9th International Conference on MANAGING PAVEMENT ASSETS (ICMPA9)

Ten Years of Pavement Distress Independent Verification & Validation in Virginia

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AASHTO THE VOICE OF TRANSPORTATION

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TRB

U.S. Department of Transportation Federal Highway Administration

WORLD ROAD ASSOCIATION MONDIALE DE LA ROUTE 1909-2009

VDOT Virginia Department of Transportation

Quality Engineering Solutions

Engineering • Inspection

VDOT Virginia Department of Transportation

Presentation Outline

- **History**
- **Process**
- **Results**
- **Conclusions**

HISTORY

History

- **Same vendor since 2005**
  - **2005**
    - **Interstate routes, ramps & loops**
  - **2006 – 2014**
    - **Interstate routes**
    - **Primary routes**
    - **20% of secondary routes per year**
- **Generally the same imaging system**
  - **Improved forward imaging in 2009/2010**

History

- **Data Quality Management Plan (DQM)**
  - **Vendor QC during collection and processing**
  - **Independent Verification & Validation**
    - **Control sites for roughness, rutting & distress**
    - **5% Independent distress rating**
    - **Year-to-year verification**
  - **VDOT acceptance**

History

- **Previous TRB Reports**
  - **Quality Monitoring Plan provides:**
    - **30% increase in accuracy of reporting deficient pavements**
    - **Cost correction of over $18 million for Interstate maintenance recommendations**
    - **Improves maintenance & rehabilitation needs by as much as 25%**

PROCESS

Data Quality Monitoring Plan

- **Pre-data collection quality procedures**
  - Identification of the key data elements to be controlled
  - Determine the criticality of each element and expected variability
  - Establish control data
  - Develop tolerance limits and variability measures

Data Quality Monitoring Plan

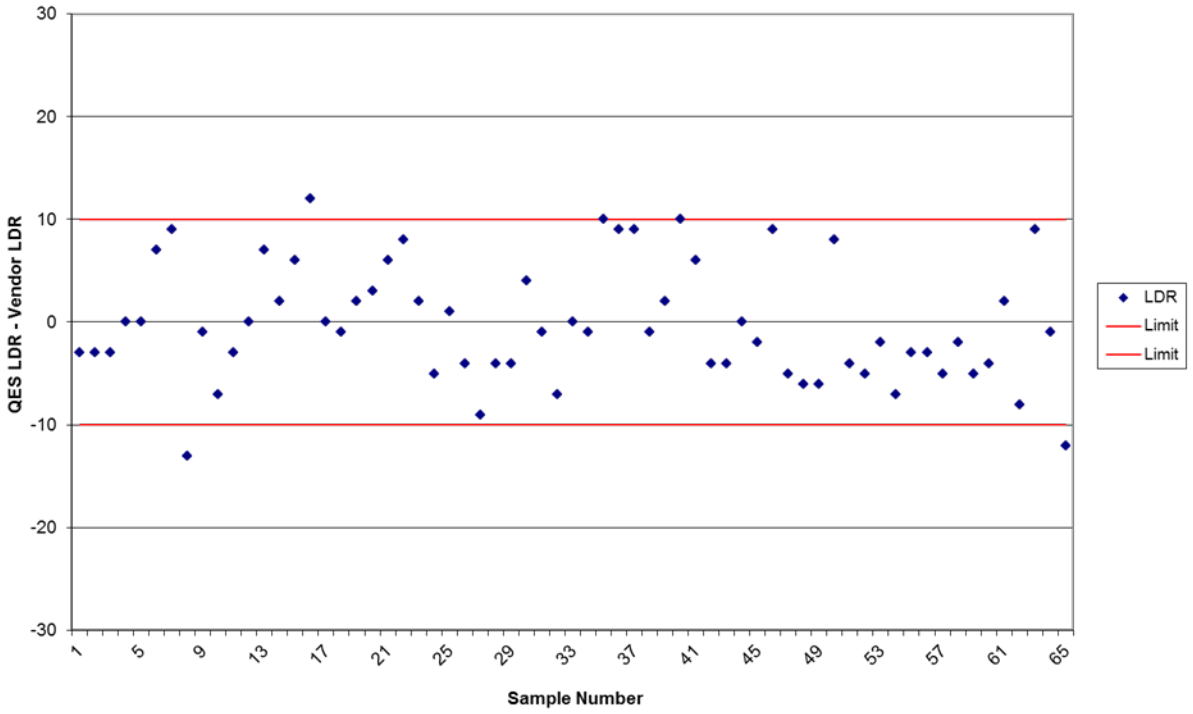
- **Production level quality checks**
  - Equipment and procedural checks
  - Verify data collection measures and associated QC
  - Develop control measures for data processing and associated QC
  - Develop reporting process and associated QC
  - Data reporting and delivery

Data Quality Monitoring Plan

- **Independent Verification & Validation**
  - Control key data elements
  - Independent distress evaluations
  - High level data range checks
  - Year-to-year consistency checks

IV&V Process

- **5% random sample per deliverable**
- **Independent distress rating**
- **Compare LDR & NDR**
  - **+/- 10 index points for 95% of the samples**

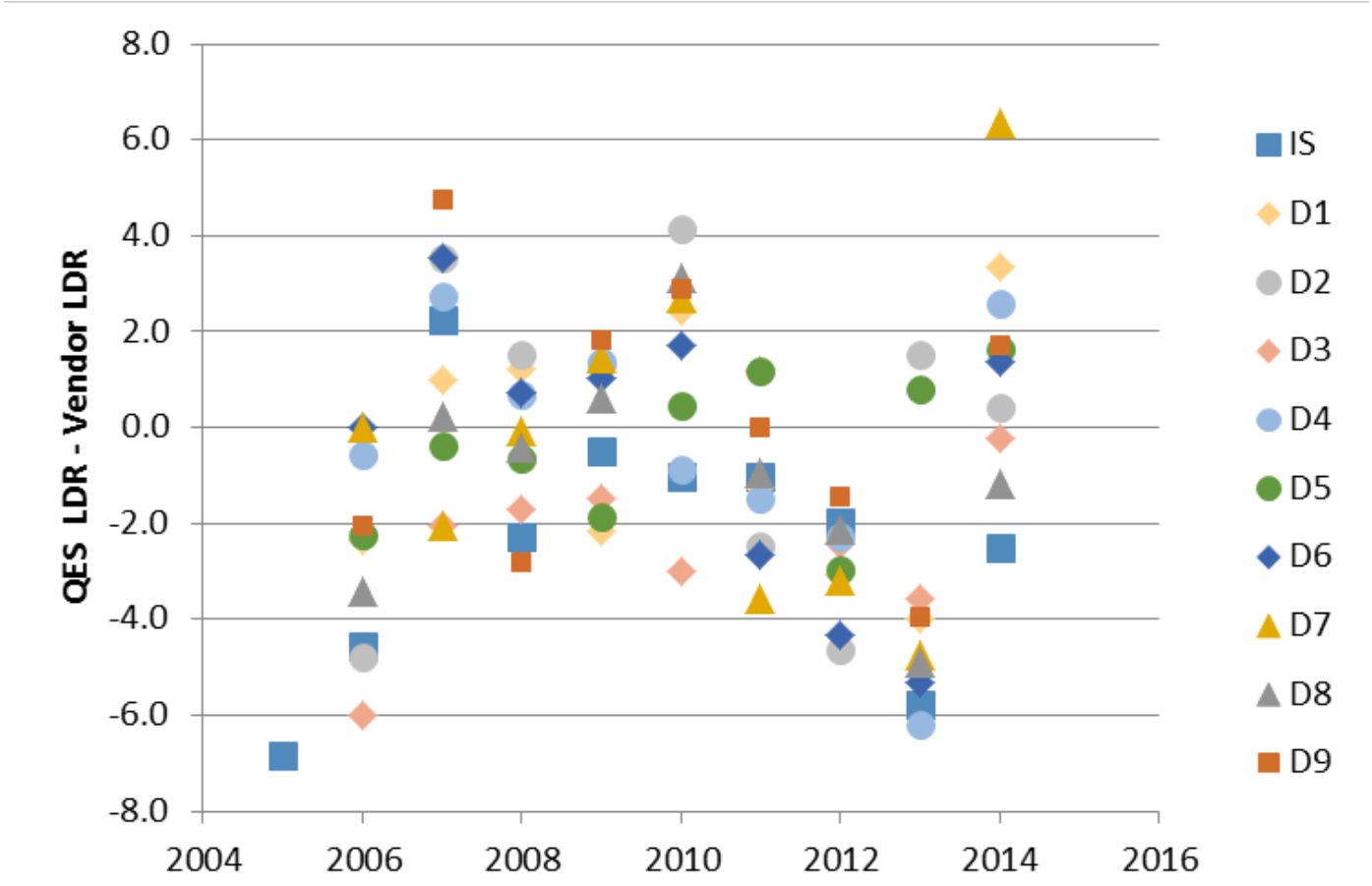


RESULTS

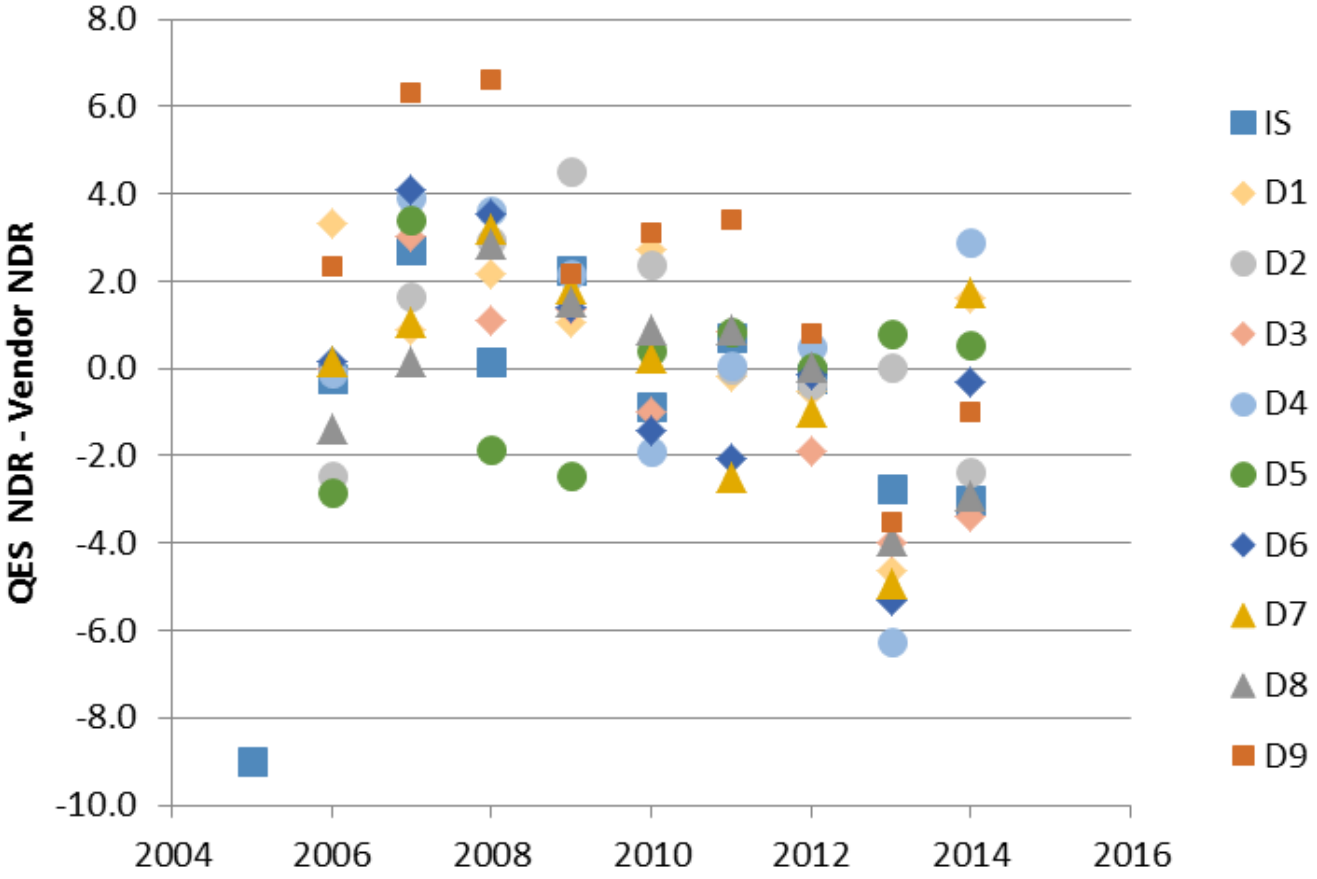
Evaluation Process

- **Evaluated how the variability between independently rated index values and the vendor delivered data changed over the years**

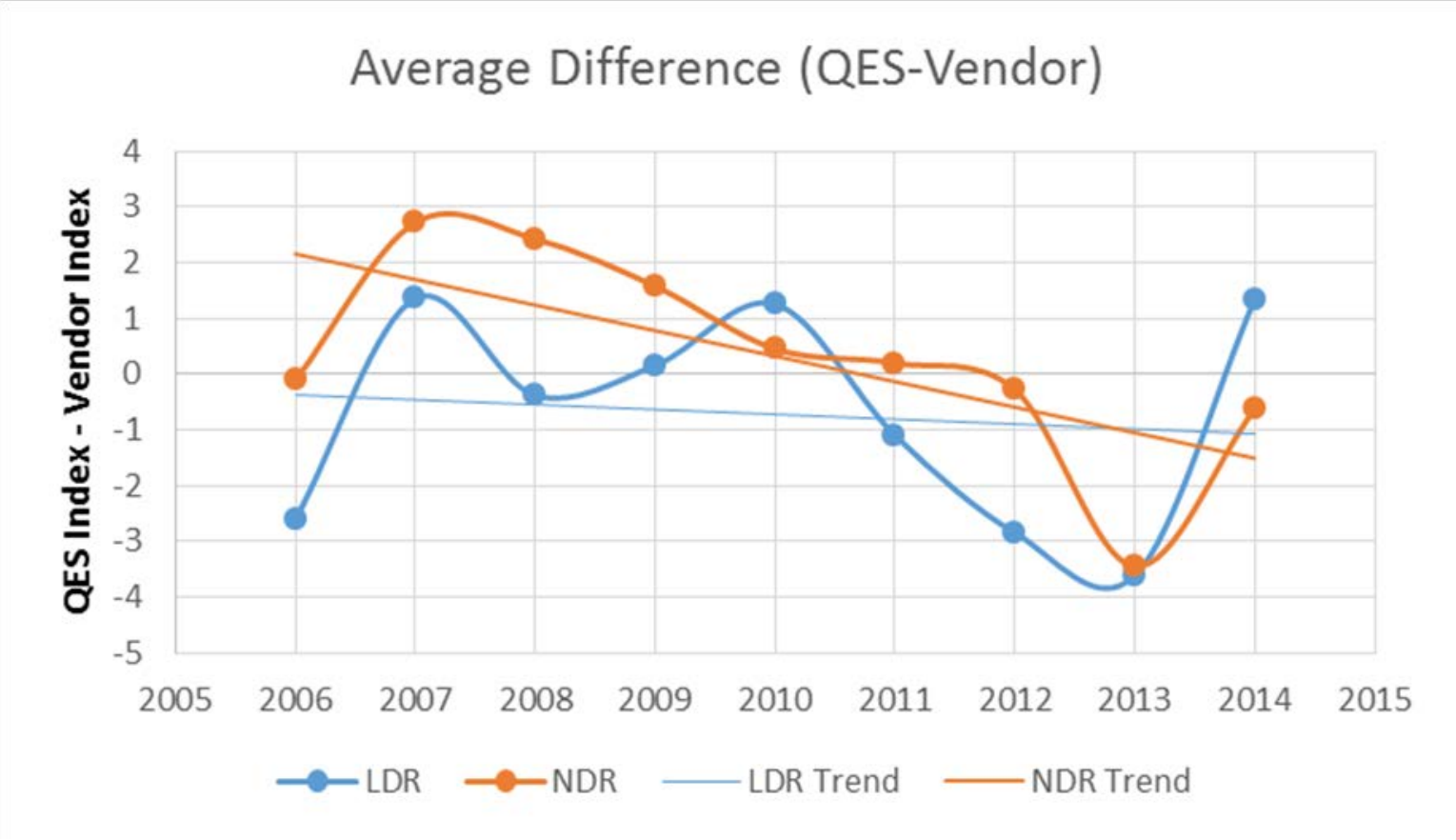
Load Related Distress (LDR)



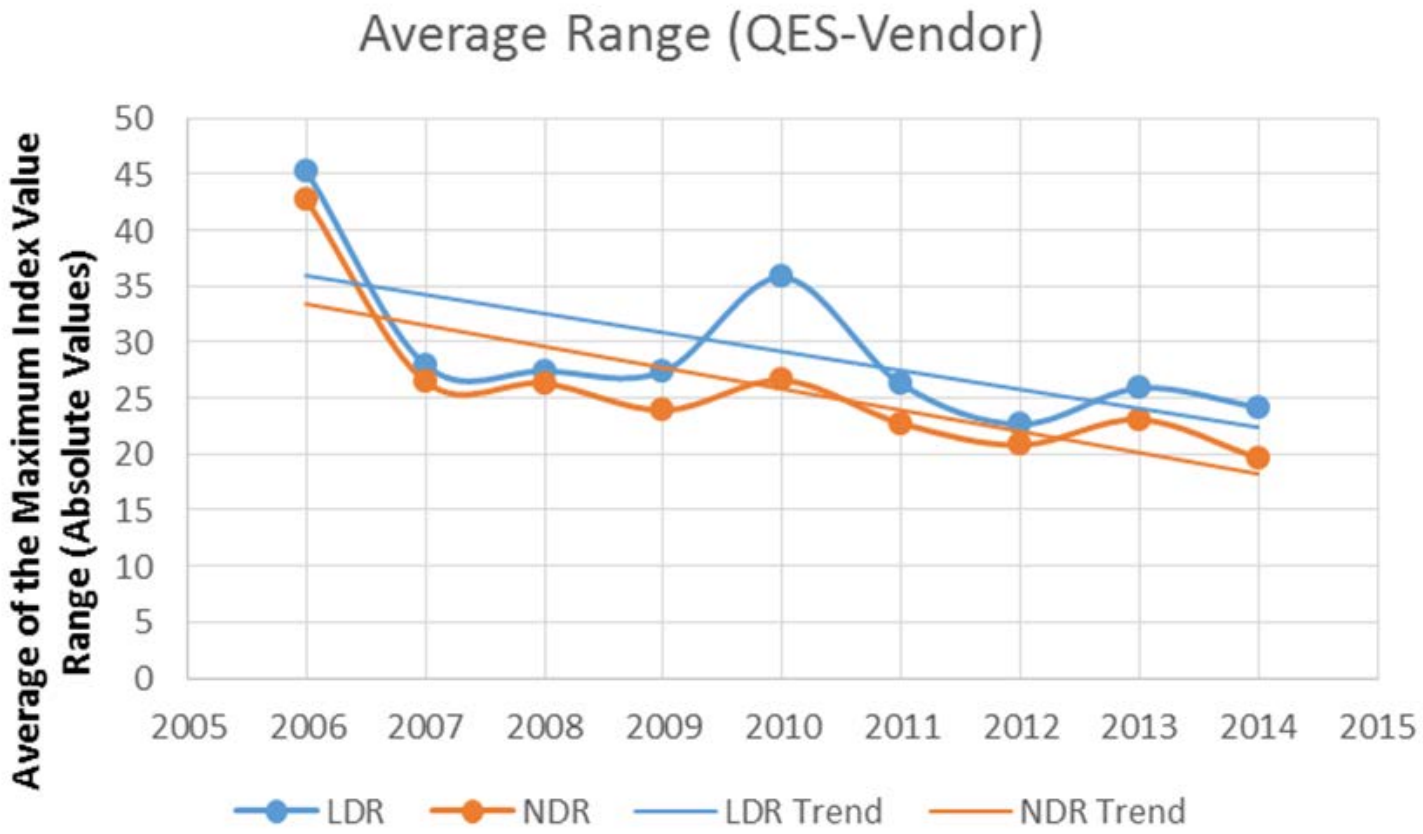
Non-Load Related Distress (NDR)



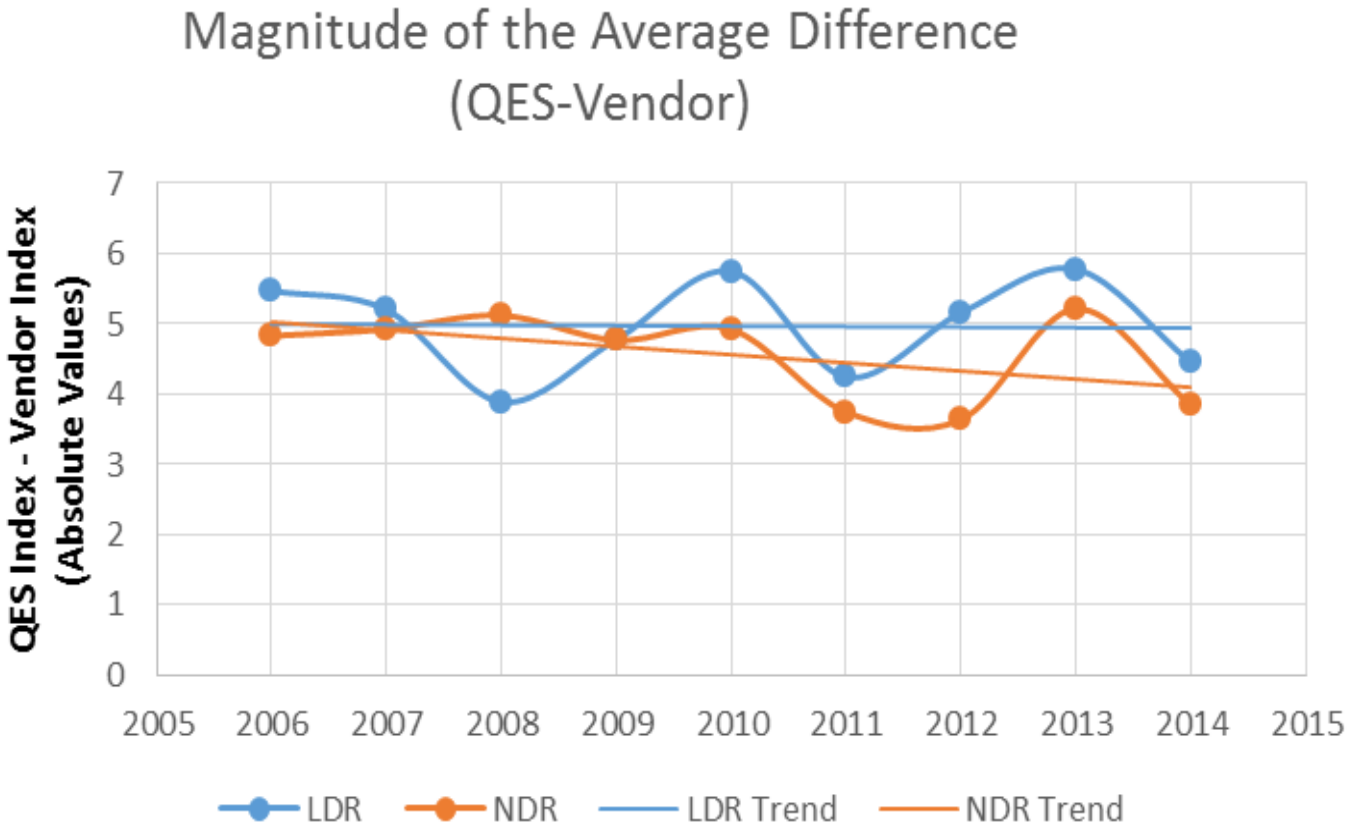
Average Index Value Difference



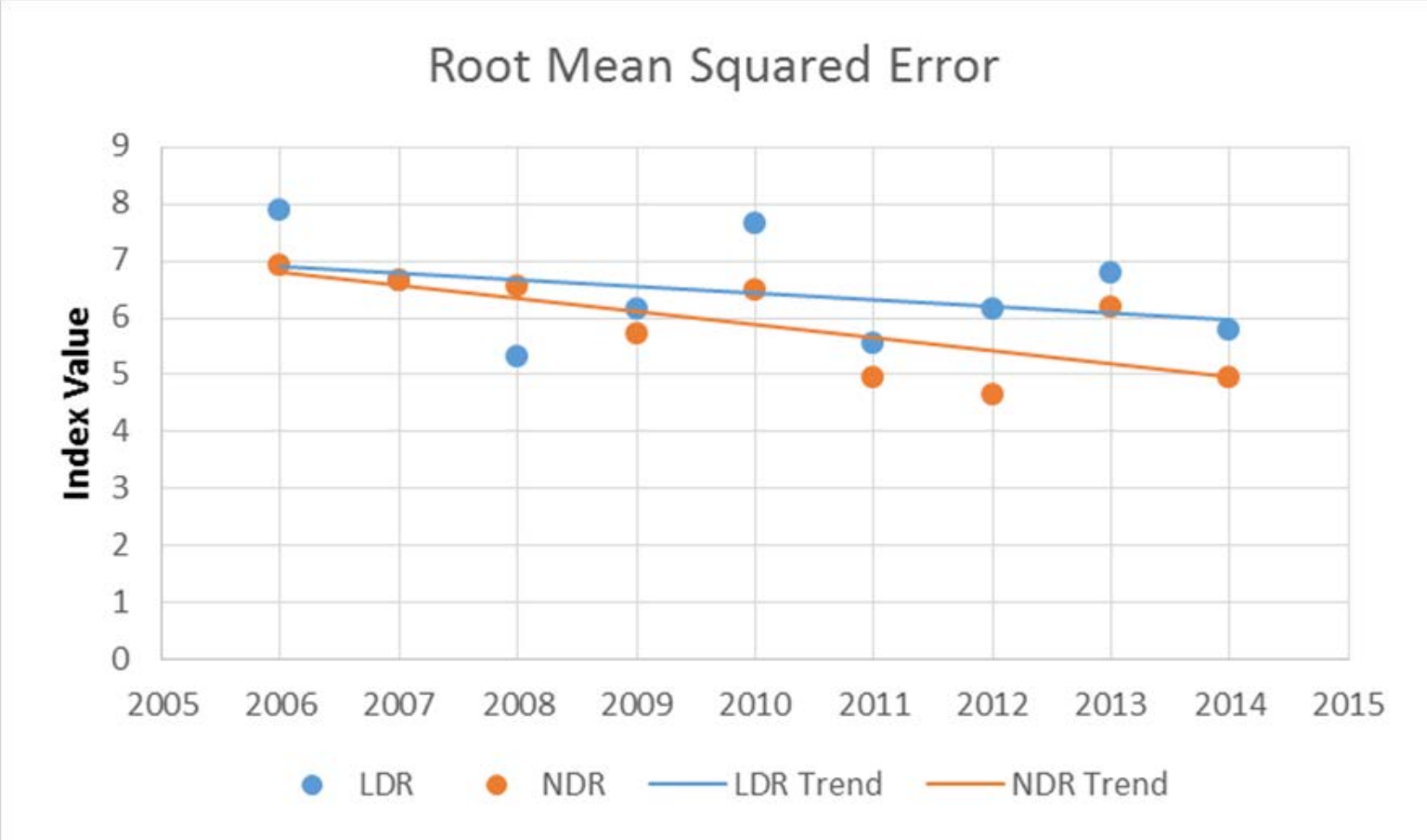
Average Maximum Range of Index Value Difference



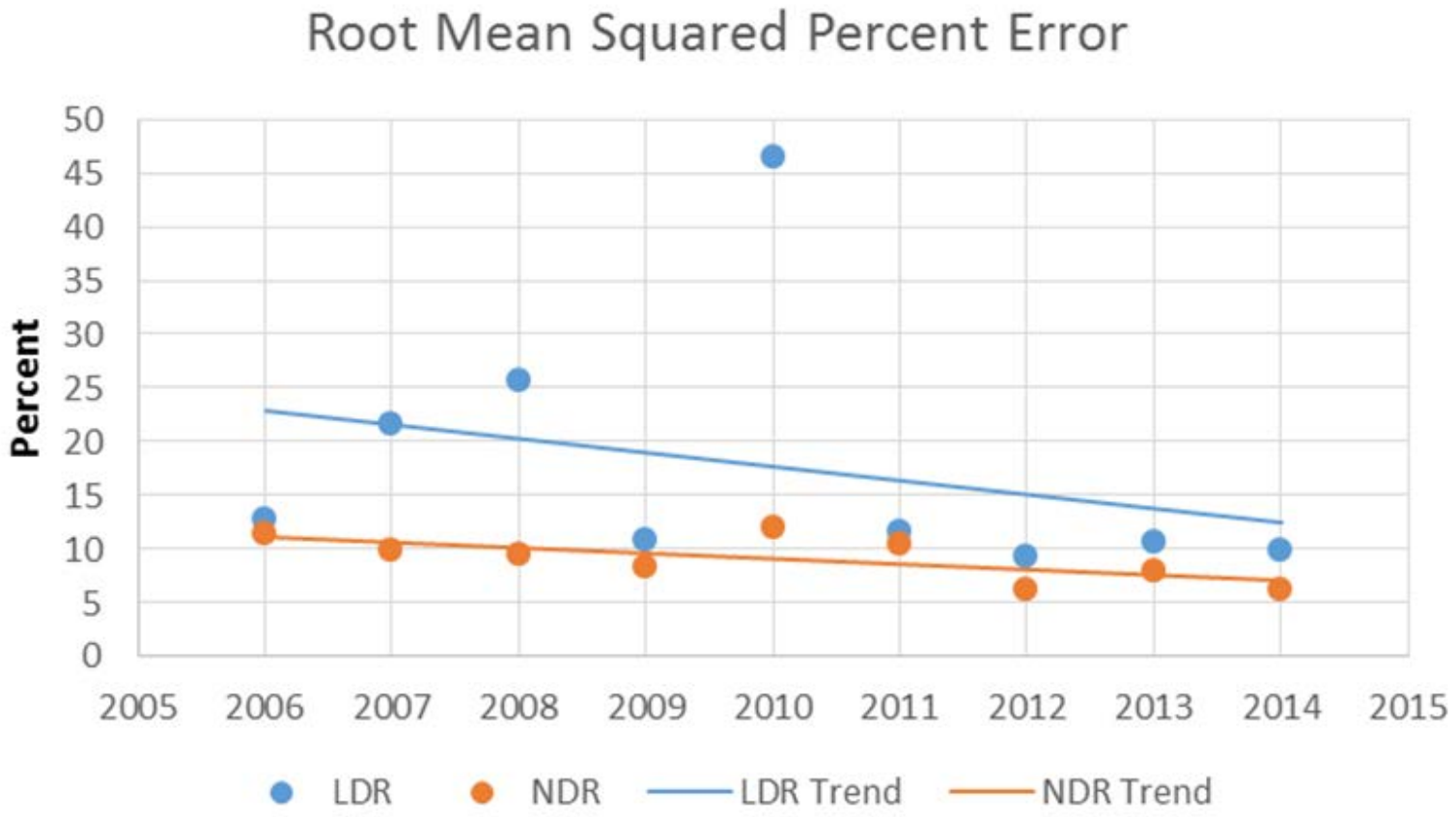
Overall Magnitude of the Average Differences



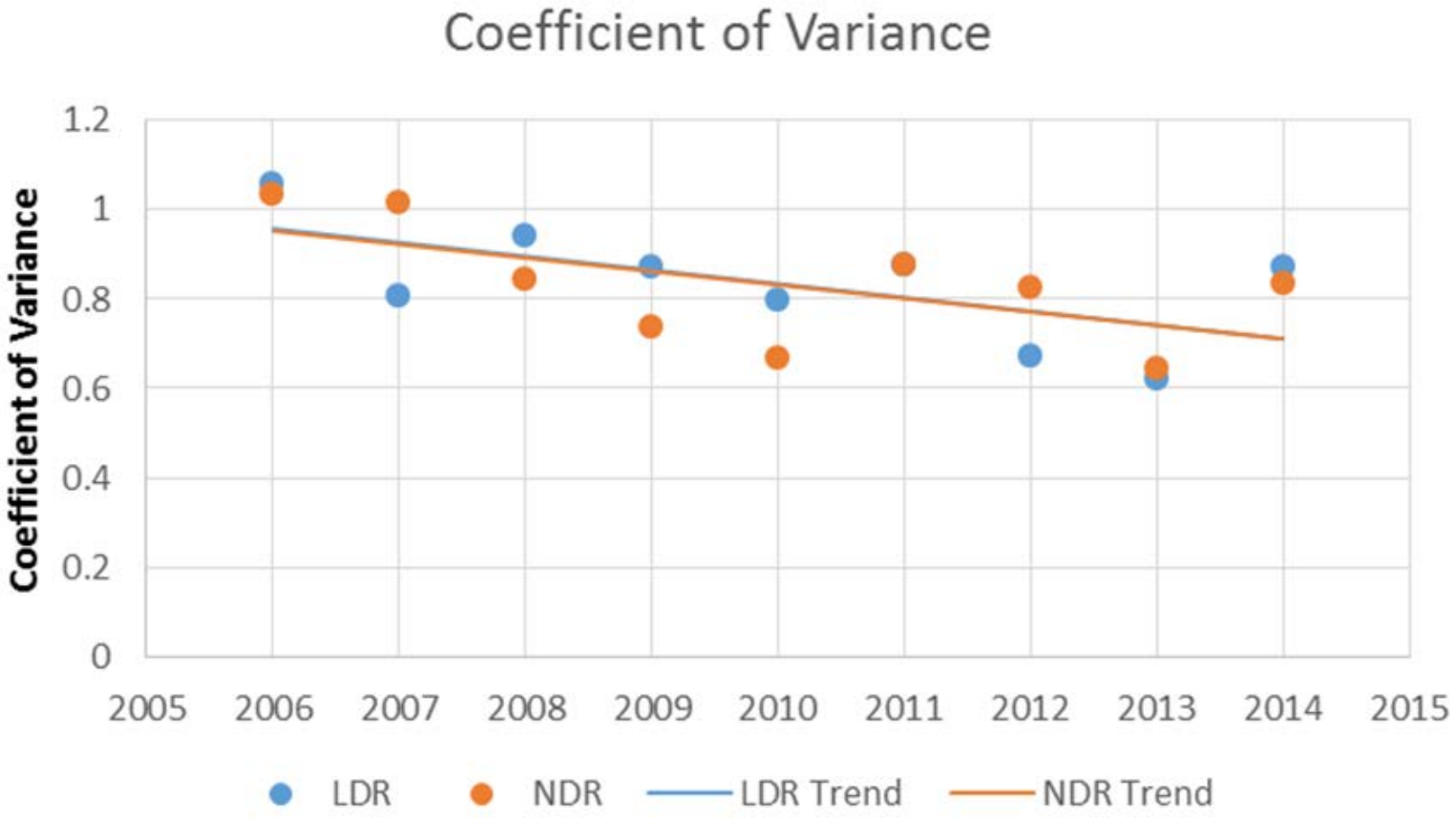
Root Mean Squared Error Over Time



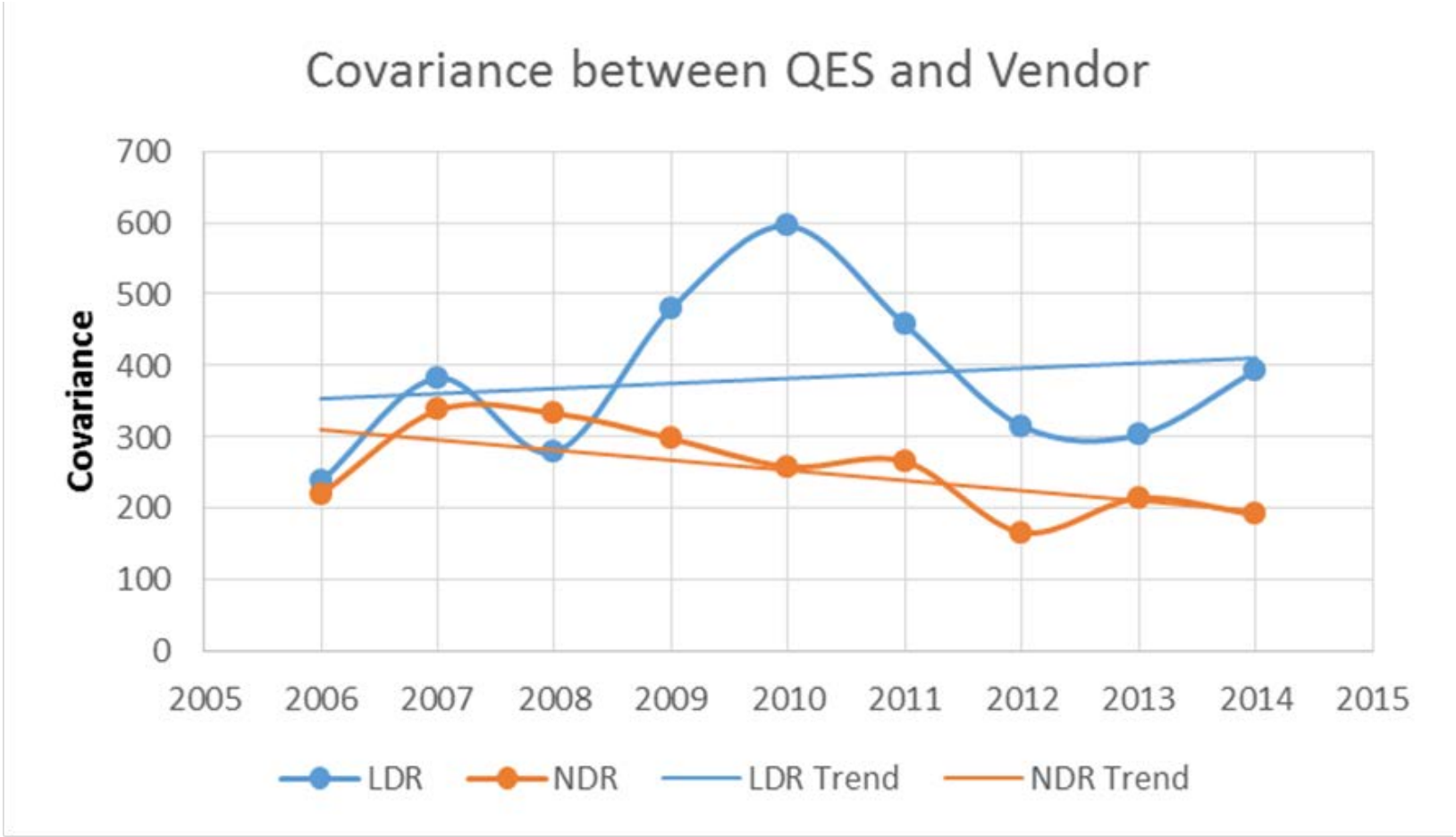
Root Mean Squared Percent Error Over Time



Coefficient of Variation Over Time



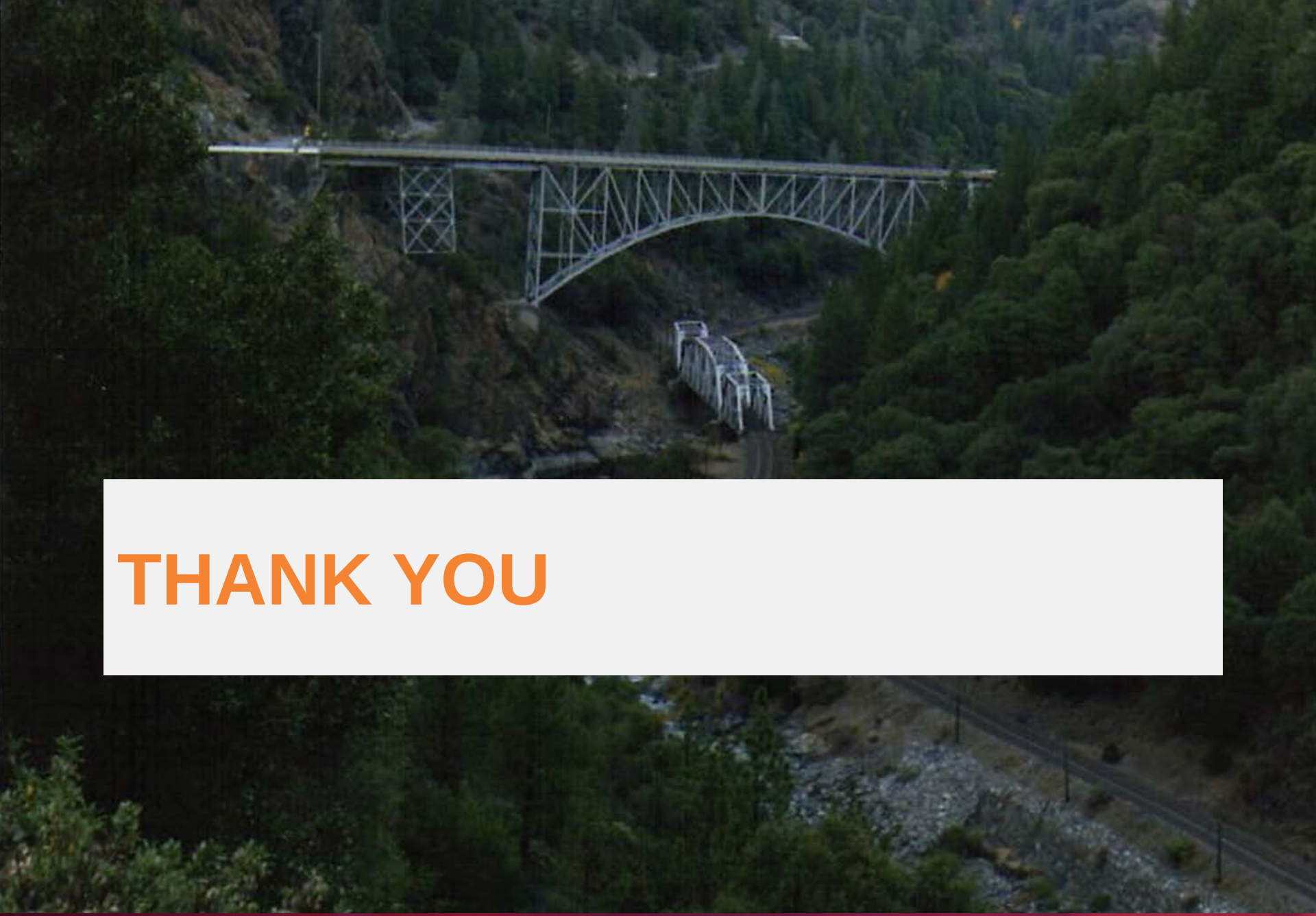
Covariance of Index Values Over Time



CONCLUSIONS

Conclusions

- **IV&V is critical in improving the quality of collected and reported data**
- **Early years show a wider variation**
- **Each evaluation of the variability over time illustrate the effectiveness of IV&V**
- **Errors are corrected before propagating to other deliverables**
- **There remains room for improvement**



THANK YOU