

A Case Study of Earned Schedule to do Predictions

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Agenda of Presentation

- Introduction to earned schedule
- Summary of technical references
- Our case study
- Defense Contract Management Agency concerns
- Mathematical modeling details
- Review of contractor performance
- Prediction accuracy
- Summary and conclusions
- Addendum:
 - Bio of the author

Introduction to earned schedule-1

- Earned schedule methodology was developed by Walt Lipke in 2003. Kym Henderson from Australia has published additional work in 2004 and 2005.
- Traditional independent estimate at completion formulas do not predict the final duration of a contract.

Introduction to earned schedule-2

- In traditional EVMS analysis, cumulative schedule variance is zero at the end of the period of performance by definition.
- Lipke proposed new measurements to track a contractor's schedule performance. These are $SV(t)$ schedule variance with respect to time, and $SPI(t)$ schedule performance index with respect to time.

Introduction to earned schedule-3

- Henderson in 2003 suggested using the concepts PD (planned duration) and PDWR (planned duration of work remaining) as predictors for an independent estimate of completion date for the contract.
- Jacob and Kane have published additional earned schedule concepts in 2004.
- The IPM conference in the last 2 years has had additional papers supporting ES concepts.

Summary of technical references-1

- “Earned Schedule: A Breakthrough Extension to Earned Value Management,” *Proceedings of PMI Global Congress Asia Pacific 2007*, January 2007 by Kym Henderson.
- “Why EVM Is Not Good for Schedule Performance Analyses (and how it could be...),” *The Measurable News*, Winter 2006-2007, by Radenko Corovic.
- “Applying Earned Schedule to the Critical Path and More,” *The Measurable News*, Fall 2006, by Walt Lipke.
- “A Simulation and Evaluation of Earned Value Metrics to Forecast Project Duration,” *Journal of Operational Research Society*, September 2006, by Mario Vanhoucke & Stephan Vandevoorde.
- “Can You Tell the Time?,” *Journal of the Association of Project Management*, August/September 2006, by Mick Higgins.

Summary of technical references-2

- “A Comparison of Different Project Forecasting Methods Using Earned Value Metrics,” *International Journal of Project Management*, May 2006, by Stephan Vandevoorde & Dr. Mario Vanhoucke
- “Earned Schedule in Action,” *The Measurable News*, Spring 2005, by Kym Henderson.
- “Further Developments in Earned Schedule,” *The Measurable News*, Winter 2004, by Walt Lipke.
- “Further Developments in Earned Schedule,” *The Measurable News*, Spring 2004, by Kym Henderson.
- “Earned Schedule: A Breakthrough Extension to Earned Value Theory?, A Retrospective Analysis of Real Project Data,” *The Measurable News*, Summer 2003, by Kym Henderson.
- “Schedule is Different,” *The Measurable News*, March & Summer 2003, by Walt Lipke.

Our case study-1

- Purpose of this contract was to build a second avionics maintenance trainer for Navy helicopters
- Navy decided to implement schedule incentive to expedite deployment constraints with moving previous maintenance trainer from East Coast to West Coast
- Problems encountered by the contractor in first trainer build effort were ignored deliberately
- Navy customer wanted DCMA to generate predictions as to when the contractor could make the enhanced schedule delivery date
- This contract was picked to test out the successful prediction capability of earned schedule methodology

Our case study-2

- Contract start date was 12/29/2003
- Contract end date was 11/16/2005
- Major milestone was shipment by 7/1/2005
- Schedule incentive was substantial for shipping earlier than 7/1/2005

Defense Contract Management Agency Concerns

- No lessons learned by contractor on this contract—previous experience in similar contracts was ignored by contractor program management
- CSSR data not accurate—too many serious mistakes made for the first three months in cost reports
- Traditional EV analysis not able to predict long term schedule issues to customer's satisfaction
- Contractor decision on work package structure not acceptable
 - Contractor used work packages whose duration was for entire period of performance for this contract
- Too many changes of key contractor personnel

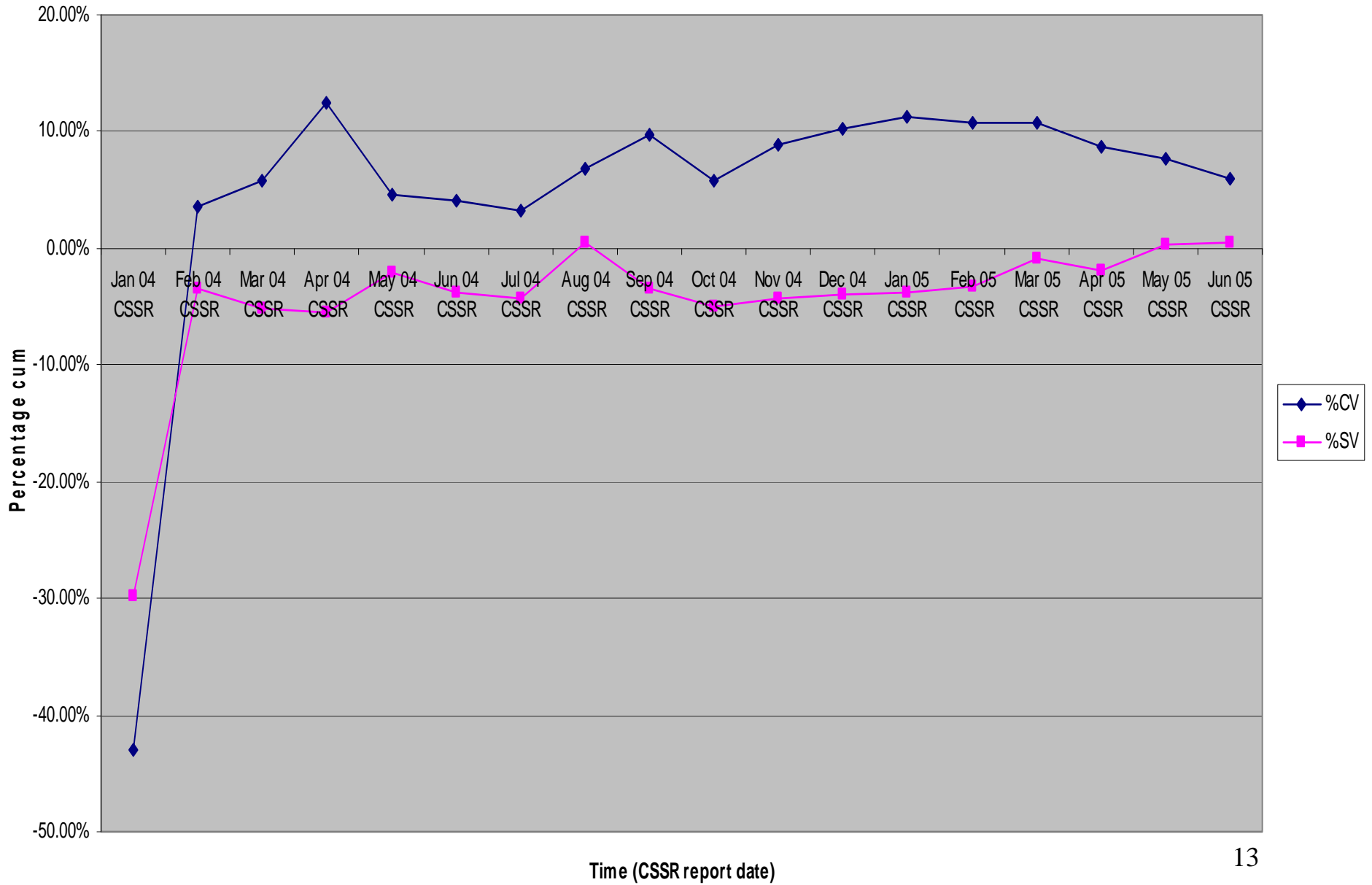
Mathematical Modeling Details

- Earned schedule calculator was used from ES website to predict completion date
- Running comparison was kept between contractor's LRE and estimated delivery date vs. DCMA's independent estimates
- All formulas were from ES website

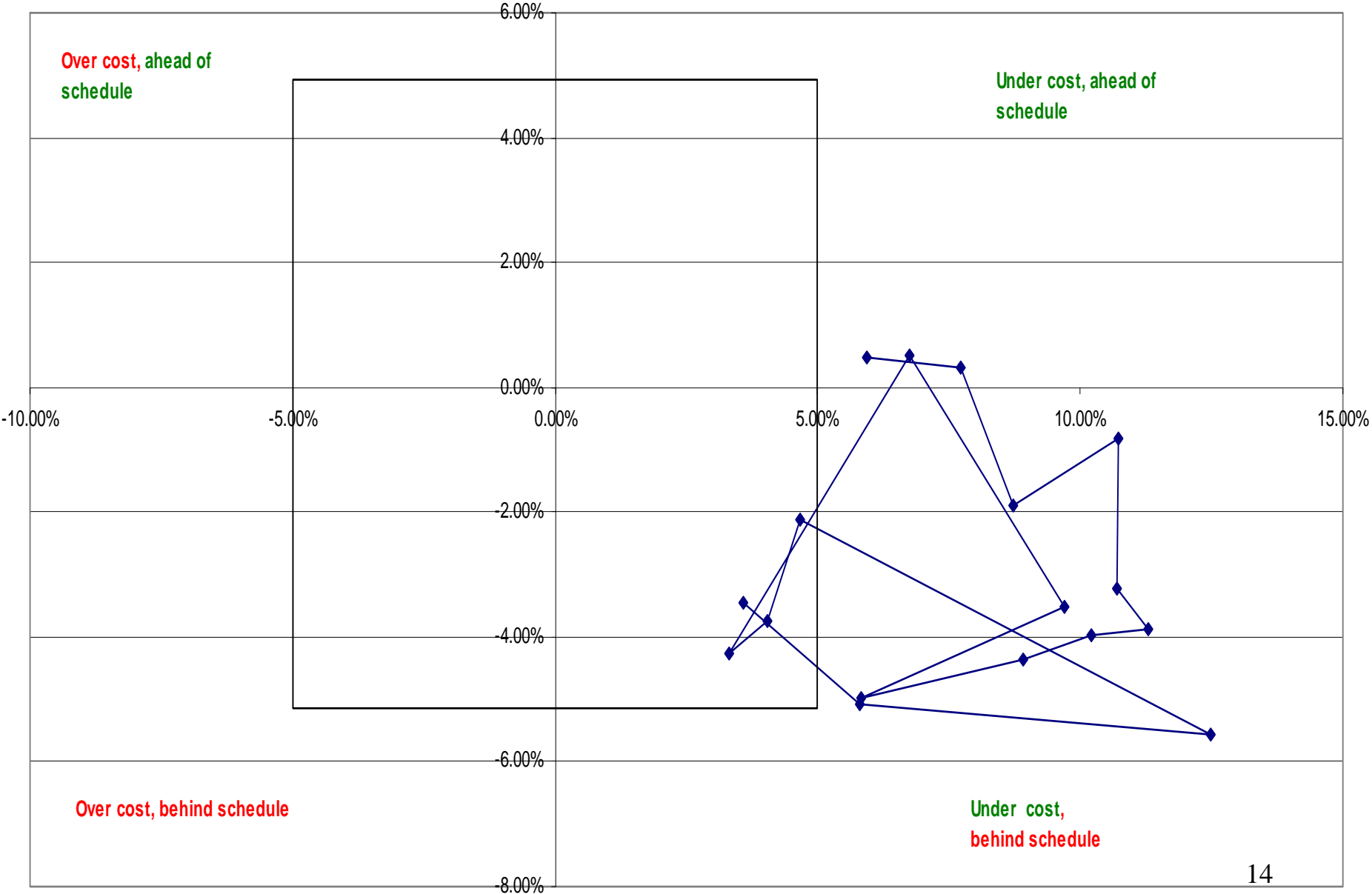
Review of contractor performance

- Plot #1 shows % CV and %SV as parameters of time
- Plot #2 shows a typical box plot of % CV and %SV
- Plot #3 shows contractor's own estimate of schedule slippage vs. DCMA's estimate

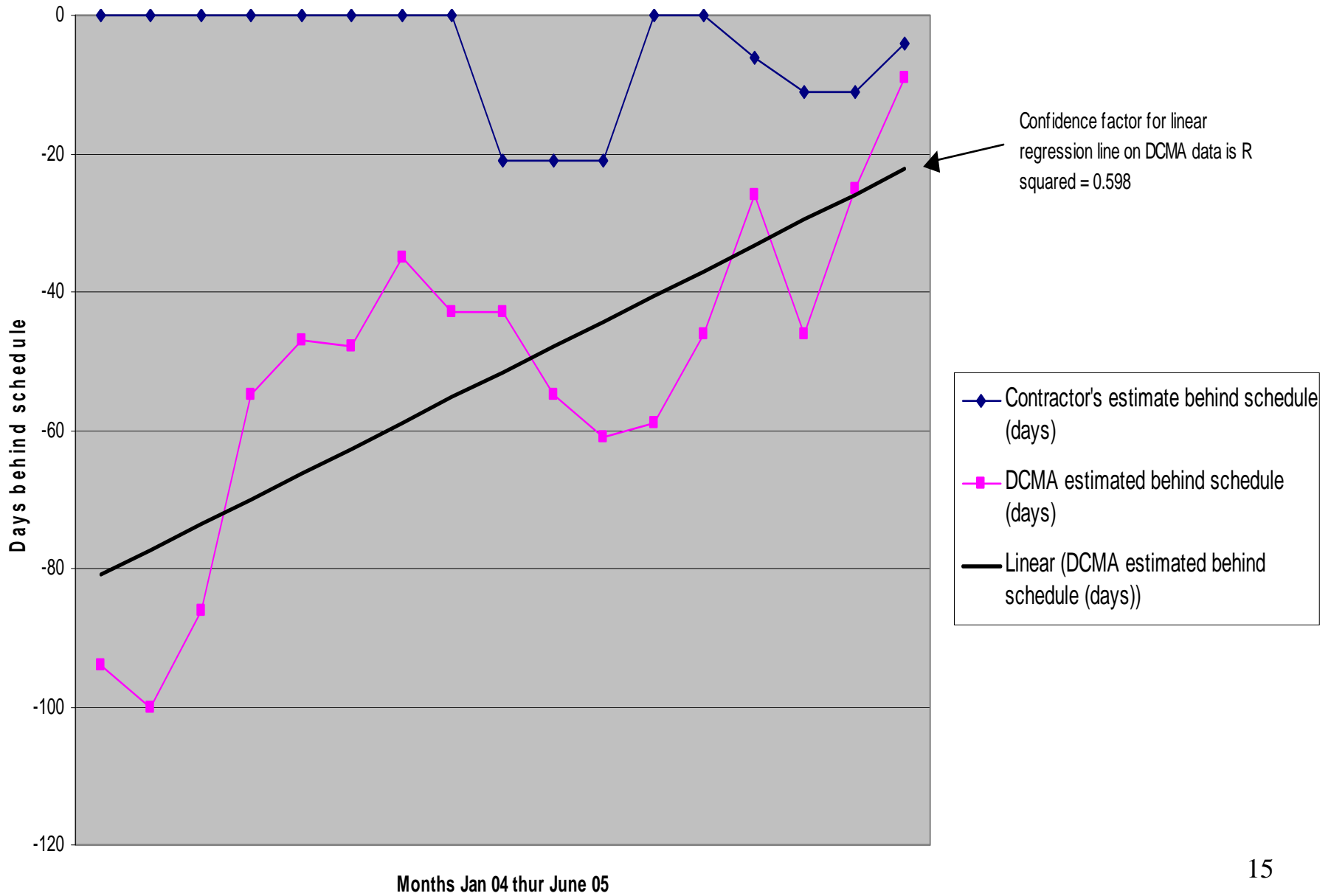
Traditional EVMS Parameters



Box Plot of %CV vs %SV



Comparison of estimated days behind schedule



Prediction Accuracy-1

- Actual history of contract schedule performance was that
 - 1) contractor worked multiple shifts and with extra help to keep delivery date within 10 day slip in last 2 months of final contract work
 - 2) shipment was actually 7 days late
 - 3) contractor did not win any schedule incentives

Prediction Accuracy-2

- Traditional EV analysis would state that contractor was under staffed and running behind schedule
- Due to changes in key contractor personnel, a learning curve had to be factored into schedule performance considerations

Prediction Accuracy-3

- DCMA estimates of completion date were much more realistic than contractor.
- DCMA, acting for benefit of Navy customer, forced contractor to implement recovery plan and to speed up work effort to make delivery

Summary and conclusions

- Earned schedule proved to be very useful in predicting how much work remained to be completed.
- US Navy customer was very satisfied with ES predictions

Addendum: Bio of the author

- BS in physics from Ohio State; MS in physics from Rensselaer Poly Tech
- 20+ years in electronic packaging technology, mainly at IBM Microelectronics
- 6 ½ years at Defense Contract Management Agency as GS 12 electronic engineer—retired in February 2007
- Certified level 2 in Defense Acquisition Workforce Improvement Act education requirements
- EVMS expert on Navy helo programs for DCMA at that office