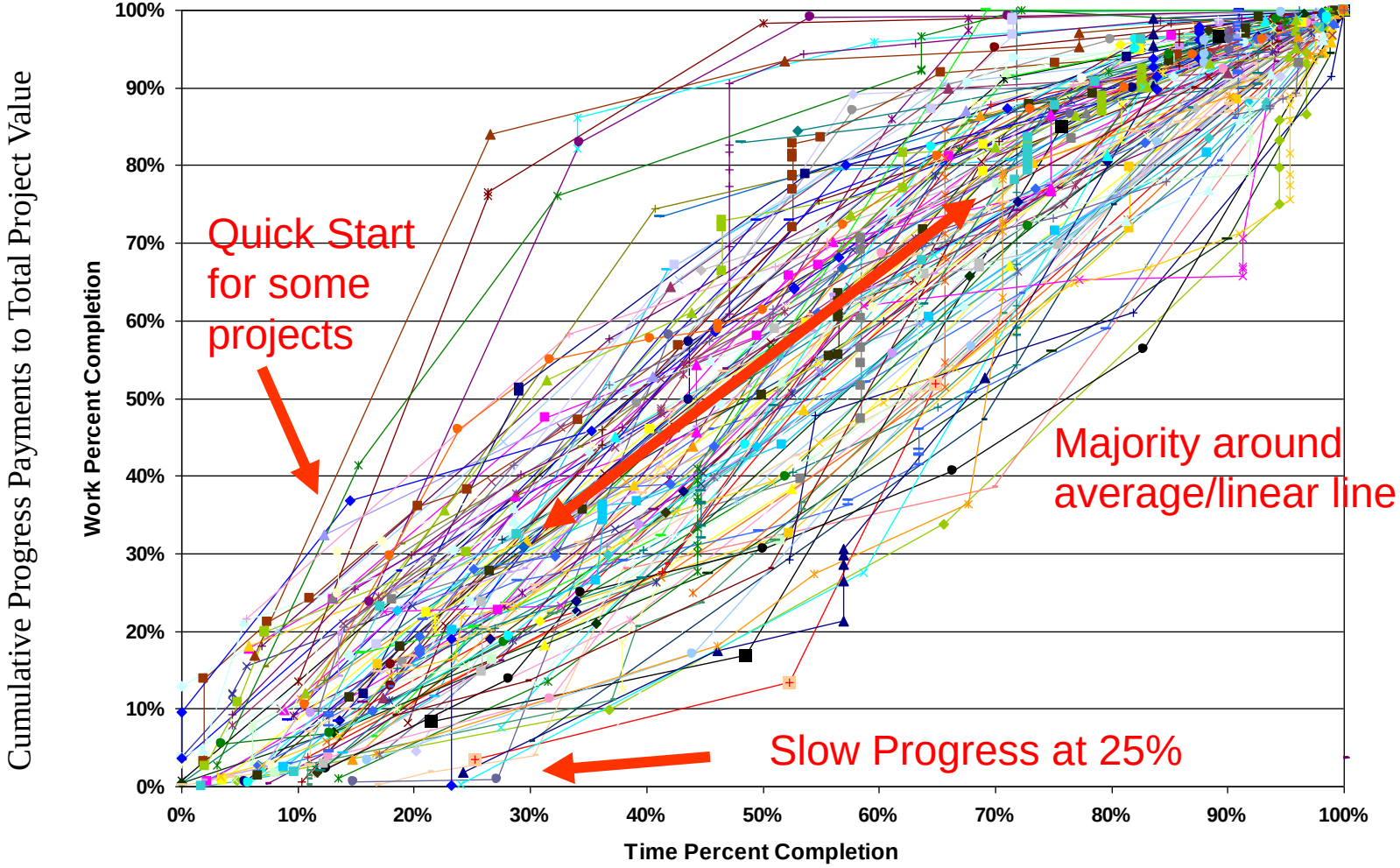
Cost Growth = (Paid-to-Contractors – original bid amount) / original bid amount

Data Collection & Analysis



Time Growth = (workable charged days – orig. contract days) / orig. contract days

Development of Performance Bounds



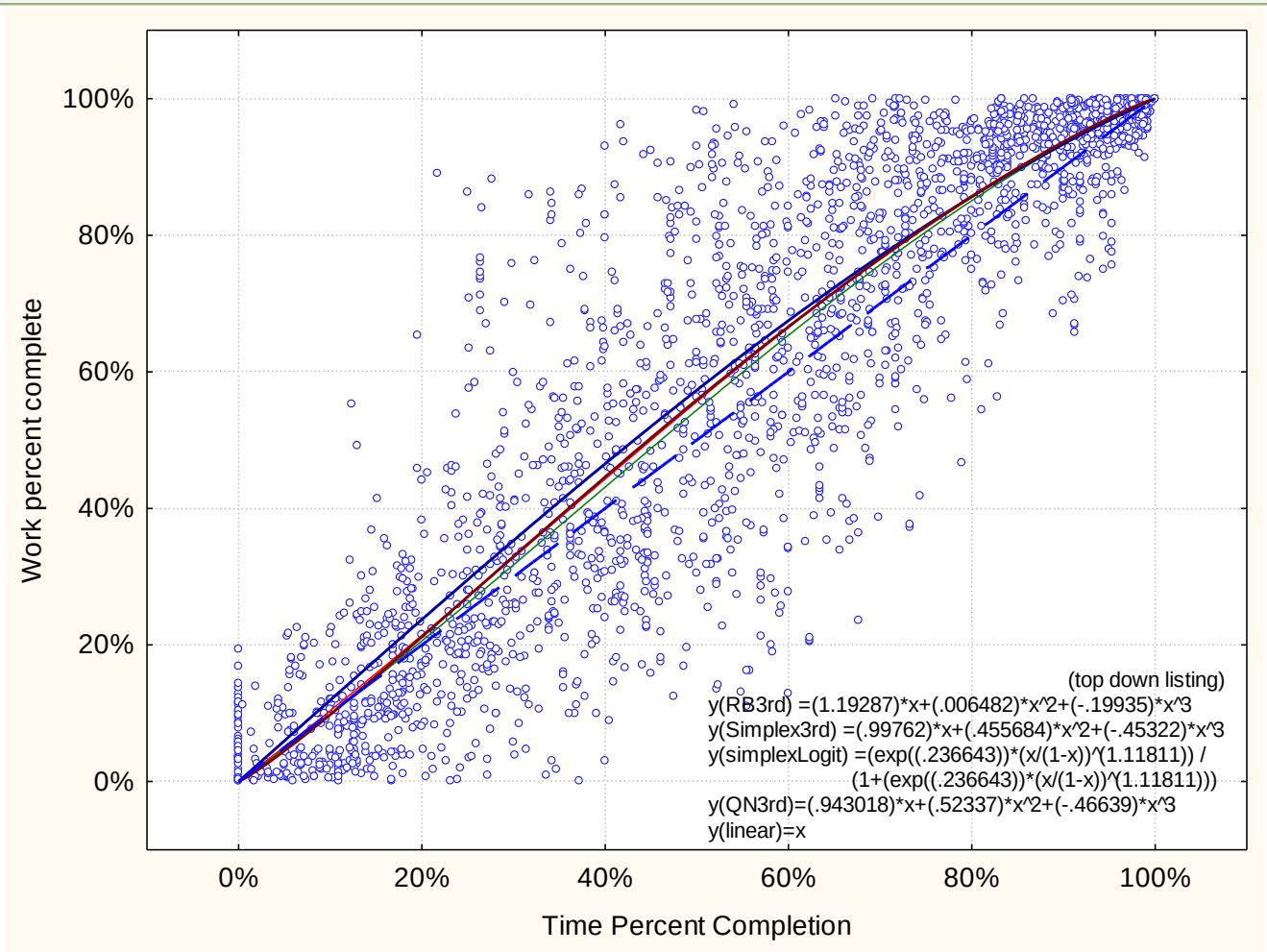
Time/Cost Performance Curves for Successfully Completed Projects (497)

Development of Performance Bounds

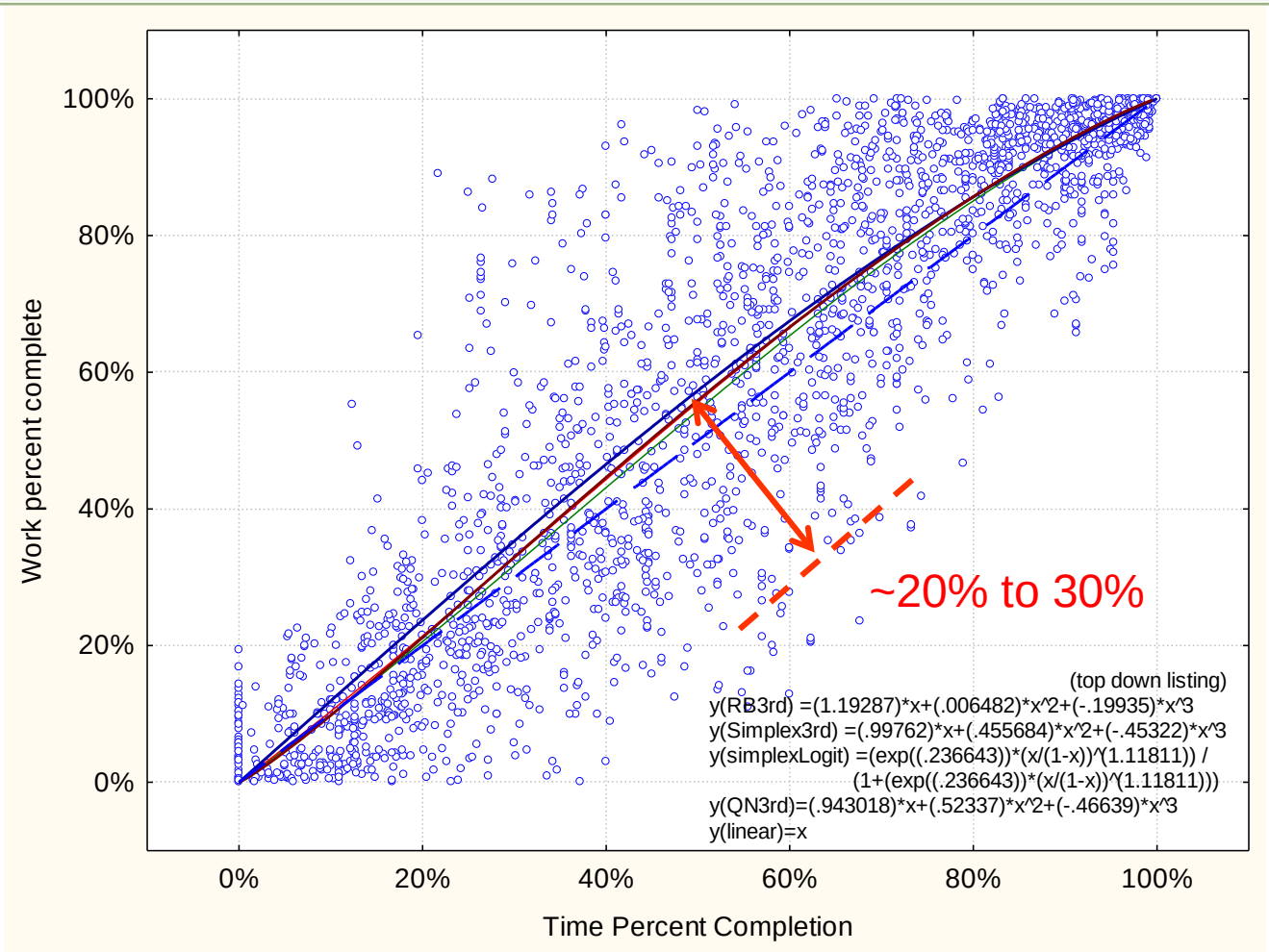
Model Structure

- The bounds would be developed based on Work Percent Complete and Time Percent Complete, using
  - Polynomial Regression $$y = b_0 + b_1 \cdot x^1 + b_2 \cdot x^2 + b_3 \cdot x^3$$
  - Logit Transformation $$y = e^{b_1} \cdot \left(\frac{x}{1-x}\right)^{b_2} \Big/ \left[1 + e^{b_1} \cdot \left(\frac{x}{1+x}\right)^{b_2}\right]$$
- To simplify using the model
  - No intercept *bo* (prevents having values when there is no work completed)
  - Sum of coefficients to equal zero (prevent partial work percent complete when completion is not done)
  - Numerical search methods were used (Quasi-Newton, Simple, Rosenbrock pattern) to fit the model to the data.

Average Performance Bounds

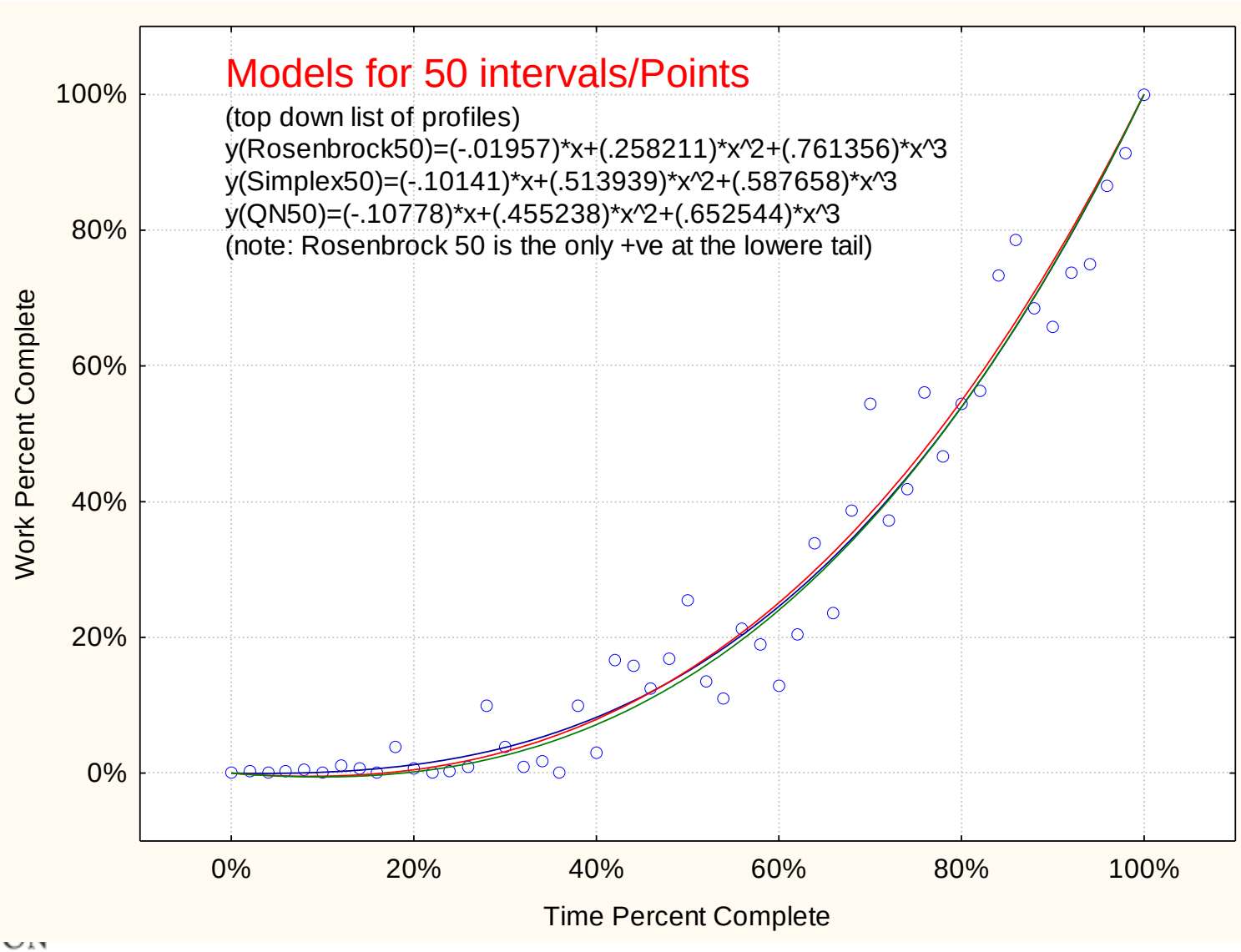


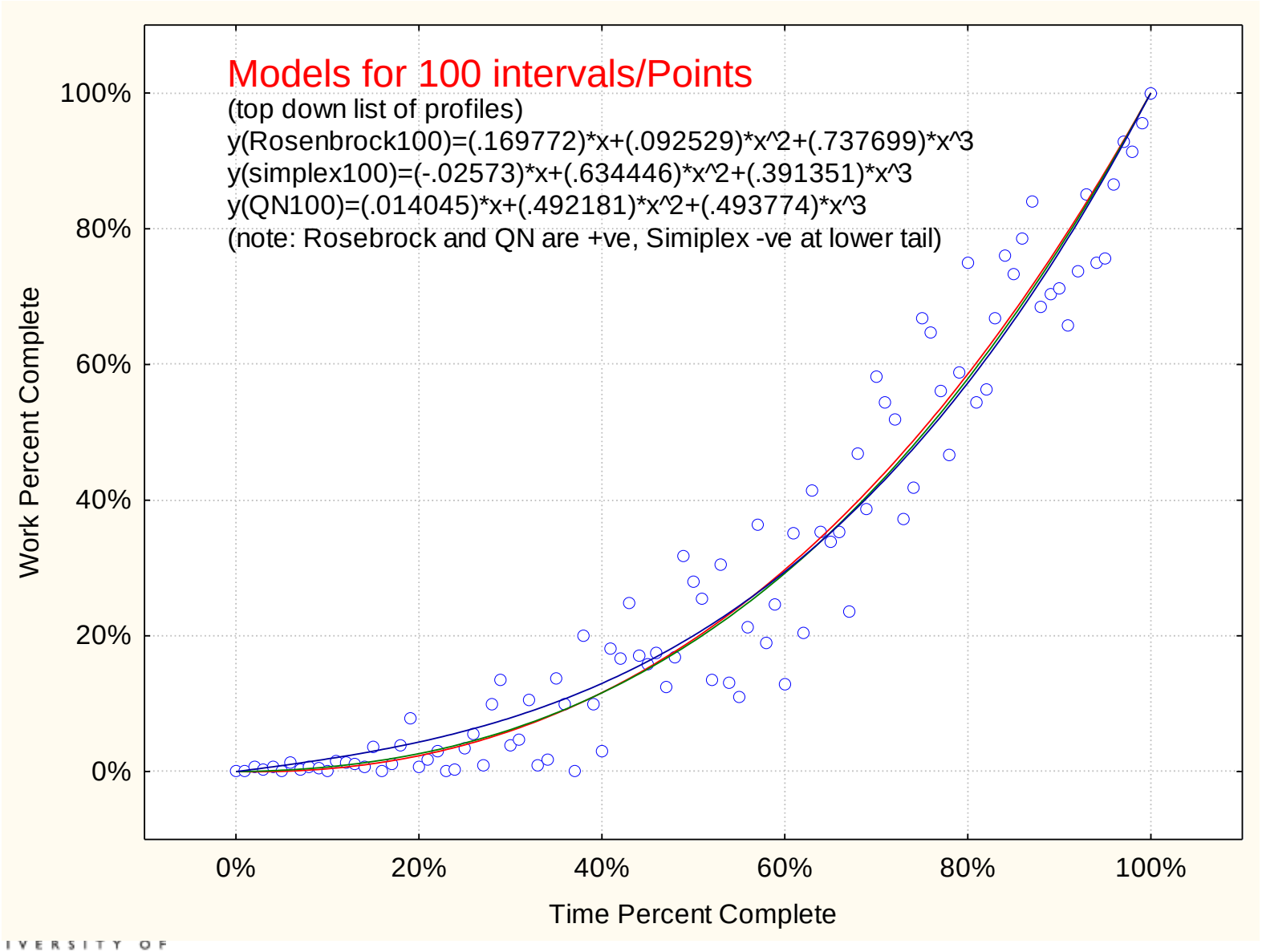
Minimum Performance Bounds

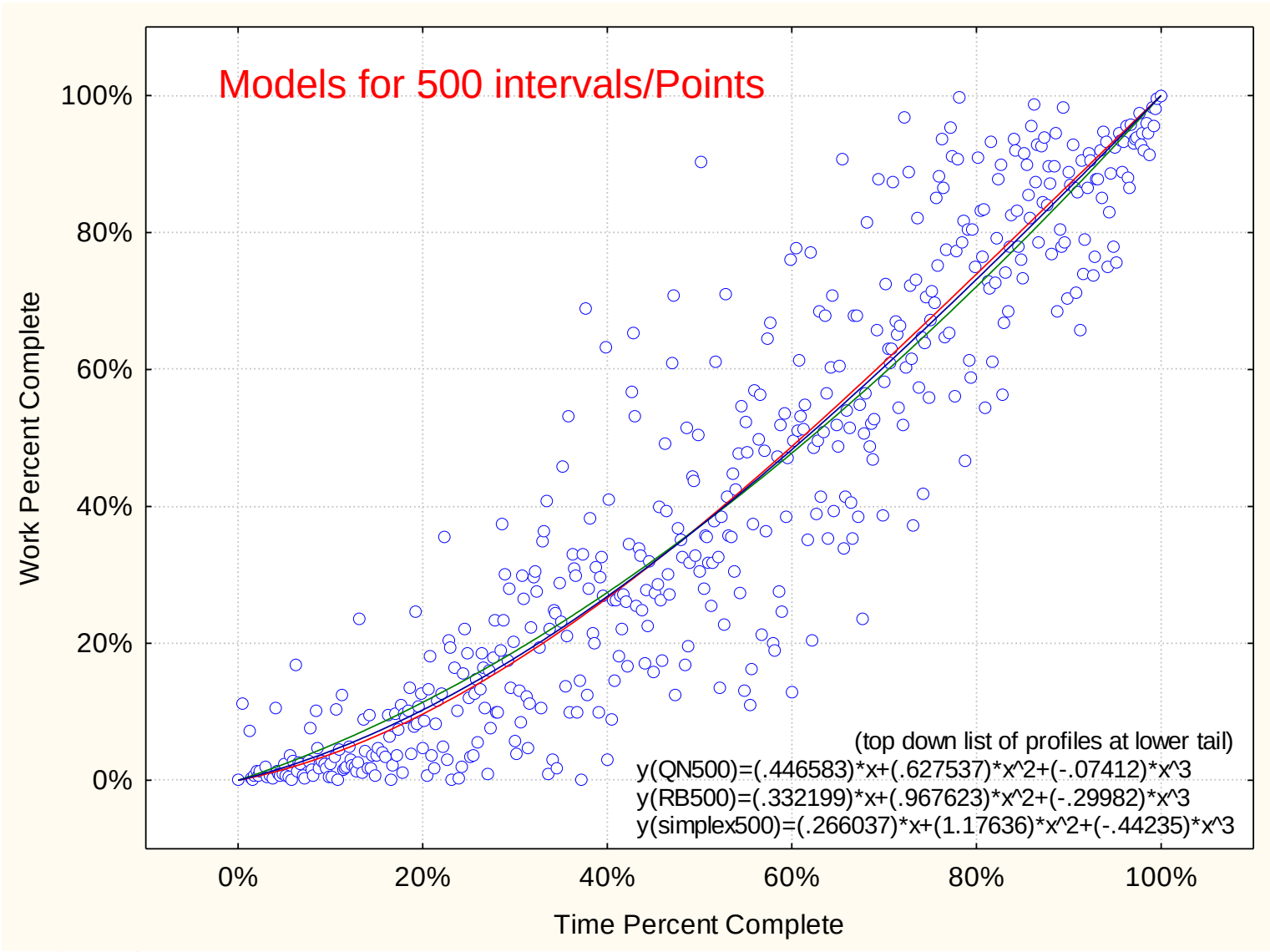


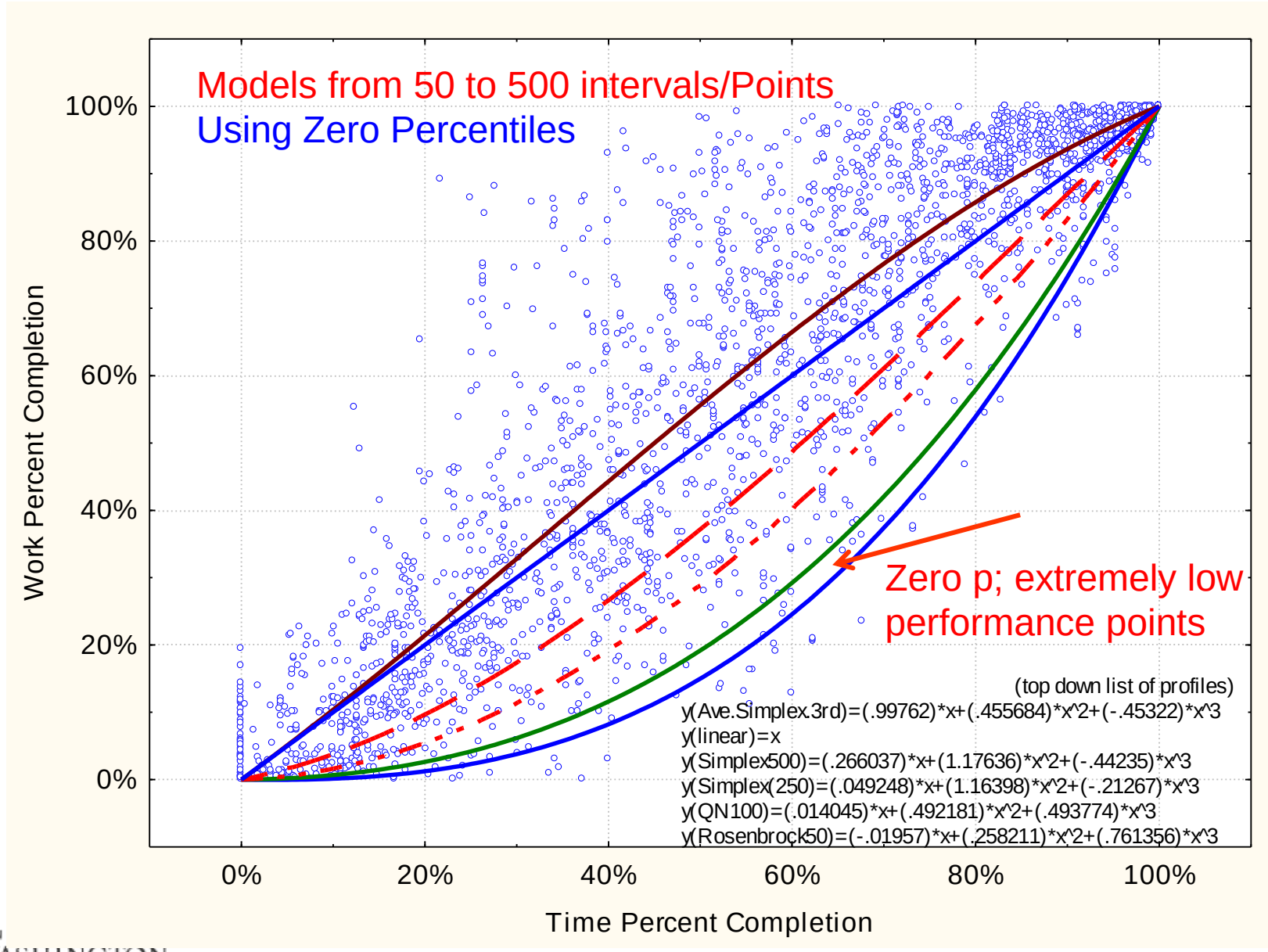
How far below the average performance would the performance is considered unsatisfactory? No Rule. Minimum Bounds at Borders.

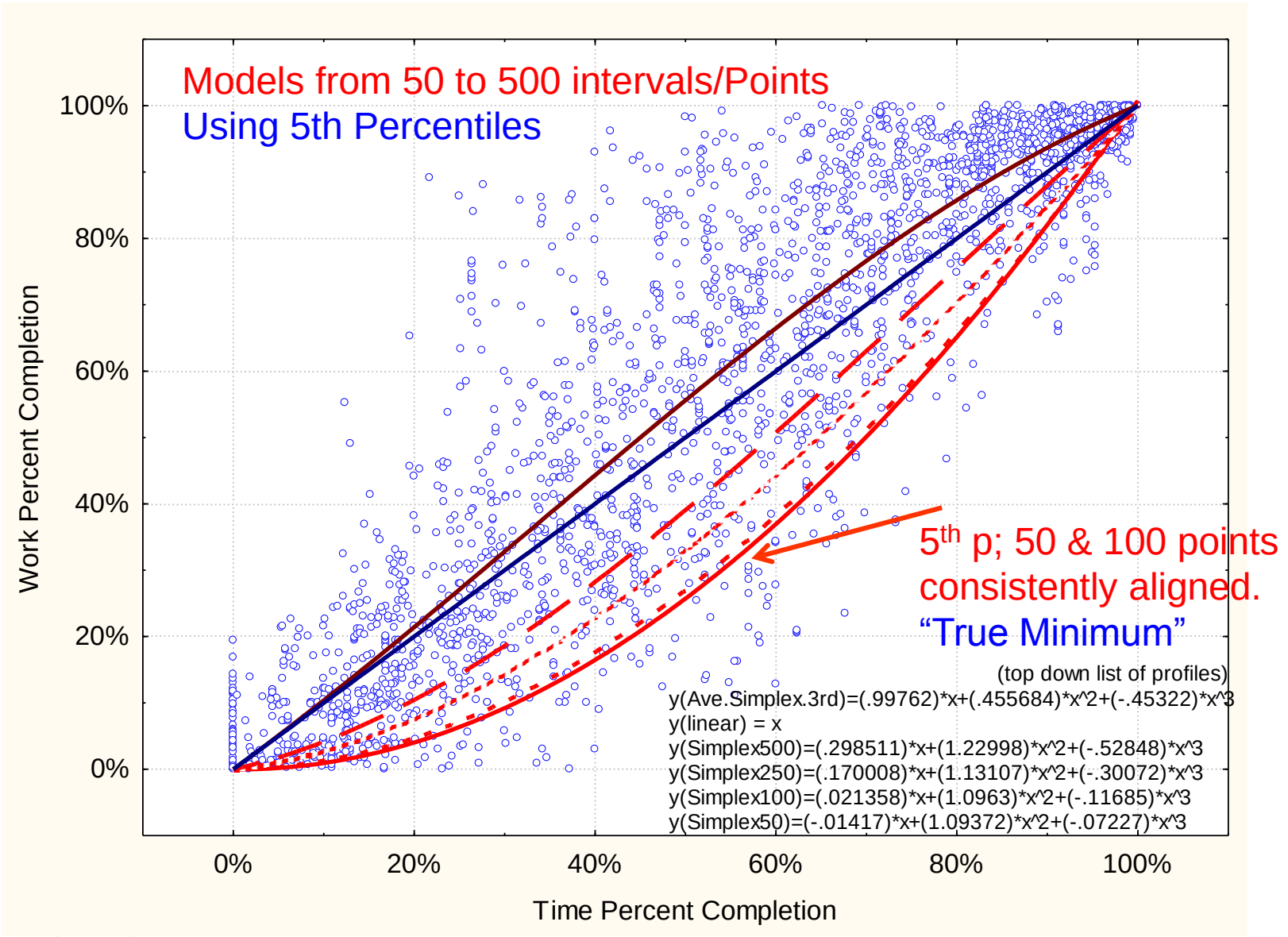
Minimum Performance Bounds



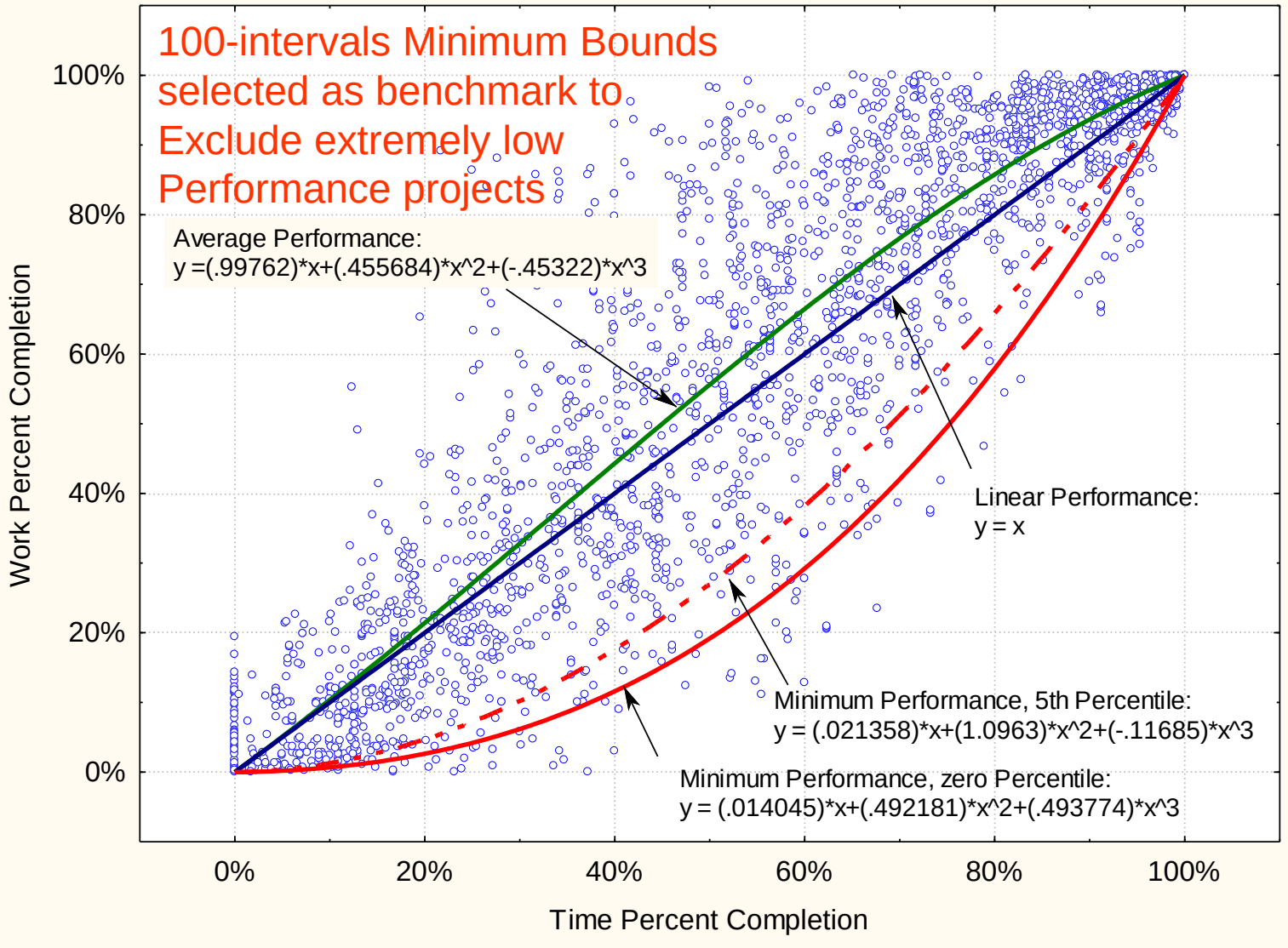

Models for 100 intervals/Points
(top down list of profiles)
y(Rosenbrock100)=(.169772)*x+(.092529)*x^2+(.737699)*x^3
y(simplex100)=(-.02573)*x+(.634446)*x^2+(.391351)*x^3
y(QN100)=(.014045)*x+(.492181)*x^2+(.493774)*x^3
(note: Rosebrock and QN are +ve, Simiplex -ve at lower tail)
Work Percent Complete
100%
80%
60%
40%
20%
0%
0%
20%
40%
60%
80%
100%
Time Percent Complete


Models for 500 intervals/Points
100%
80%
60%
40%
20%
0%
Work Percent Complete
0%
20%
40%
60%
80%
100%
Time Percent Complete
(top down list of profiles at lower tail)
y(QN500)=(.446583)*x+(.627537)*x^2+(-.07412)*x^3
y(RB500)=(.332199)*x+(.967623)*x^2+(-.29982)*x^3
y(simplex500)=(.266037)*x+(1.17636)*x^2+(-.44235)*x^3


Models from 50 to 500 intervals/Points
Using Zero Percentiles
Zero p; extremely low performance points
(top down list of profiles)
y(Ave.Simplex.3rd)=(.99762)*x+(.455684)*x^2+(-.45322)*x^3
y(linear)=x
y(Simplex500)=(.266037)*x+(1.17636)*x^2+(-.44235)*x^3
y(Simplex(250)=(.049248)*x+(1.16398)*x^2+(-.21267)*x^3
y(QN100)=(.014045)*x+(.492181)*x^2+(.493774)*x^3
y(Rosenbroçk50)=(-.01957)*x+(.258211)*x^2+(.761356)*x^3
Work Percent Completion
Time Percent Completion
0%
20%
40%
60%
80%
100%


Models from 50 to 500 intervals/Points
Using 5th Percentiles
5th p; 50 & 100 points consistently aligned.
"True Minimum"
(top down list of profiles)
y(Ave.Simplex.3rd)=(.99762)*x+(.455684)*x^2+(-.45322)*x^3
y(linear) = x
y(Simplex500)=(.298511)*x+(1.22998)*x^2+(-.52848)*x^3
y(Simplex250)=(.170008)*x+(1.13107)*x^2+(-.30072)*x^3
y(Simplex100)=(.021358)*x+(1.0963)*x^2+(-.11685)*x^3
y(Simplex50)=(-.01417)*x+(1.09372)*x^2+(-.07227)*x^3
Work Percent Completion
0%
20%
40%
60%
80%
100%
Time Percent Completion

Minimum Performance Bounds



Minimum Performance Bounds

- Projects are of different sizes and durations and this would affect the shape and location of the minimum boundary. Using **Cluster Analysis**, Minimum Bounds were developed for projects classified based on:
  - Quantity of asphalt concrete pavement/hot mix asphalt (ACP/HMA),
  - Value of contracts,
  - Duration of projects, and
  - Length (miles) of projects.

Minimum Performance Bounds

Contract Value

Cluster no.	No. of projects	Min contract value ($2005)	Max contract value ($2005)	Mean ($2005)
4	348	$105018.58	$2321238.82	$1073383
3	128	$2357167.46	$6495159.59	$3612667
2	19	$6638740.47	$18715549.56	$9484181
1	2	$30304343.08	$49787911.29	$40046130

ACP/HMA Quantity

Cluster no.	No. of projects	Min ACP/HMA	Max ACP/HMA	Mean
3	342	0.00	16753.74	4978.59
2	129	16927.26	48767.96	28764.12
1	26	51338.70	99426.20	69997.30

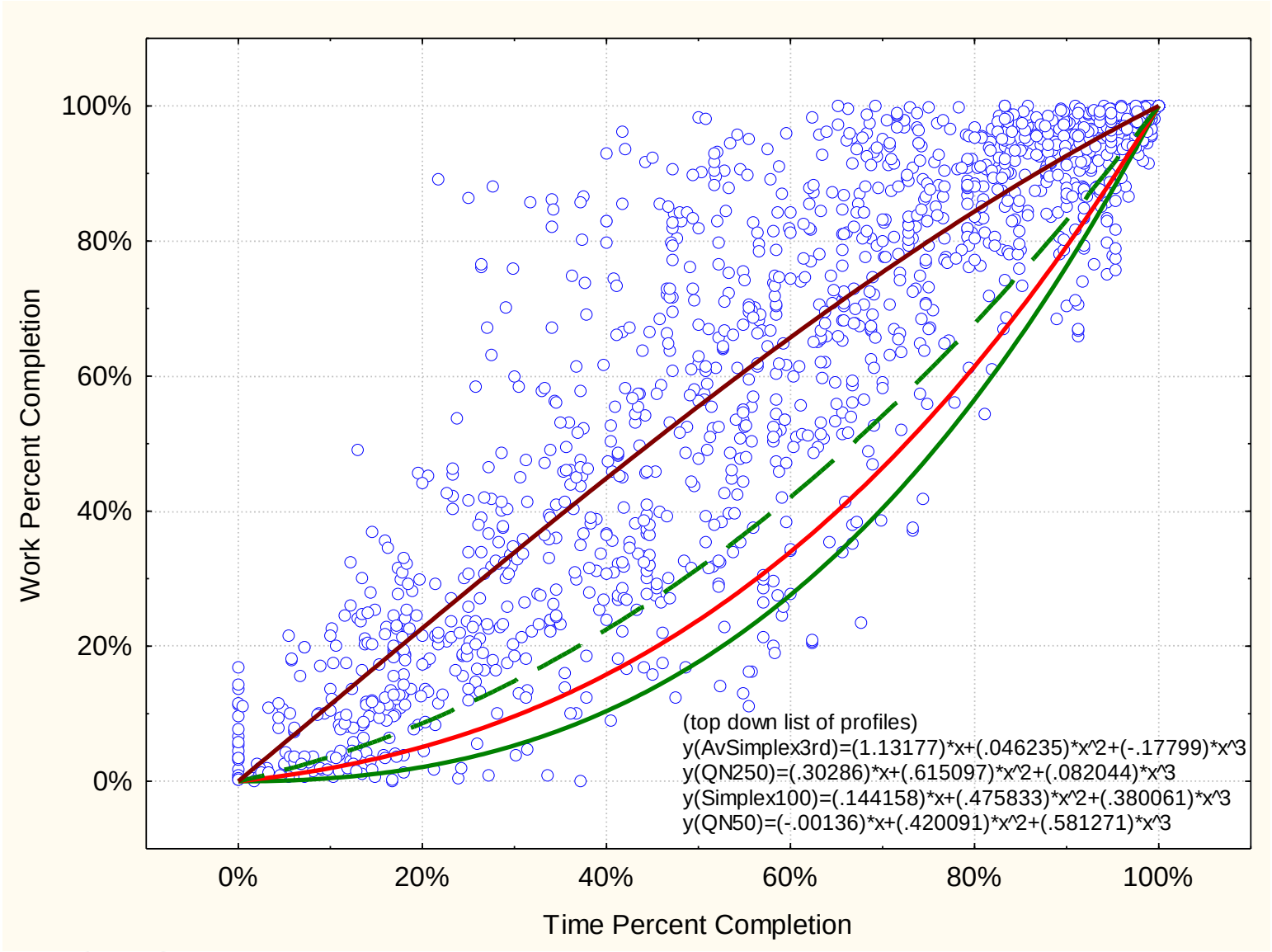
Project Duration

Cluster no.	No. of projects	Min duration (working days)	Max duration (working days)	Mean
3	331	3	64	39.81
2	143	65	146.5	89.01
1	23	154	615.5	212.02

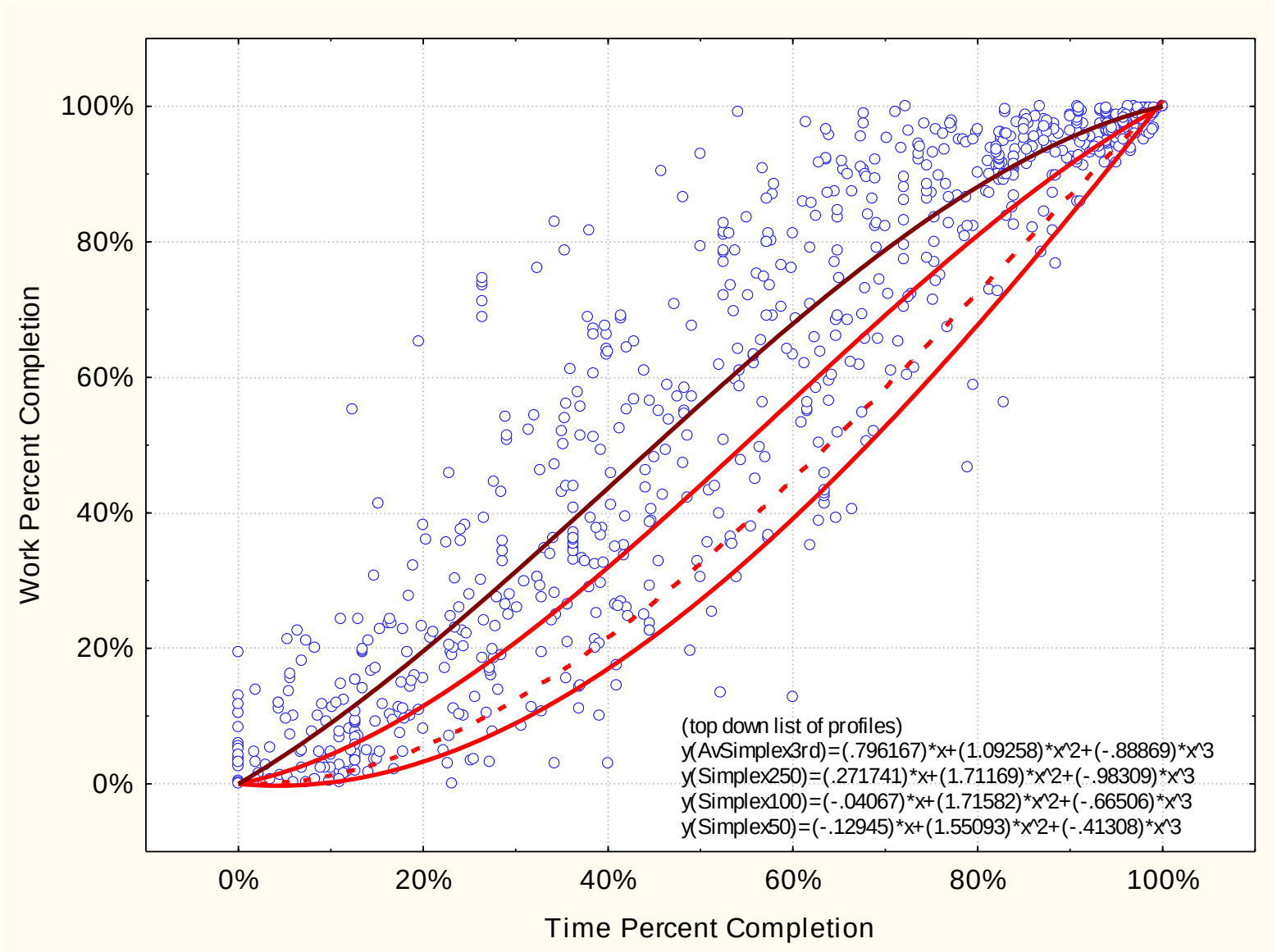
Project Miles

Cluster no.	No. of projects	Min. miles	Max. miles	Mean
3	326	0.01	6.27	2.38
2	145	6.4	18.95	10.37
1	26	20.11	52.17	28.10

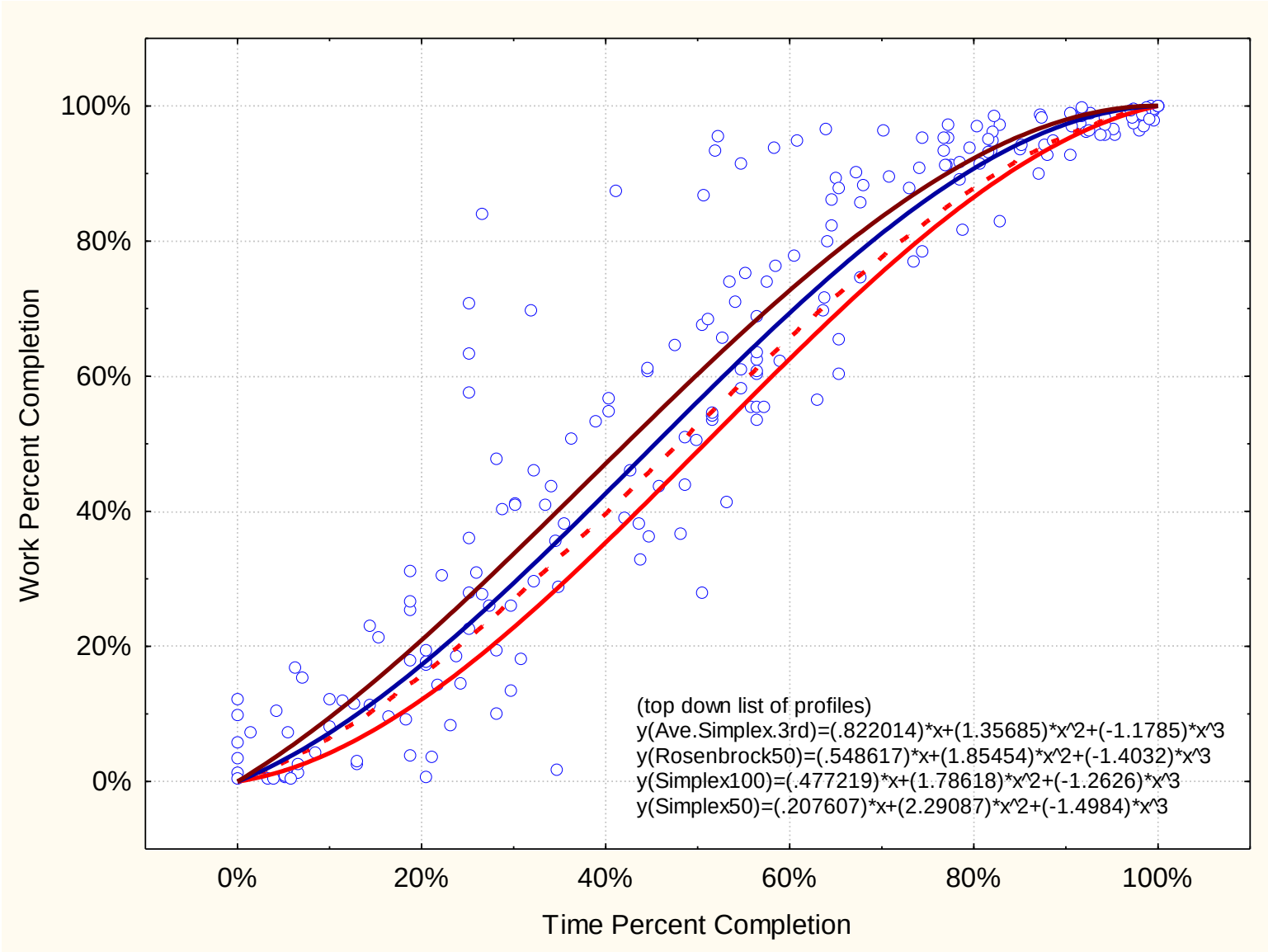
Contract Value – Small Projects



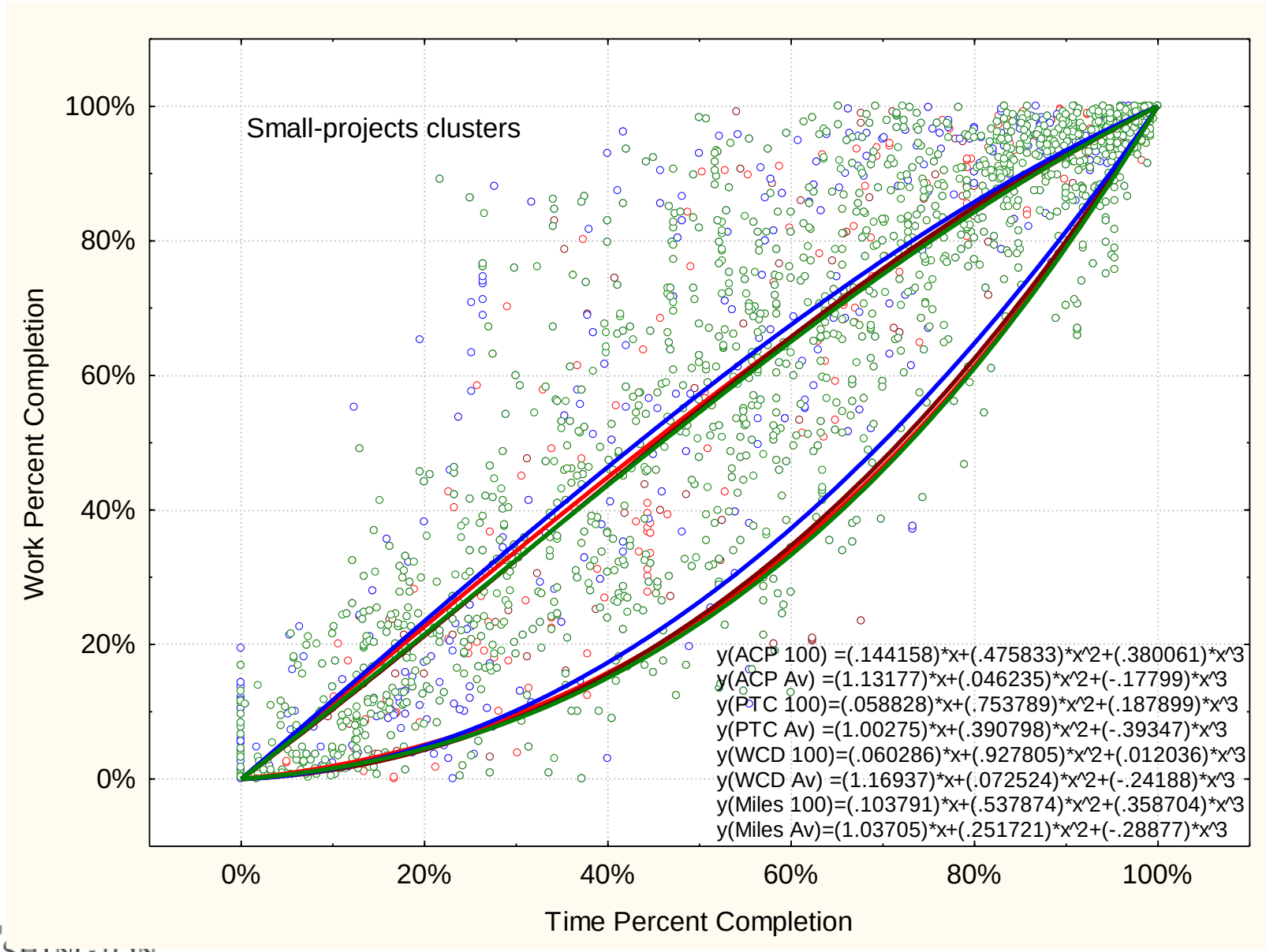
Contract Value – Medium Projects



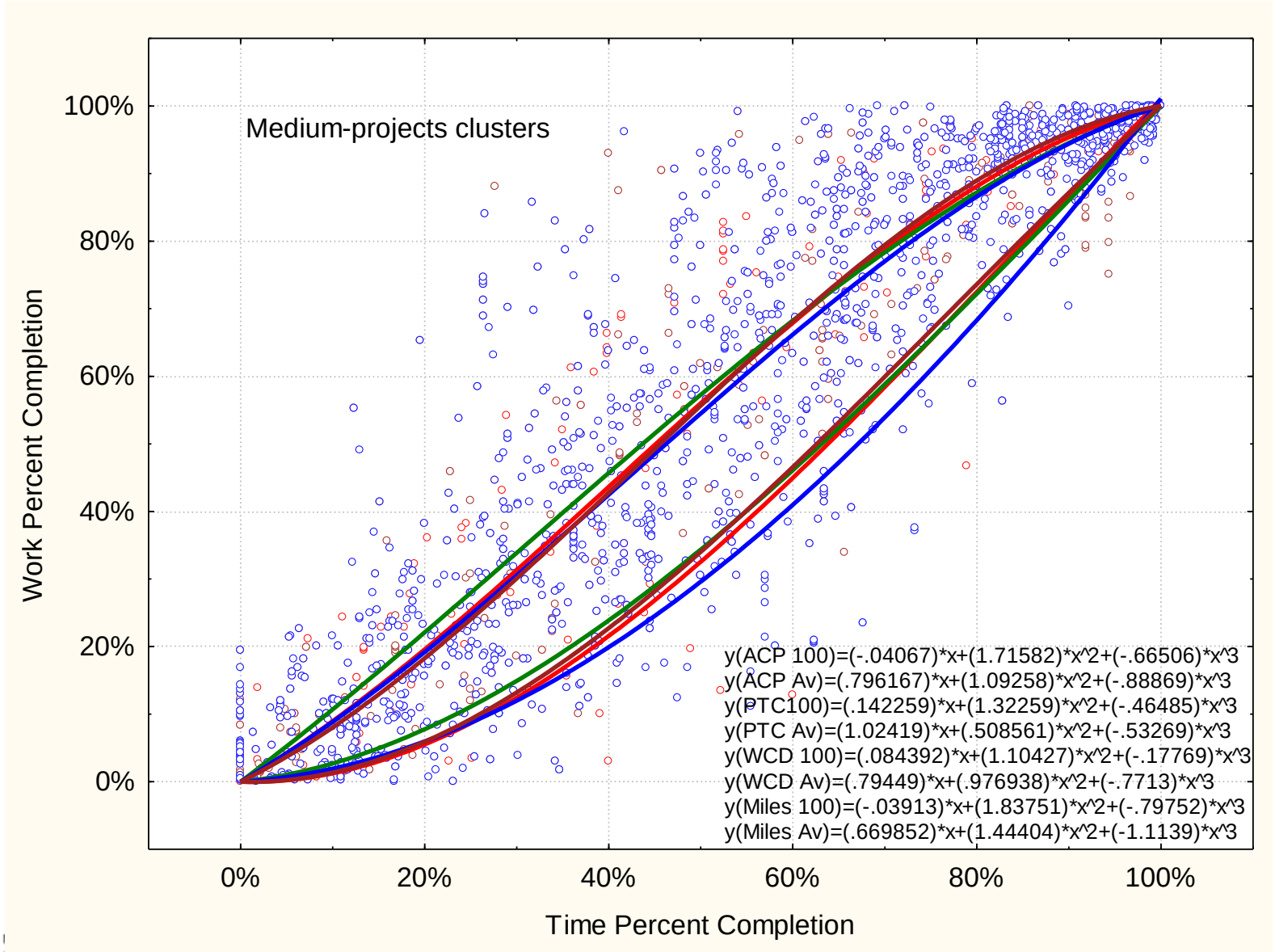
Contract Value – Large Projects



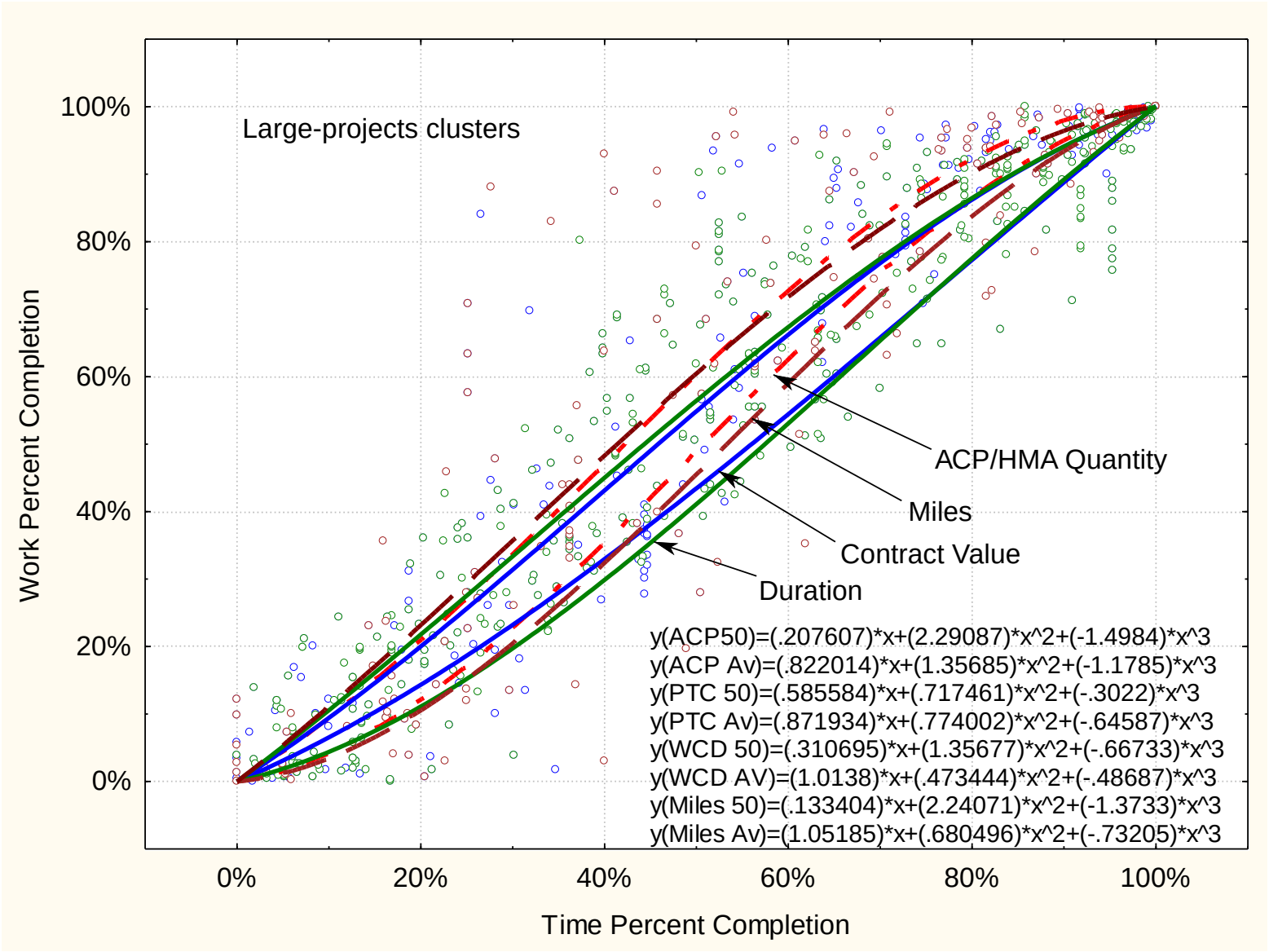
Small Projects (ACP, Value, Duration, Miles)



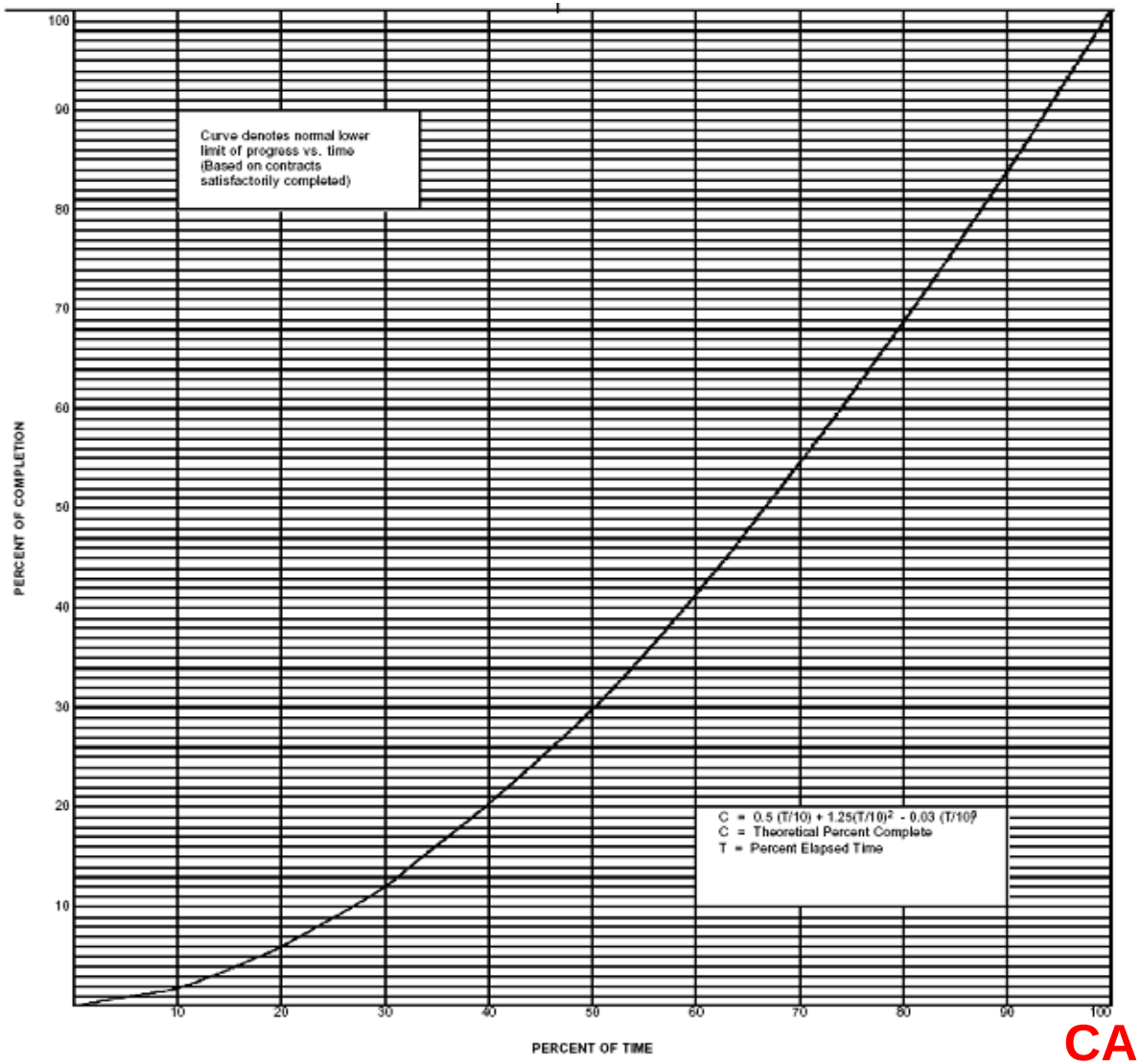
Medium Projects (ACP, Value, Duration, Miles)



Large Projects (ACP, Value, Duration, Miles)



Progress Charts



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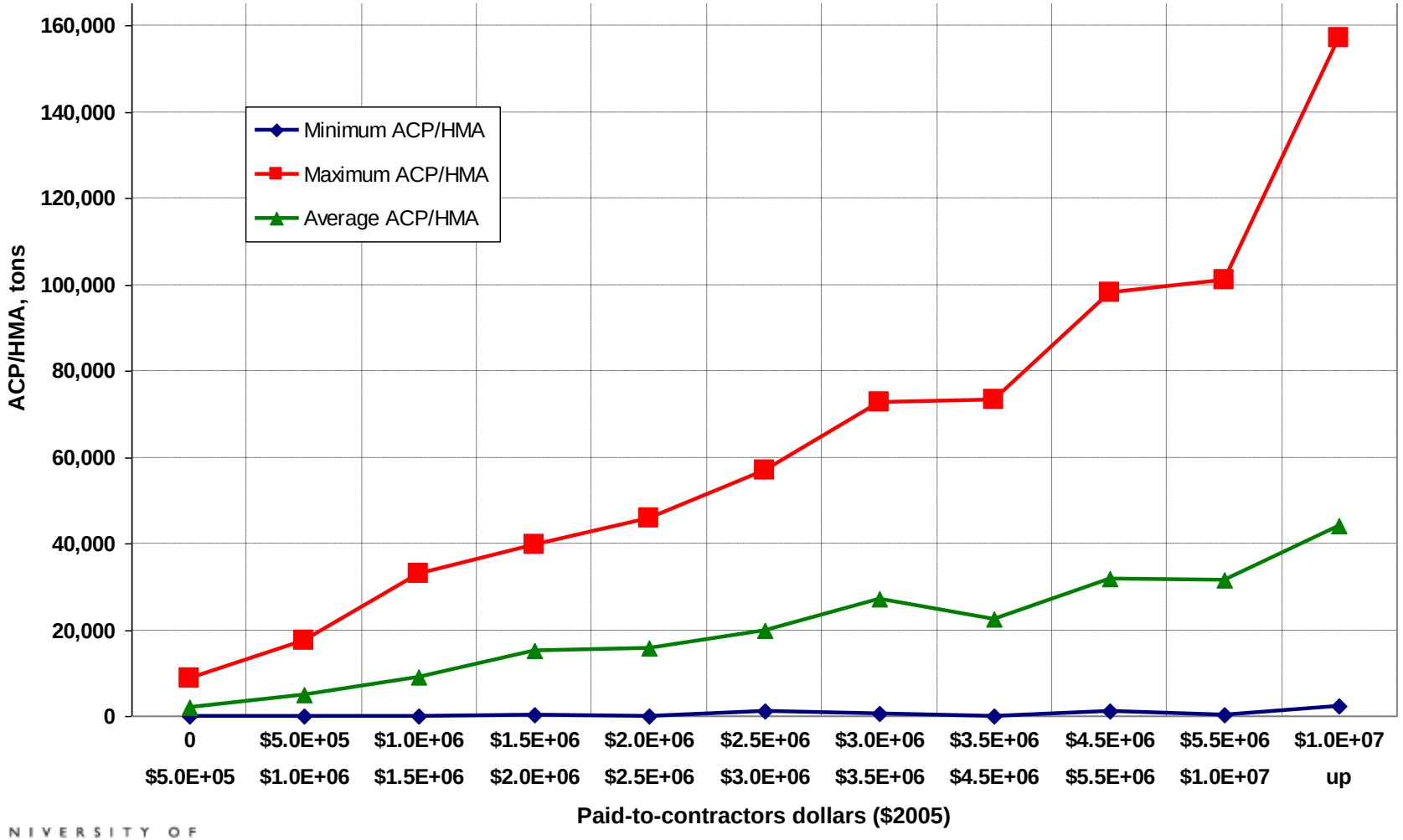
Develop Conceptual Time and Cost - Prediction Models

Time/Cost Prediction

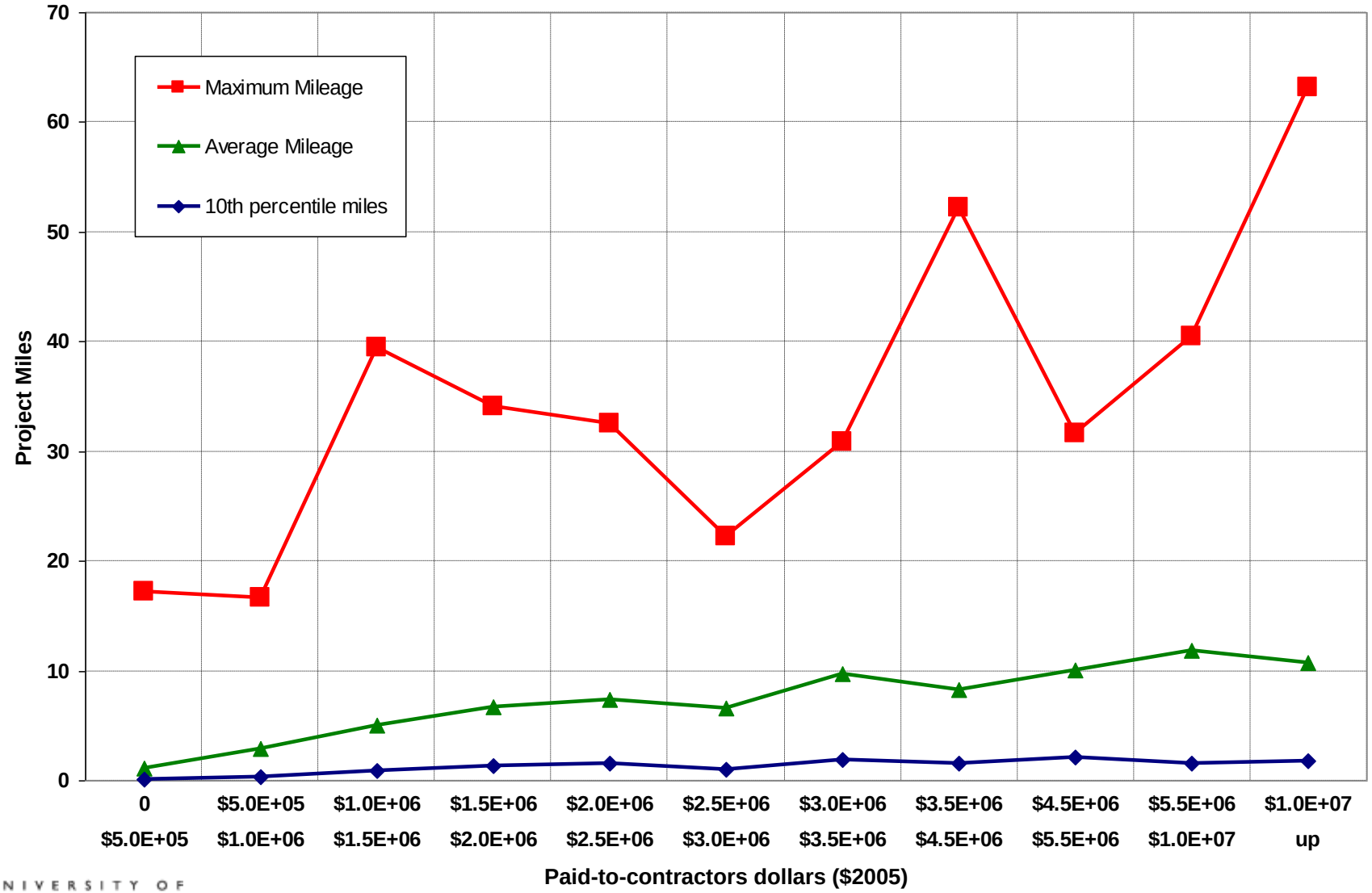
- Assess current status/performance of prediction
- WSDOT project databases; Isolate "pavement" projects
- Assess available data and identify major variables
  - Quantities of ACP/HMA (tons; metric and English)
  - Quantities of Grading (tons/cy), Surfacing (tons)
  - Length of projects (miles)
  - Duration of projects (working days) / Contract Value
- Build prediction model using regression
  - General Multiple Regression Models (GRM)
  - Ridge Regression
  - General Partial Least-squares Regression (PLS)
- Test and validate the model

Model Phase I: Preliminary Analysis

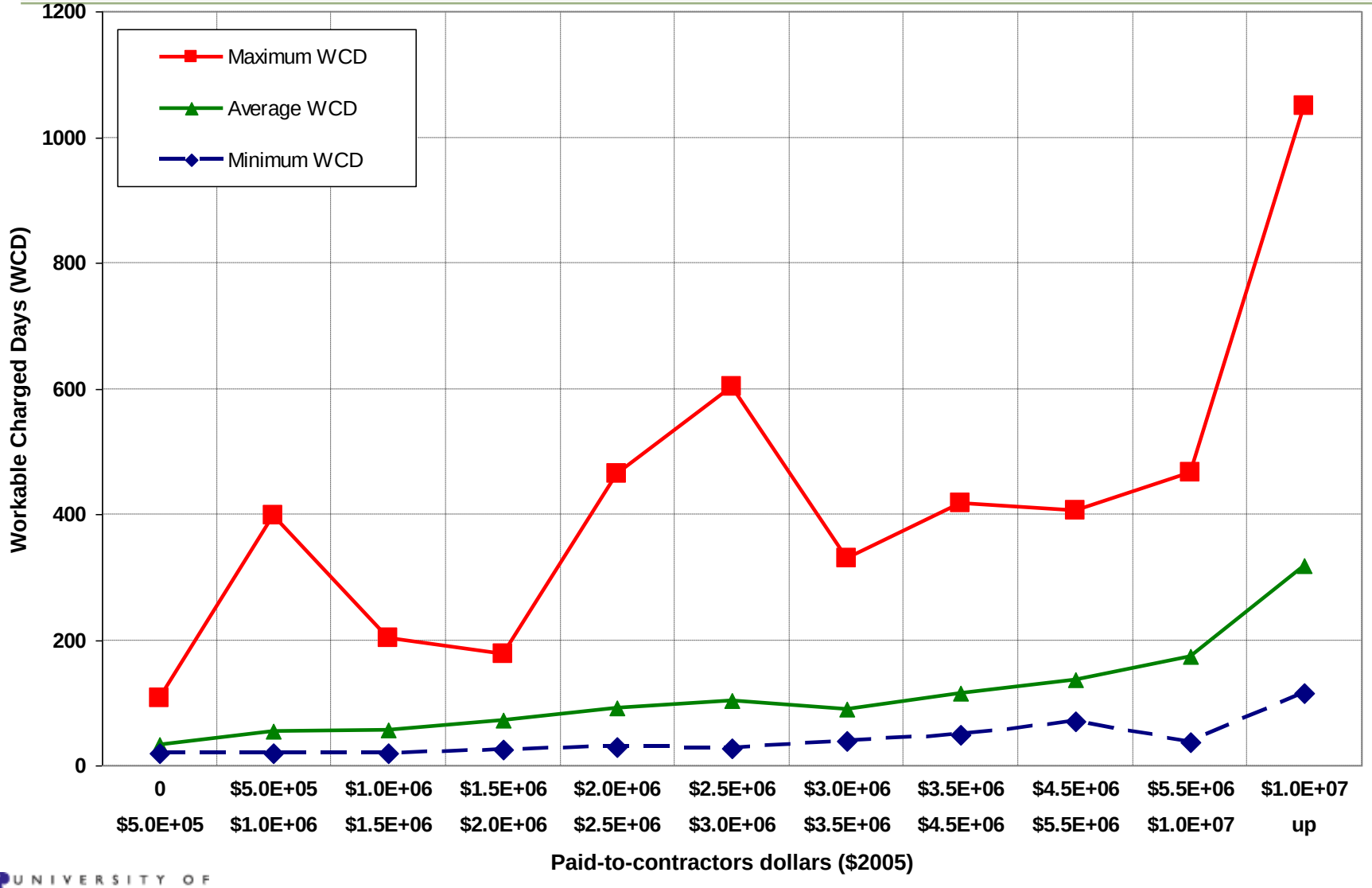
- Variables Characteristics



Model Phase I: Preliminary Analysis



Model Phase I: Preliminary Analysis



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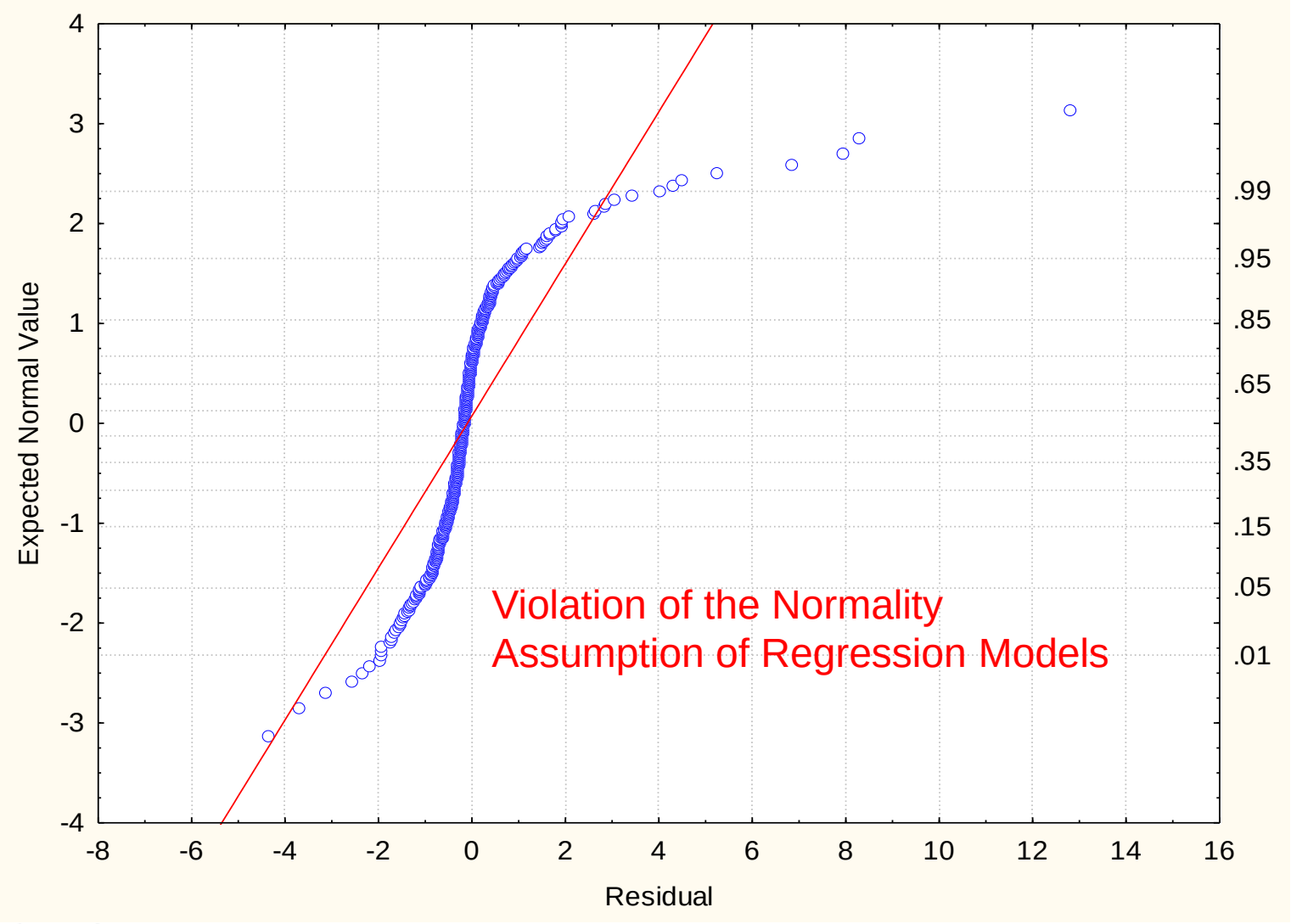
Model Phase I: Preliminary Analysis

- Best Subset Regression

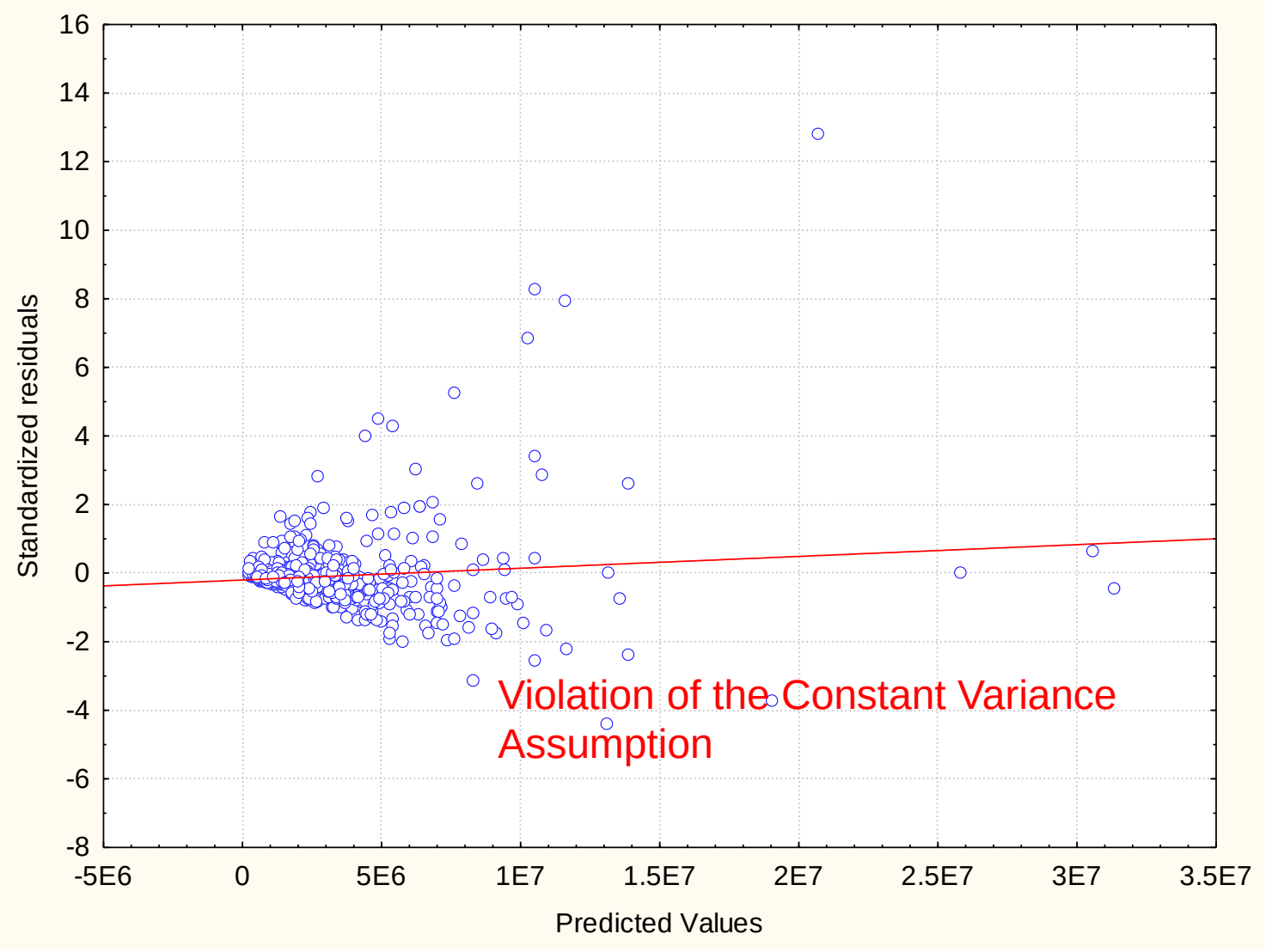
Subset #	Adj. R^2	# of Vars	WCD	Mileage	ACP ton	Grading ton	Grading cy	Surfacing ton
1	0.73438	5	0.50626		0.23930	-0.31556	0.33924	0.191570
2	0.73427	6	0.50219	0.01784	0.22911	-0.32063	0.34386	0.192664
3	0.72446	4	0.54463		0.27051	-0.26336	0.42462	
4	0.72424	5	0.54214	0.01153	0.26404	-0.26645	0.42791	
5	0.71839	4	0.52982		0.26534		0.08018	0.141038
6	0.71815	5	0.53192	-0.01016	0.27091		0.07993	0.140878
7	0.71806	4	0.52183		0.24068	-0.06964		0.270030
8	0.71779	5	0.52323	-0.00644	0.24435	-0.06902		0.269250
9	0.71640	3	0.52819		0.25430			0.209828
10	0.71617	4	0.53058	-0.01151	0.26065			0.209399

Negative parameters
Multicolinearity is suspected

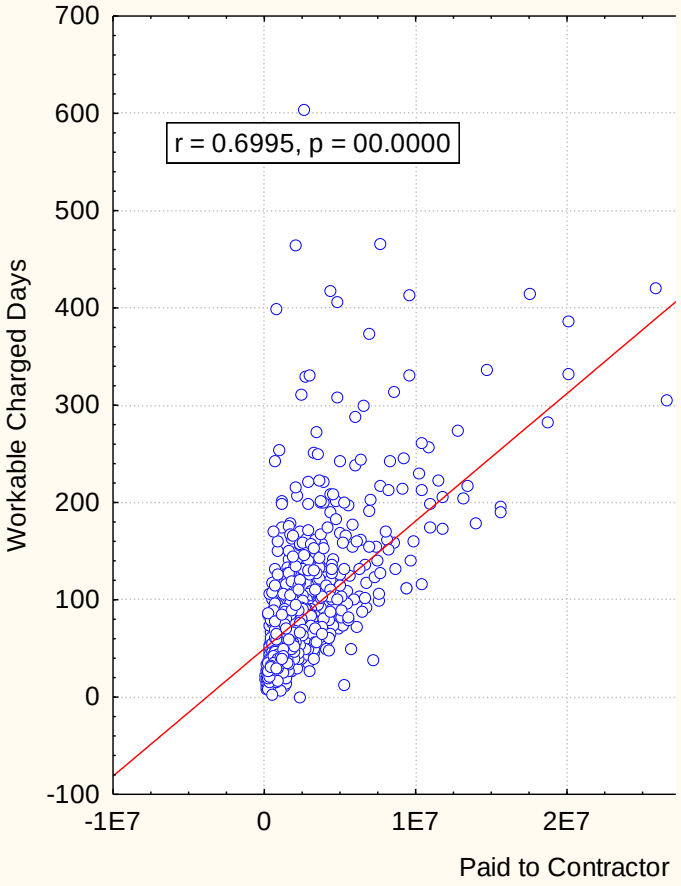
Model Phase I: Preliminary Analysis

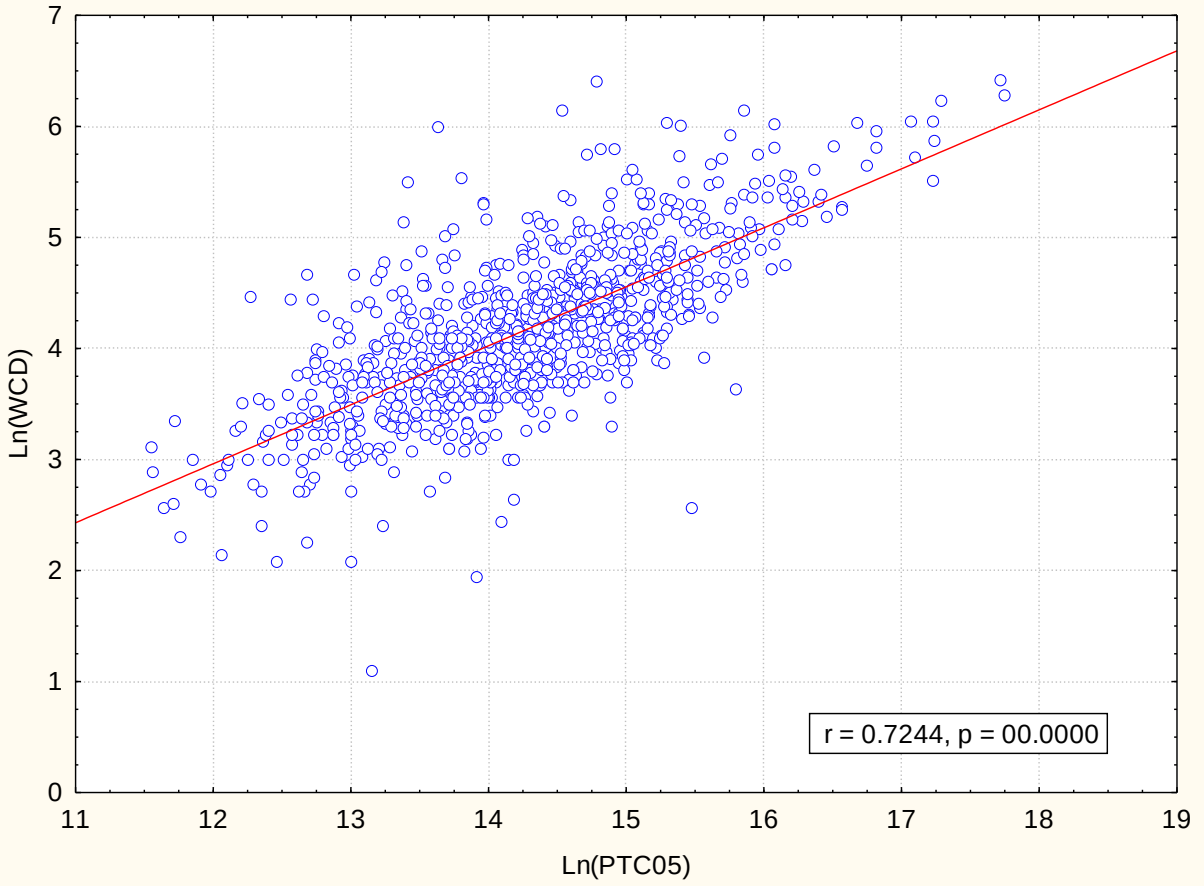


Model Phase I: Preliminary Analysis



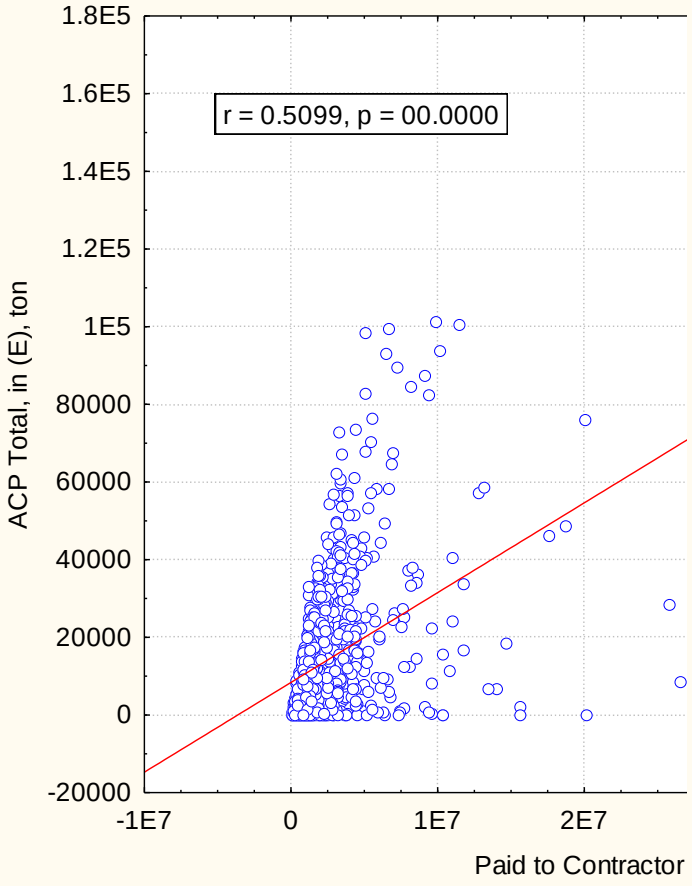
Model Phase II: Transformation & Ridge

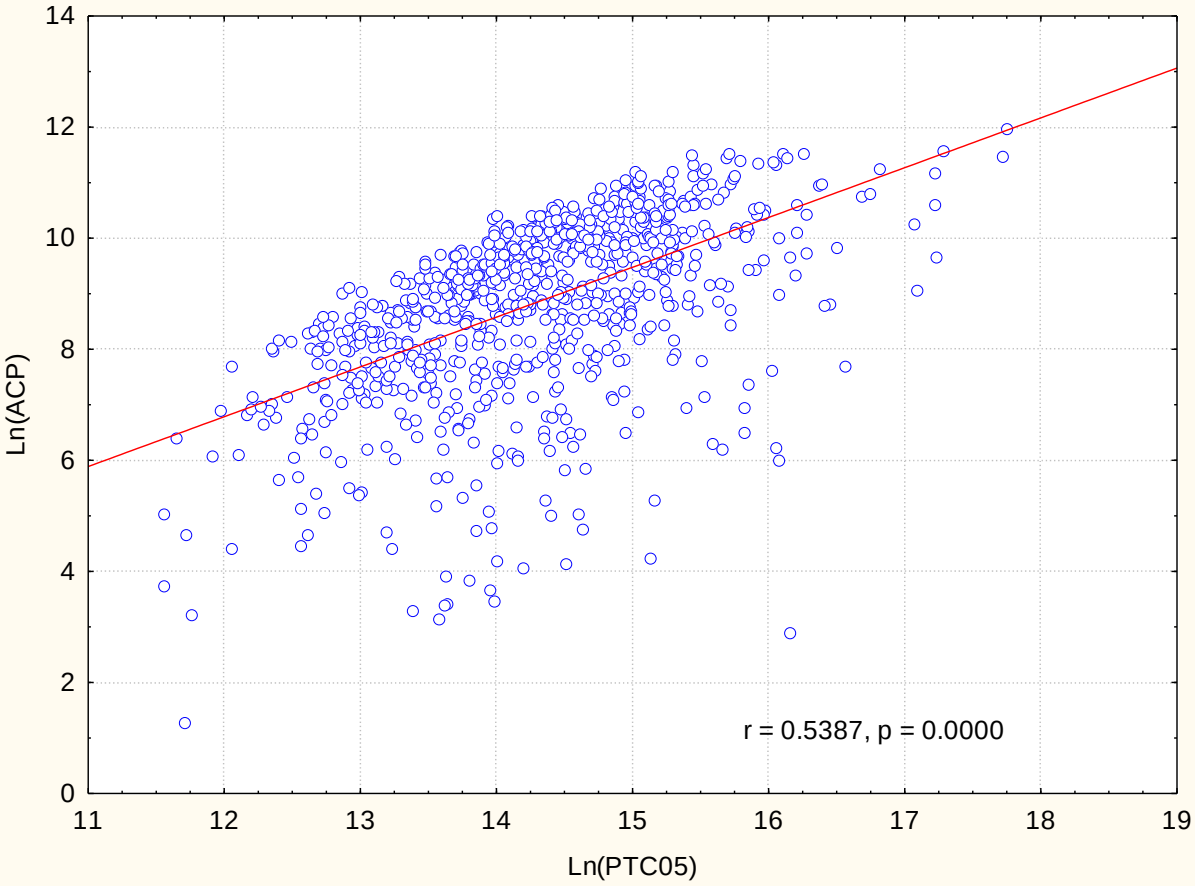




Relations between the variables could be nonlinear and natural logarithm would better model the relation

Model Phase II: Transformation & Ridge





Relations between the variables could be nonlinear and natural logarithm would better model the relation

Model Phase II: Transformation & Ridge

- Best Subset Regression

Negative parameters

Subset #	Adj. R^2	# of Vars	Ln (WCD)	Ln (Mileage)	Ln (ACP)	Ln (Grad.tn)	Ln (Grad.cy)	Ln (Surf. tn)
1	0.993387	6	0.454197	-0.029436	0.417384	-0.081123	0.074937	0.154458
2	0.993347	5	0.457394	-0.030630	0.414170	-0.028739		0.177593
3	0.993340	4	0.446023	-0.030094	0.418743			0.155753
4	0.993322	5	0.444281	-0.029935	0.419584		0.005458	0.151168
5	0.993070	5	0.486856	-0.028905	0.467181	-0.074158	0.139899	
6	0.993019	4	0.477137	-0.029372	0.468225		0.075002	
7	0.992936	5	0.469871		0.370399	-0.088881	0.099528	0.150559
8	0.992860	3	0.467347		0.367100			0.167074
9	0.992857	4	0.504210	-0.031295	0.476289	0.040467		
10	0.992855	4	0.459281		0.371939		0.023739	0.146876

Multicolinearity still exist

Model Phase II: Transformation & Ridge

- Correlation between variables

	Ln (PTC05)	Ln (WCD)	Ln (Mileage)	Ln (ACP)	Ln (Grading ton)	Ln (Grading cy)	Ln (Surfacing ton)
Ln(PTC05)	1.00	0.73	0.59	0.64	0.48	0.50	0.60
Ln(WCD)		1.00	0.30	0.38	0.53	0.51	0.53
Ln(Mileage)			1.00	0.60	0.12	0.10	0.30
Ln(ACP)				1.00	0.24	0.22	0.43
Ln(Grad. ton)					1.00	0.89	0.67
Ln(Grad. cy)						1.00	0.71
Ln(Surf. ton)							1.00

correlations between the variables were generally greater than 0.5

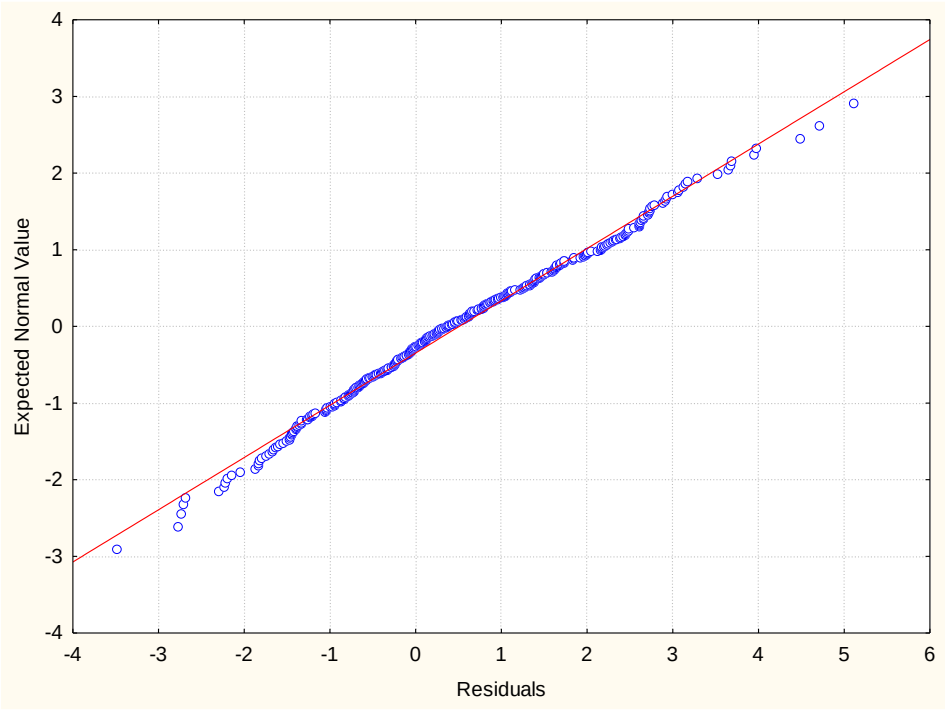
Model Phase II: Transformation & Ridge

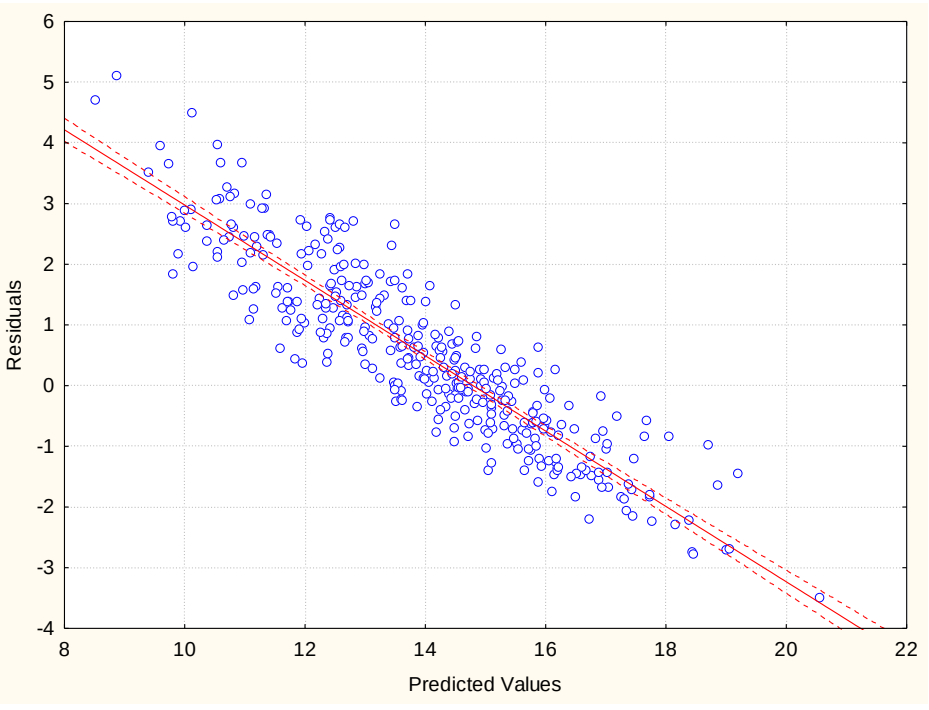
- Ridge Regression

Model (1)	Variables (Ln) (2)	Adj R^2 (3)	MAPE Ln (Val. Sample) (4)	MAPE Ln (Full sample) (5)	MAPE Orig. (Full Sample) (6)	Adj R^2 Full Sample (7)
3.1	WCD, ACP, ST	0.9582	0.0546	**0.08027**	**0.90071**	0.9577
2.1	WCD, ACP	0.9433	0.0592	**0.08270**	**0.72009**	0.9425
4.1	WCD, ACP, GT, ST	0.9643	0.0629	**0.07929**	**1.03843**	0.9648
5.1	WCD, ACP, GT, GC, ST	0.9670	0.0643	**0.08314**	**1.22998**	0.9677
6.1	All including mileage	0.9669	0.0650	**0.08460**	**1.29144**	0.9677
3.2	WCD, ACP, GC	0.9557	0.0657	**0.08366**	**0.93953**	0.9562
1.2	WCD	0.8945	0.0944	**0.13381**	**1.37117**	0.8943
1.1	ACP	0.8898	0.1047	**0.12341**	**0.64304**	0.8879

No Multicolinearity; No –ve parms

Model Phase II: Transformation & Ridge





Transformation: Better models, meeting the assumptions

Model Phase III: Relaxed Assumption

- Intercept
- Ridge Regression
- Partial Least Squares Regression

Model	Adj R2	MAPE Orig.	Inter-cept	Ln WCD	Ln Mileage	Ln ACP	Ln Grad. ton	Ln Grad. cy	Ln Grad. cy
6.1	0.8185	**0.3446**	8.9795	0.5163	0.2228	0.2178	0.0151	0.0247	0.0811
4.1	0.7736	**0.3791**	7.7222	0.7040		0.3255	0.0035		0.0775
5.1	0.7486	**0.4060**	7.8908	0.5743		0.3220	0.0040	0.0197	0.1116
5.2	0.7439	**0.4187**	9.2803	0.6602	0.2372	0.1094		0.0407	0.0871
4.2	0.7404	**0.4201**	9.5255	0.6863	0.2507	0.1190		0.0708	
2.1	0.7146	**0.4279**	8.6080	0.8712		0.2281			
2.2	0.7105	**0.4391**	10.1282	0.9158	0.2876				
3.1	0.6909	**0.4576**	8.6399	0.7298		0.2091			0.0947

Model Phase IV: Cluster Analysis

- K-means cluster analysis

Model	Adj R2	MAPE Orig.	Inter-cept	Ln WCD	Ln Mileage	Ln ACP	Ln Grad. ton	Ln Grad. cy	Ln Grad. cy
5.1	0.7696	**0.2322**	4.9065	0.5616		0.6662	0.0054	0.0282	0.0415
4.1	0.7844	**0.2530**	3.9779	0.6317		0.7457	0.0063		0.0476
6.1	0.7965	**0.2550**	5.8858	0.7564	-0.0092	0.5088	-0.0652	0.0697	0.0557
3.2	0.7642	**0.2567**	5.2735	0.8148		0.5751	0.0152		
3.1	0.7670	**0.2729**	4.5693	0.7120		0.6563			0.0441
2.1	0.7449	**0.2769**	4.7516	0.7869		0.6439			
4.2	0.7701	**0.2955**	5.3822	0.7622	-0.0009	0.5698		0.0368	
5.2	0.7728	**0.3000**	5.4199	0.7353	-0.0203	0.5559		0.0168	0.0517
3.3	0.7625	**0.3046**	5.3923	0.8521	0.0086	0.5590			
2.2	0.6573	**0.3383**	10.4916	0.9715	0.1177				

Time Prediction

ntract #	Miles	PTC 05	ACP/HMA	Grad. ton	Grad. cy	Surfacing Ton	WCD
5159	22.26	5007423.24	45801.30	37246.43	18457.41	8281.66	**115**

Model #	Predicted WCD	MAPE	Model #	Predicted WCD	MAPE
4.3	**136**	18.07%	P5.2	**118**	2.36%
5.1	**135**	17.25%	P4.2	**110**	4.45%
3.1	**126**	9.22%	P5.3	**127**	10.09%
4.1	**129**	12.49%	P5.1	**124**	8.08%
2.2	**130**	13.22%	P6.1	**127**	10.38%
3.2	**114**	1.01%	P4.1	**124**	7.79%
2.3	**117**	1.70%	P4.3	**123**	6.94%
3.3	**129**	12.26%	P3.3	**112**	2.90%
2.1	**105**	8.65%	P3.2	**121**	5.54%
3.11	**112**	2.25%	P4.11	**103**	10.14%
2.4	**88**	23.59%	P3.1	**105**	8.67%
4.2	**148**	28.80%	P3.4	**94**	18.63%
			P2.2	**92**	20.41%
			P2.5	**89**	22.71%
Average	**122**	6.46%		**112**	2.62%
Std Dev.	16			14	

Cost Prediction

year	Contract #	WCD	Miles	ACP/HMA	Grad. ton	Grad. cy	Surfacing Ton	PTC 05
2004	6708	110	15.92	37618.30	91823.00	91823.00	1031.30	3,382,380.43

Model #	Predicted Cont Value	MAPE
6.1	**$4,572,146.38**	35.18%
5.2	**$4,316,438.86**	27.62%
3.3	**$4,406,344.72**	30.27%
3.2	**$4,085,948.10**	**20.80%**
4.2	**$5,273,127.93**	55.90%
4.1	**$3,399,518.62**	**0.51%**
2.2	**$4,071,571.25**	20.38%
3.1	**$3,204,820.47**	**5.25%**
5.1	**$3,360,561.01**	**0.65%**
2.1	**$3,685,129.76**	**8.95%**
Average	**$4,037,560.71**	**19.37%**
Std Dev.	**$642,285.08**	