PROJECT VOLATILITY

Statistical versus causal project management

Vince Kellen, PhD
CIO, UC San Diego

vkellen@ucsd.edu

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THE DREADED PMO OFFICE

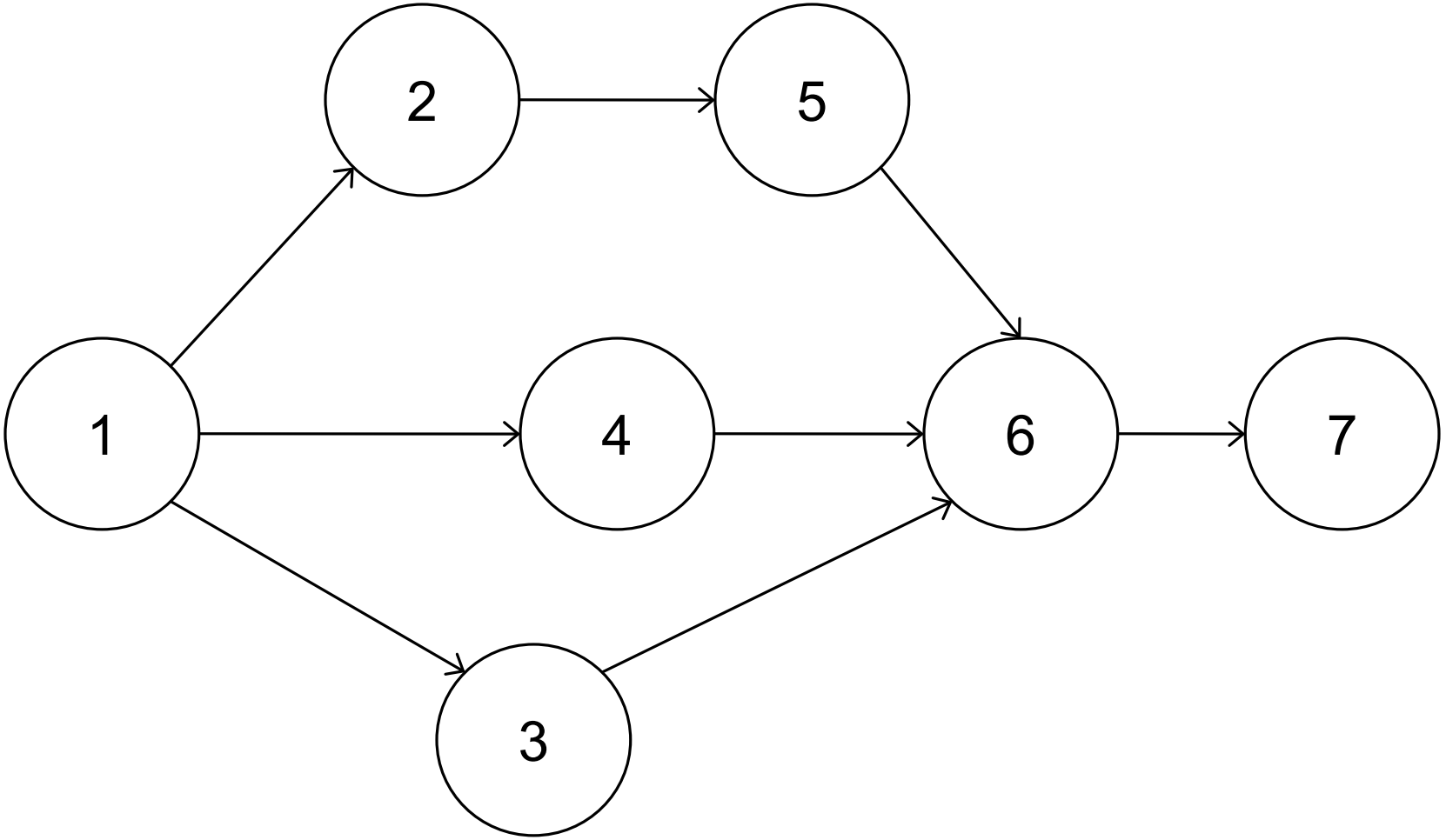
Agenda

- Statistical versus causal project management
- Definition of a project
- Organizational design for a PMO
- Breaking the work down
- Volatility: V1, V2, V3, V4, V5, V6, V7, V8
- Levels of analysis
- Other project statistics
- Portfolio analysis, Lean / TQM

What is statistical project management?

- **Traditional project management is deeply causal**
  - **Complete specification of precedence, critical path, resource availability & allocation**
  - **Intervention is based on progress. Progress is measured as cost flowing through the project over time**
  - **Variance is the variance between high and low estimates in the mind of the estimator**
- **Statistical project management lets go of the need for causality**
  - **No (or crude) specification of precedence (no dependencies), no critical path, some measure of resource allocation**
  - **Intervention is based on variance (volatility)**
  - **Variance can be many things…**

Dependencies



Wither dependencies?

- **IT projects are somewhat unique in that material goods and hard dependencies that are rife in other industries (can't start building until the ice melts) are not as important**
  - **Material goods are, for most projects, somewhat uninteresting**
  - **Projects are about the allocation of human resources**
  - **Dependencies represent engineering decisions, many of which can be engineered away through clever architecture and clever teams**
- **Critical path diminishes**
  - **In traditional project management, one tries to shorten the critical path by removing dependencies. Dependencies create large date flux**
  - **In statistical project management, we do not bother to model dependencies in the project plan. Dates are considered (mostly) immovable**
  - **Push the 'flux' or the change to the technical leads, relieving the project manager the burden of modeling**

Wither dependencies? (more)

- **In IT projects, little is truly new. The rest, like Vivaldi's violin concertos, are variations on a theme**
- **The chance that engineering dependencies can cripple a project are lower than you think. Why is this?**
  - **IT is plastic. We can create tools, partial solutions, prototypes on the fly. We can build models of the real thing using the real thing**
  - **Innovative minds sharp with IT architecture are infinitely inventive and like Vivaldi, can create new but very similar works**
- **The chance that human dependencies can cripple a project, while normally ever-present, can be lower than you think. Why is this?**
  - **By reducing architectural diversity, thus simplifying skill acquisition**
  - **By increasing the range and repertoire of each individual IT worker**

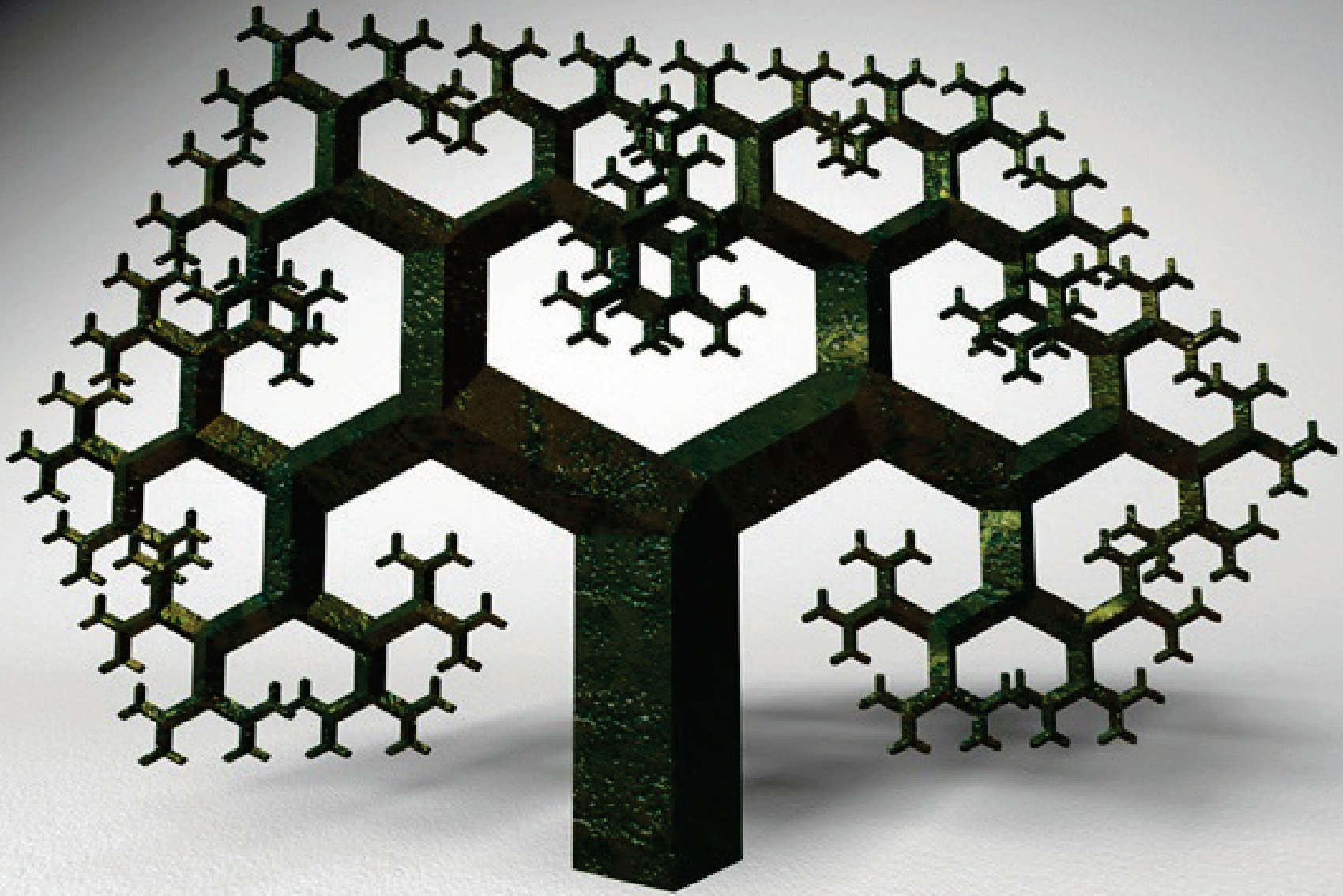
What is a project?

- A project is a temporary collection of work activities to which you can say 'no'
- People who work on a project can come from multiple units within the organization
- All projects follow a formula; they are repeatable
- Question of the day: Why do we even have projects?
  - To displace the current structure of the firm. By their transient nature and different set of rules, projects may perform better than the alternative and shepherd expensive resources better
  - To manage knowledge better. Some endeavors require more knowledge or skill than can be organized as rapidly or as effectively as other methods

The original project?

Designing the organization for projects

- What does a PMO do? Where does it sit? Who reports to it?
- Two answers
  - Big centralized PMO or small central PMO with PM distributed
- Why decentralized?
  - Because there are more projects than you can possibly manage centrally. Because project size is sort-of Pareto distributed (a few large ones, lots of little ones). Because project criticality is also Pareto distributed
  - Spreading PM responsibilities around embeds knowledge of the PM discipline in multiple places. This knowledge is a force multiplier!
- What does a small central PMO do?
  - Educate, analyze, prod, pull, push, herd, perchance to lead



Breaking it down

- **Building a project plan is not much more than**
  - **Identifying patterns**
  - **Decomposing each pattern into further details**
  - **Estimating details independently and in an unbiased way**
  - **Repeating until not much more needs to be known**
- **Great project planners and estimators do this *fast***
  - **How? By rapidly knowing unknowns* through progressive problem decomposition**
- **The cost of understanding a thing to be delivered is:**
  - **Cheapest a) in one mind and b) on one notepad**
  - **More expensive c) in many minds and d) on many papers, whiteboards**
  - **More expensive with e) models, f) prototypes, g) alphas, h) betas**
  - **Much, much, much more expensive i) 1 month and j) 12 months after go-live**

* Unknowns come in two flavors: 1) things an individual does not know and 2) things the world does not know. Very little in IT is in category 2. Rarely does an IT group wander into totally undiscovered territory for which prior knowledge is not entirely or mostly helpful

Phases, objects, resources, tasks

- **Task is the unit of work being estimated, 4-20 hours in length with an average of <12 being excellent**
- **Phases are a way of grouping tasks (planning, design, build, deploy, maintain, etc.)**
- **Objects are what is being delivered. Objects can be independently assessed by multiple assessors. Objects are tangible or concrete (report, data entry screen, document, etc.)**
- **Resources are people who do work on tasks**
- **One decomposes a project by enumerating the objects then considering the steps needed to cause the object to become usable (realization)**

Key terms for a project

- **Project manager**
  - **Responsible for delivery of the project on the date specific**
  - **Responsible for project communication**
  - **Responsible for resource bartering**
  - **Responsible for date negotiations**
- **Technical leader**
  - **Responsible for the technical correctness of the project deliverables**
  - **Responsible for the functional use of the project deliverables**
  - **Responsible to coordinating the technical work being done**
- **Estimator**
  - **Anyone who estimates a task**

Volatility

Traditional project estimate variance

Best estimate for a task:

$$t_e = \frac{a + 4m + b}{6}$$

Variance for a task:

$$\sigma_{te} = \left(\frac{b - a}{6} \right)^2$$

Population variance as commonly understood

$$\sigma^2 = \frac{1}{N}\sum_{i=0}^{N}\left(X_i - \overline{X}\right)^2$$

Subtle change in variation for projects

- **Rather than compare N observations differences from the population mean, evaluate an observation with two data points:**
  - **The expected outcome (the estimate) and the realized outcome (the actual)**
  - **Square this difference for each task, sum the squares for all observations**
  - **Divide by the number of observations**
- **Essentially, this measure represents the average squared distance from the anticipated result for a set of observations**
  - **Small and large projects can be compared**

$$V = \frac{1}{N}\sum_{i=1}^{N}\left(X_{e_i} - X_{a_i}\right)^2$$

  - **X_{a_i} = actual outcome for each item X, X_{e_i} = estimated outcome for each item X**

Simple example

#	Task description	Est	Act	Diff	Diff^2
1	Create prototype data entry panel	16	18	2	4
2	Add data integrity checking	22	18	-4	16
3	Test data entry panel	12	11	-1	1
	Sum	50	47	-3	21
	Average	17	16	-1	**7**

The variance for this small project is **7**

Volatility

V1: Task estimate versus actual

V2: Task estimate yesterday versus today

V3: Task end date estimate versus actual

V4: Task end date estimate yesterday versus today

V5: Flow of resource hours estimated for each day per task versus actual flow for each day

V6: Milestone date estimate versus actual

V7: Milestone date estimate yesterday versus today

V8: Time entry system date versus time entry date

Volatility (again)

- **Task volatility**
  - **V1 measures how well the teams are hitting the estimates**
  - **V2 measures how much all the tasks are changing**
  - **V3 measures how well we are estimating task closure dates**
  - **V4 measures how much the task end date is changing**
  - **V5 measures how smoothly resources spend time on tasks each day**
- **Milestone volatility**
  - **V6 measures how well the teams are hitting milestone dates**
  - **V7 measures how much the milestone dates are changing**
- **Time entry volatility**
  - **V8 measures how close to the actual day of work people are entering their time**

Level of analysis

- **Volatility can be measured for**
  - **A collection of projects**
  - **A single project**
  - **A project senior manager (IT)**
  - **A project senior client (non-IT)**
  - **A project manager**
  - **A technical lead**
  - **An object**
  - **A phase**
  - **A task**
  - **A task owner**
- **This turns projects and project participants into highly measured, highly valued performance athletes!**

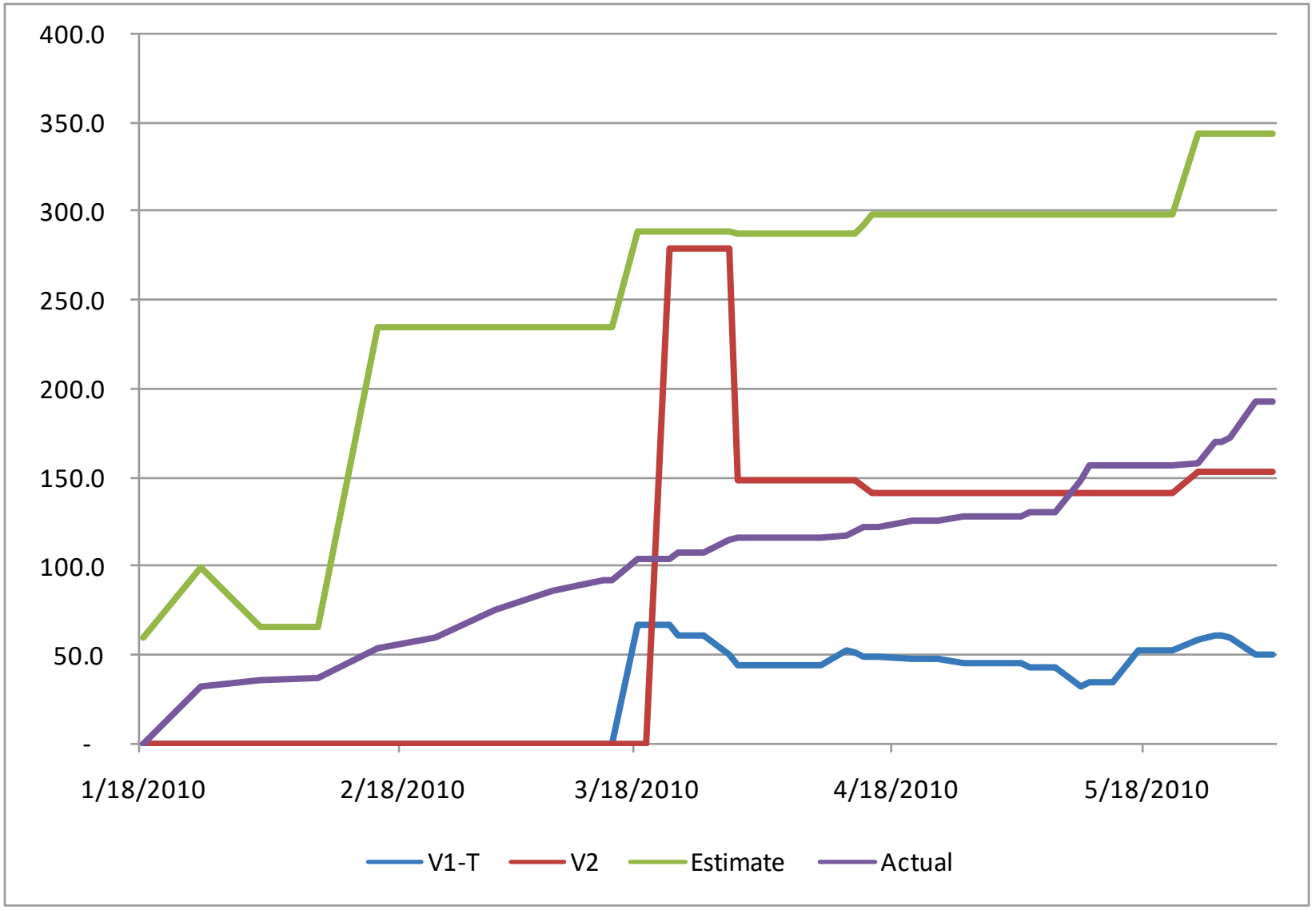
Metrics, metrics, metrics

- **Each day, the following statistics are calculated for all active projects**
  - **Objects, staff, task count**
  - **Total estimated and actual hours**
  - **Average task estimate**
  - **Total of tasks started or completed (touched), estimate and actual**
  - **Totals for completed tasks, estimate and actual**
  - **Over/under percent for all tasks, touched and completed**
  - **V1, V2, V3, V4, V5, V6, V7, V8**
  - **Each daily row has today's values, yesterdays and the difference between values, as well as a z-score for each difference score**
- **All statistics are standardized and represent how many standard deviations away the project is from the portfolio of projects' mean**
- **Projects are then ranked by this standardized score**

More metrics

- **Trend analysis**
  - **Cumulative and incremental volatility introduced. Is volatility increasing or decreasing?**
  - **Total estimate over time. Is the project expanding or shrinking in total size?**
- **Total average hours per day per resource on a project. Are the resources excessively multi-tasked?**
- **For a given project, total estimated hours per week. Is the project a slow-burning or fast-burning project?**
- **Task estimated hours per day. Is the task a slow-burning or fast-burning task?**
- **But wait, there is more…**

MPS-1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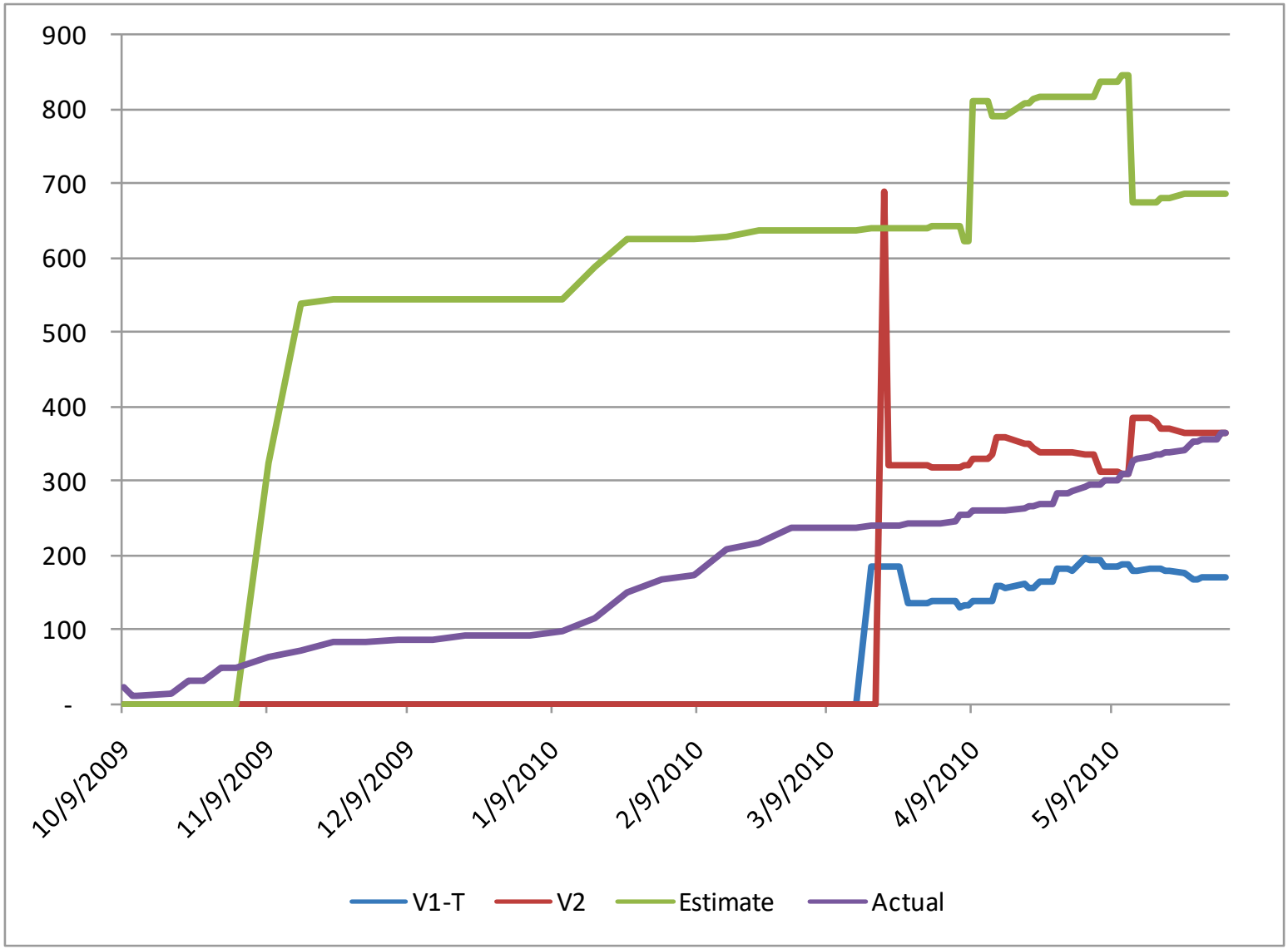
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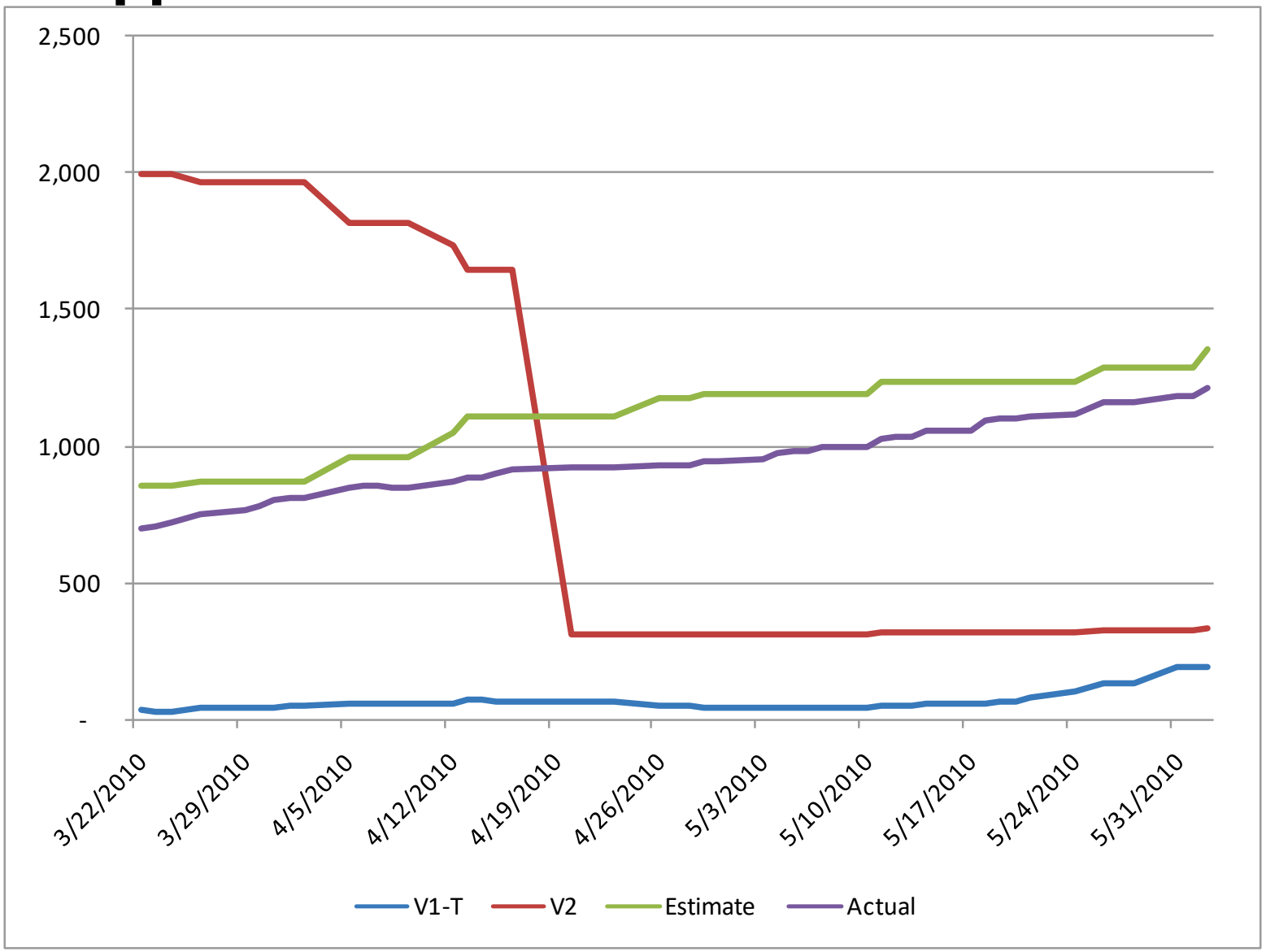
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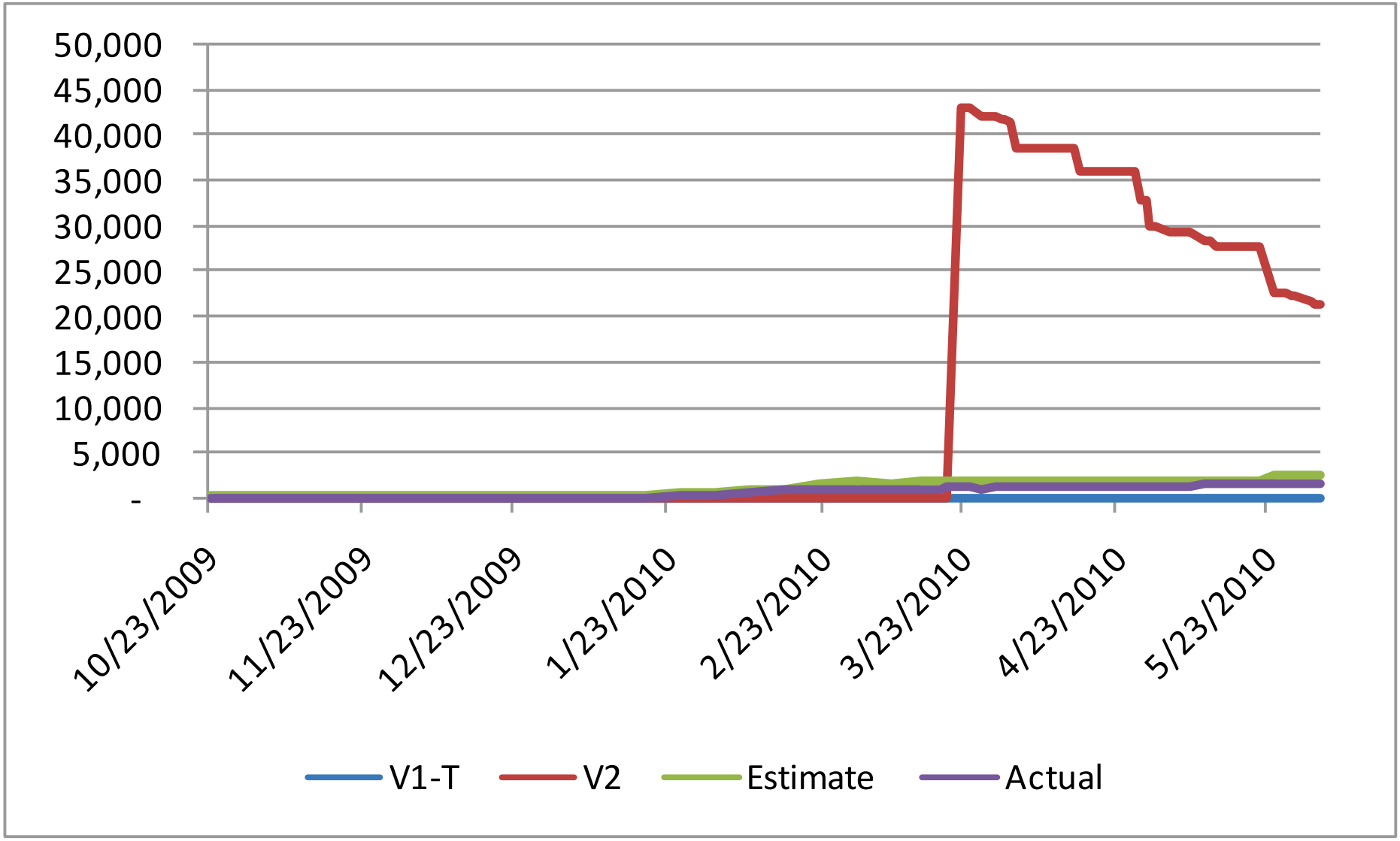
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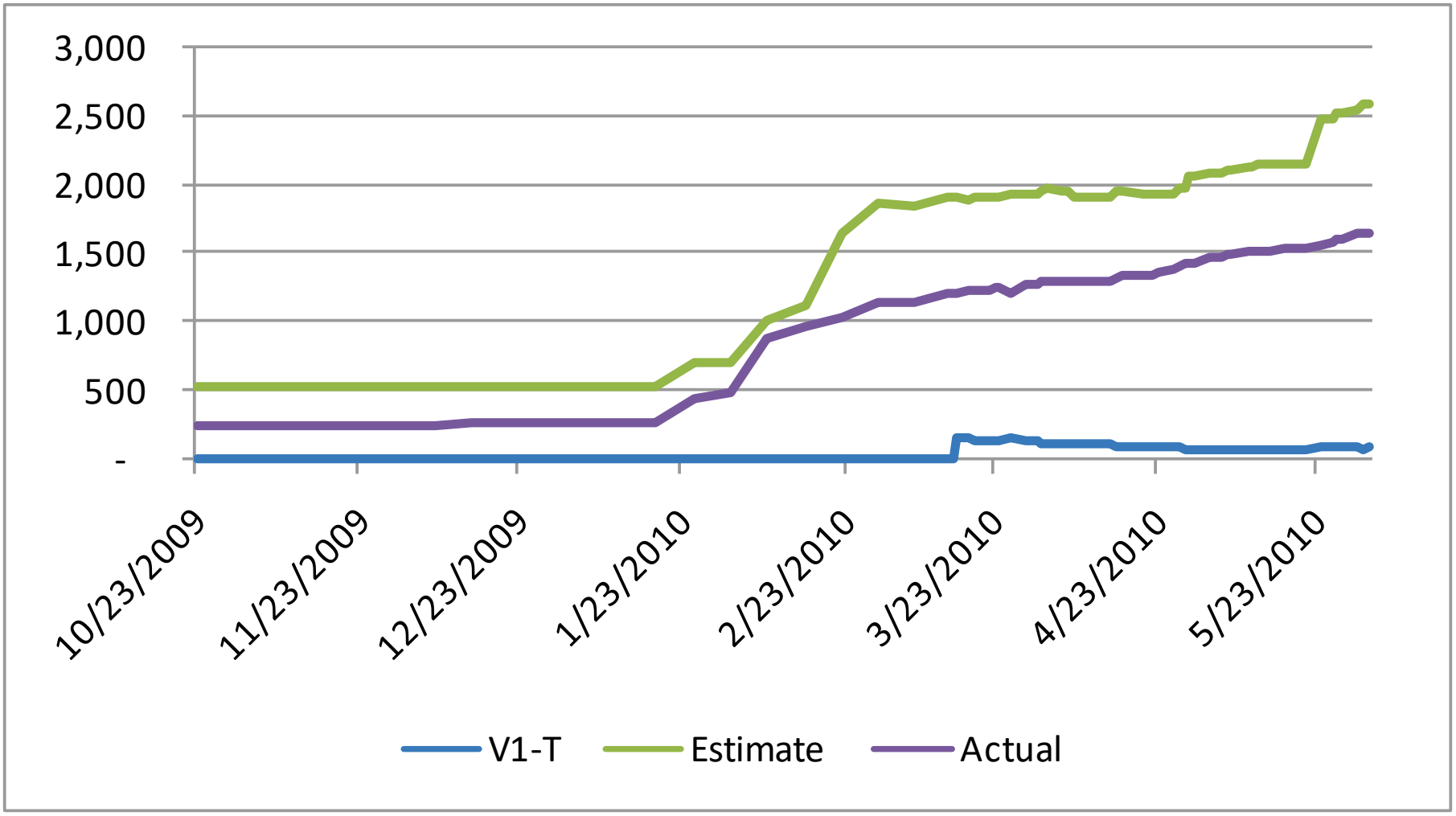
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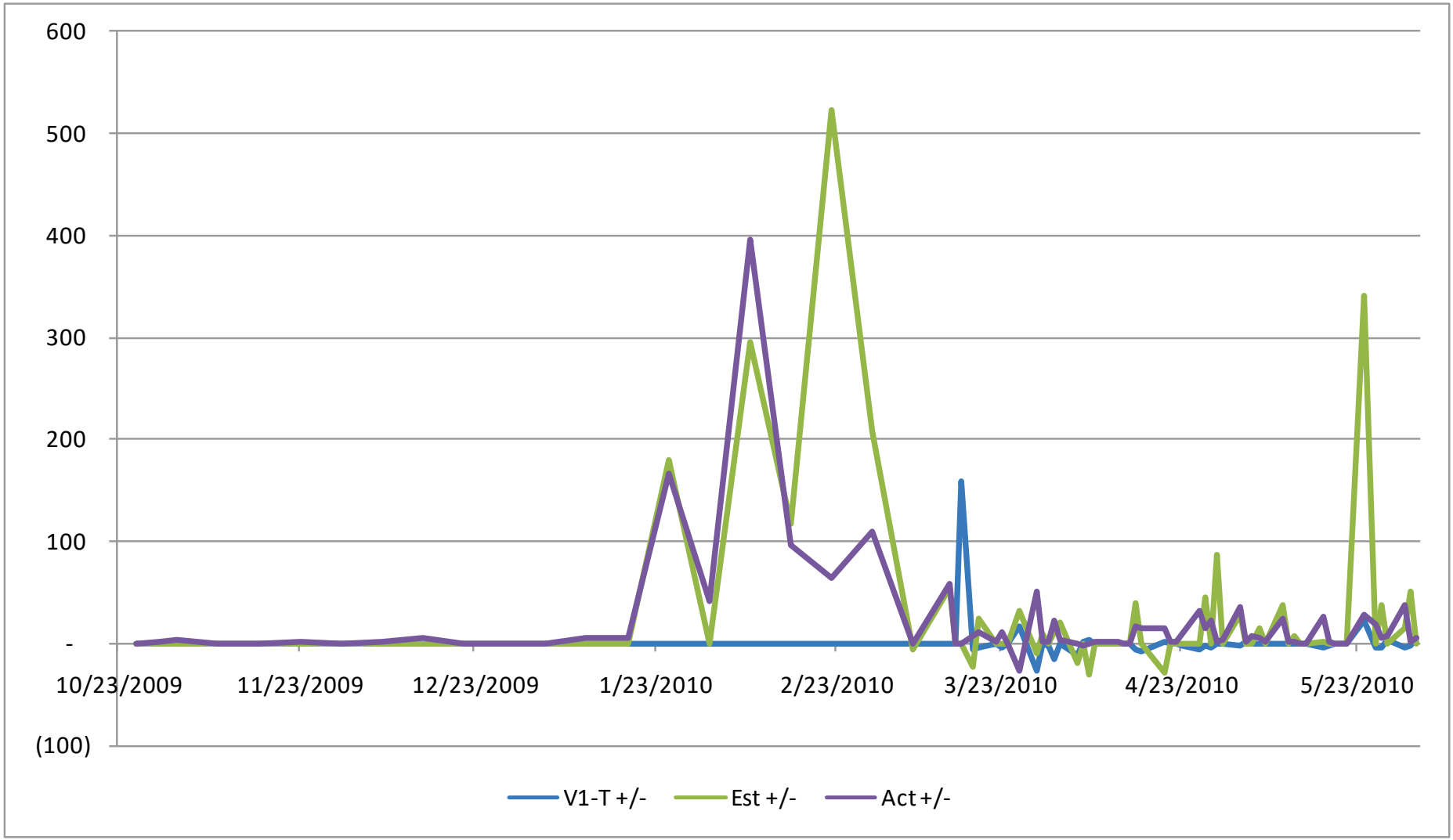
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Directions

- **By exploiting this notion of project volatility, we get the following benefits**
  - **Lots of metrics across different dimensions of the gap between expected and actual outcomes**
  - **The ability to compare and contrast projects, project managers and apply statistical process control**
    - **Reduce variation through standard approaches to managing projects**
    - **Allow for both agile and waterfall methods**
    - **Identify points of intervention early**
- **For our Lean and ITS-PRO implementation, an area considered without metrics and statistical process control is now rich in metrics**
- **The ultimate goal is to conserve staff time**
  - **Prevent excessive overtime**
  - **Complete more projects faster without increasing resources**

QUESTIONS?