Project Information Form

Project Title	Development of Risk Management Strategies for State DOTs to Effectively Deal with Volatile Prices of Transportation Construction Materials (Risk Management Systems for GDOT)
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Start and End Dates	Start Date: May 1, 2012 End Date: June 30, 2014
Brief Description of Research Project	The overarching objective of this project is to enhance transportation agencies' understanding of the opportunities, challenges and best practices for utilizing risk management strategies for the asphalt cement price volatility in transportation projects. The final deliverable of this project is a comprehensive risk management guide that systematically addresses risk management for asphalt cement price volatility. The specific research objectives are: 1) Identify and analyze the latest developments and trends in utilization of risk management strategies for the mitigation of asphalt cement

	price risk; 2) Identify key features for the most promising risk management strategies and establish their respective potential benefits and limitations; 3) Enhance the assessment of risk management strategies considering the strategic objectives of transportation agencies and unique project goals; 4) Enhance the quantitative assessment of risk management strategies considering their key respective parameters; 5) Devise appropriate risk identification and allocation matrices for the successful adoption of asphalt cement price risk management strategies; and 6) Transform research findings into educational and professional development activities.
Describe Implementation of Research Outcomes (or why not implemented) (Attach Any Photos)	The primary contributions of this research to the body of knowledge are: (a) the creation of several time series models that have the power to explain the variations of asphalt cement prices; and (b) the creation of stochastic processes to model fluctuations of asphalt cement prices. It is expected that this work contributes to the transportation planning community by helping capital planners of transportation agencies and owners of major capital projects understand and model the volatility in the asphalt cement market. All steps of this research have been conducted in close collaboration with the GDOT Office of Materials and Office of Contracts and Bidding Administration.
Impacts/Benefits of Implementation (actual, not anticipated)	Fluctuations of asphalt cement price index were modeled using an appropriate stochastic process. It was concluded that the Geometric Brownian Motion (GBM) is a good stochastic process to model random variations of asphalt cement price over time. A probabilistic approach based on the Monte-Carlo simulation was applied on the GBM model to simulate future random paths and predicted intervals for asphalt cement price index. These results will be presented in the 2014 Construction Research Congress (CRC2014) in Atlanta. Furthermore, a dataset consisting of contractors' submitted bid data was retrieved and prepared from 3,749 highway construction projects awarded in the state of Georgia from January 1998 to July 2013. These

	projects were distributed geographically across the seven districts throughout the state. Major asphalt mixture line items were identified and the dataset was categorized based on the major asphalt mixture line items.
Web Links • Reports • Project website	The primary results of this analysis were presented as a poster at the 93rd Annual Meeting of the Transportation Research Board (TRB) (Washington DC, 2014) and awarded the 2nd place, STRIDE Student Poster Competition. The NCTSPM support was acknowledged in the paper. The results of the time series analysis of asphalt cement index in the state of Georgia were presented in the seventh international structural engineering and construction conference (Honolulu, June 18-23, 2013). The NCTSPM support was acknowledged in the paper. 2 progress reports were submitted to GDOT Office of Research. 2 conference papers were submitted to the 2014 ASCE Construction Research Congress (CRC) that will be held in May 2014 in Atlanta. Both papers were accepted for full publication in the proceedings.