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# Navigation Economic Technologies (NETS)

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*One Team: Relevant, Ready, Responsive and Reliable*

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# NETS

- **NETS is a Research & Development program managed by the Corps' Institute for Water Resources.**
- **The goal of NETS is to advance the Corps world-class engineering with state-of-the art tools and techniques for economic modeling and analysis.**



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# NETS Team

- **Includes:**
  - ◆ **Academics from seven universities**
  - ◆ **Representatives from**
    - ◆ **ORNL**
    - ◆ **TVA**
    - ◆ **Corps Centers of Expertise for  
Inland and Deep Draft**
    - ◆ **IWR**



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# NETS vs. Upper Miss

- **NETS is a research program aimed at both Inland and Deep Draft navigation economic evaluation.**
- **Many NETS research efforts have focus on the Upper Mississippi River in the hope that some products would be useful to the Upper Miss study team.**
- **It is up to the Upper Miss study team to determine the usefulness or appropriateness of any NETS product to the Upper Miss study.**



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# NETS Activities

- 1. Modeling**
- 2. Data Gathering**
- 3. Knowledge Base**
- 4. Peer Review**
- 5. Communications**



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# NETS Product Update

- **Shippers' Responses to Changes in Transportation Costs and Times: Mid-America Grain Study**
- **Shippers' Responses to Changes in Transportation Costs and Times: Non-Grain Commodities**
- **Longer-Term Forecasting of Commodity Flows on the Mississippi River: Application to Grains and World Trade ("World Grain Model")**



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# Mid-America Grain Study

- **Professor Kenneth Train of the University of California at Berkeley and Professor Wesley W. Wilson of the University of Oregon and the Institute for Water Resources form the study team.**
- **A survey of grain shippers was conducted to obtain information about the mode and origin/destination (O/D) of their shipments, the next-best alternative mode and O/D, as well as factors that might induce the shipper to switch to the next-best alternative.**



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# Mid-America Grain Study

- An econometric model was estimated on the combined revealed-preference data (the shippers' observed choices in the market) and stated-preference data (the choices that shippers said they would make if transportation costs or times rose for their current mode and O/D.)
- This study has gone through an independent peer review process and the final report is complete. Also, a paper illustrating this study was submitted to the Transportation Research Board (TRB) for publication and presentation at the January 2005 conference.



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# Mid-America Grain Study

**This study demonstrated several things.**

- **The most important being that it is possible (though difficult) to collect the necessary information to estimate shipper response.**
- **Also, the study confirms the shortcoming of traditional methods. Specifically that the reservation price (alternative rail price) understates the willingness to pay and that perfectly inelastic demand overstates willingness to pay.**



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# Mid-America Grain Study

- **The results of the study form the basis for estimating demand curves for water transportation.**
- **Study results will be compared to a second survey to be initiated June 2006 for validation. Final results by early CY 2007.**



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# Shipper Responses:

## Non-Grain Commodities

- Will employ same stated preference and revealed choice techniques as the Mid-America Grain Study.
- Scheduled to begin May 2006
- Survey completion by fall 2006, final results by early CY 2007.



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# World Grain Model

- **The purpose of this study is to illustrate the development of a spatial equilibrium model to forecast international commodity flows from a specific region.**
- **The methodology will be robust enough to provide credible projects in flows for 50 years.**
- **The uncertainties of key variables will be explicitly considered.**



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# World Grain Model

- **Forecasting of policy variables will be evaluated using “scenario analysis.”**
- **The methodology will be illustrated by an application to the grain sector on the Mississippi river system.**
- **Review of draft model and model results has been completed; model modifications are ready for review.**



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- **NETS web site: [www.corpsnets.us](http://www.corpsnets.us)**
  
- **NETS NEWS!**
  - **An email alert with summary information about new developments will go out to team members and other interested parties. The email will provide a link to the product on the NETS web site. To subscribe or unsubscribe from NETS News, log on to**  
  
**[www.corpsnets.us/NETSnews/news\\_signup.html](http://www.corpsnets.us/NETSnews/news_signup.html)**



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# NESP Economic Products

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# NESP Product Update

- **Transportation Rate Analysis**
- **Traffic Forecasts: Non-Grain**
- **Survey Model**
- **Model Certification**



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# TRANSPORTATION RATE ANALYSIS

## STATEMENT OF WORK

**The basic work to be accomplished is the identification of ultimate origins and final destinations, and the development, and documentation of transportation rates and charges on a sampling of the commercial traffic that moved via the Upper Mississippi River Navigation System.**



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# STATEMENT OF WORK...

## MORE DETAILS

**The Contractor shall document or determine for each movement in the sample the total origin-to-destination shipping costs for:**

- ✓ **The existing waterway routing,**
- ✓ **The least-costly all overland routing,**
- ✓ **One other alternative routing if deemed feasible & appropriate (generally St. Louis transfer location),**
- ✓ **For grains (only), a Pacific Northwest (PNW) routing.**



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# STATEMENT OF WORK...

## MORE DETAILS

**Total origin-to-destination costs will include:**

- ✓ **Loading/ unloading charges at origin and destination,**
- ✓ **Rates for movements to or from the line-haul,**
- ✓ **The modal line-haul rate,**
- ✓ **Any inter-modal transfer, handling and storage costs.**



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# TRANSPORTATION RATE ANALYSIS

**Tennessee Valley Authority (TVA) is our contractor for this study, and they are also the contractor for the Transportation Rate Study for Ohio River Main-Stem System Study.**

**The Scope of Work (with the Rate Sheet attachments) for this effort has been completed, and will be available soon for your review at our web site.**



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# TRANSPORTATION RATE ANALYSIS

**Survey Forms and Letter of Introduction for TVA are complete and will also be available soon at our web site.**

**TVA will begin interviewing terminal operators by telephone and in person later this month, pending OMB approval of the survey forms. We ask that you get the word out that these surveys are important.**



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# TRANSPORTATION RATE ANALYSIS

**From the 2004 WCSC database, the Corps' study team and the TVA have selected a sample of approximately 1300 origin-destination waterway movements.**

**The sample is based on movements with the highest tonnage segmented by commodity group and by waterway reach to assure adequate coverage.**



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# SCHEDULE AND PHASING OF WORK

**Initiate work with OMB approval of surveys, and transfer of funds to TVA (May 2006).**

**Data collection, sample movements, telephone interviews and surveys complete(15 Nov. 2006).**

**Individual rate sheets for each movement with all cost components broken out separately, and a draft final report (15 February 2007).**

**Final Report incorporating revisions resulting from review of the draft final report (15 April 2007).**



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# Traffic Forecasts: Non-Grain

- **Scope of Work currently under preparation**
- **Work to be performed by contract**
- **Completion programmed for early CY 07**



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# Survey Model

- **Motivation for a new economic model stems from the desire to address the limitations that were identified at various stages of the feasibility study review process.**
- **The Survey Model attempts to accomplish this by replacing the demand for water transportation function in the economic model developed during the feasibility study with a demand function that is based on empirical data.**



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# Survey Model

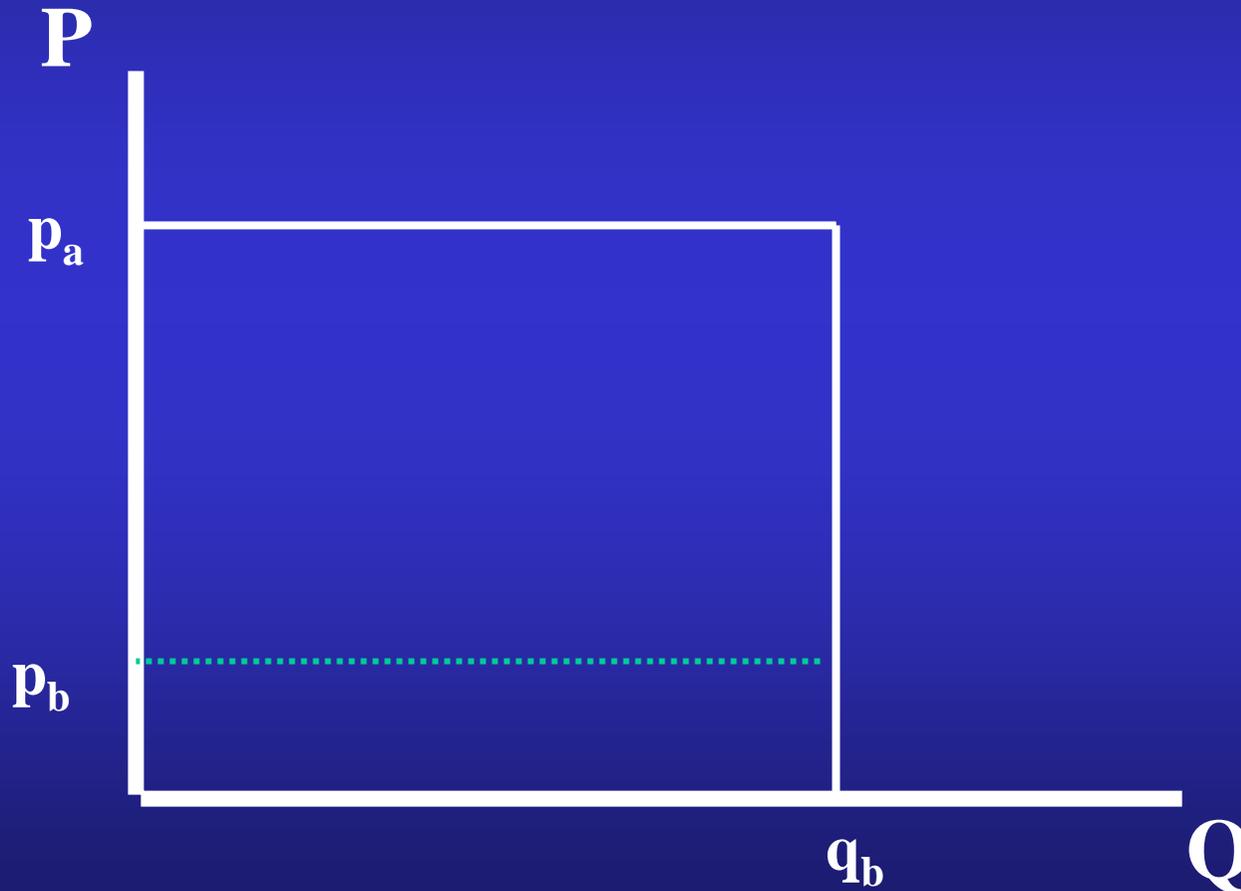
***Objective:*** Incorporate the results found in “Shippers Responses to Changes in Transportation Costs and Times: The Mid-America Grain Study” into the framework of the existing economic system model **ESSENCE.**



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# Demand Function

## Inelastic Demand

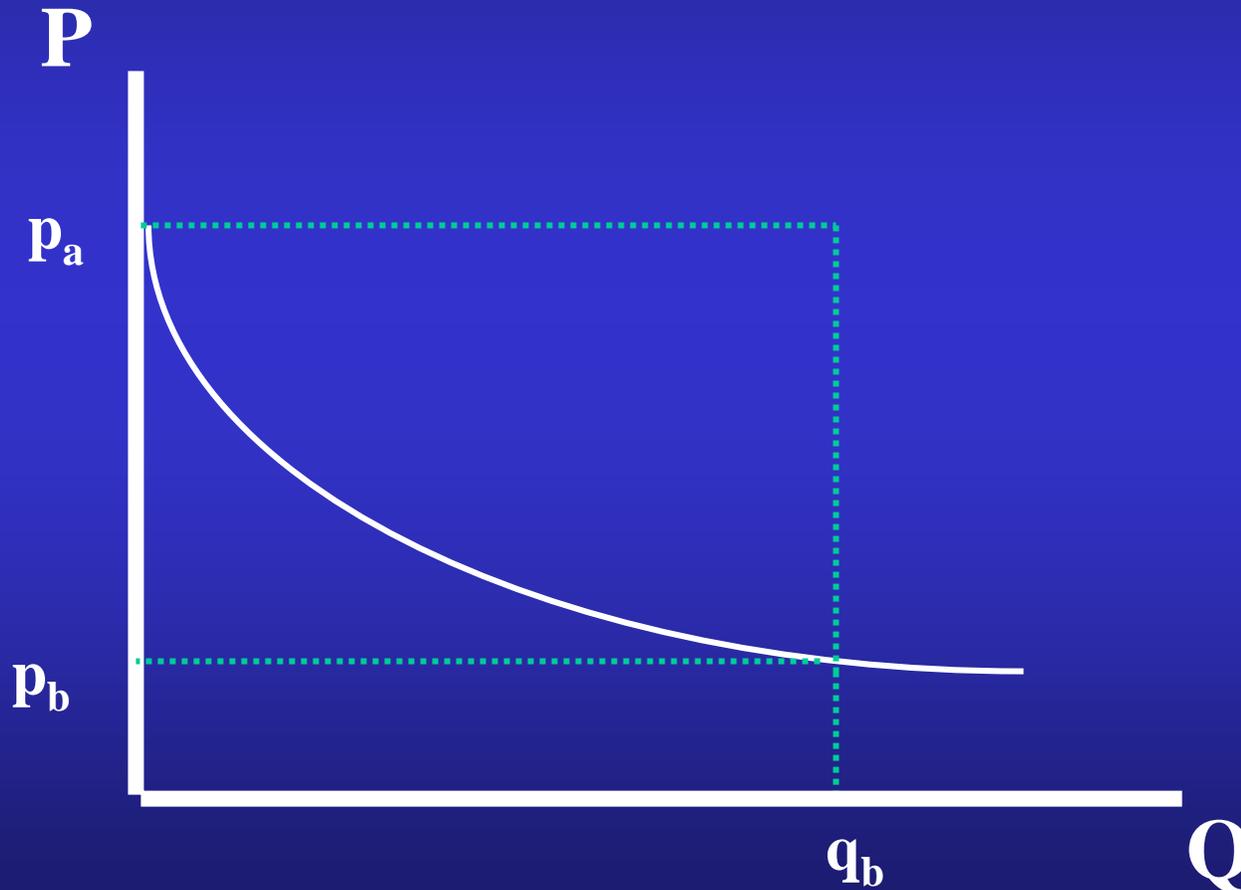




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# Demand Function

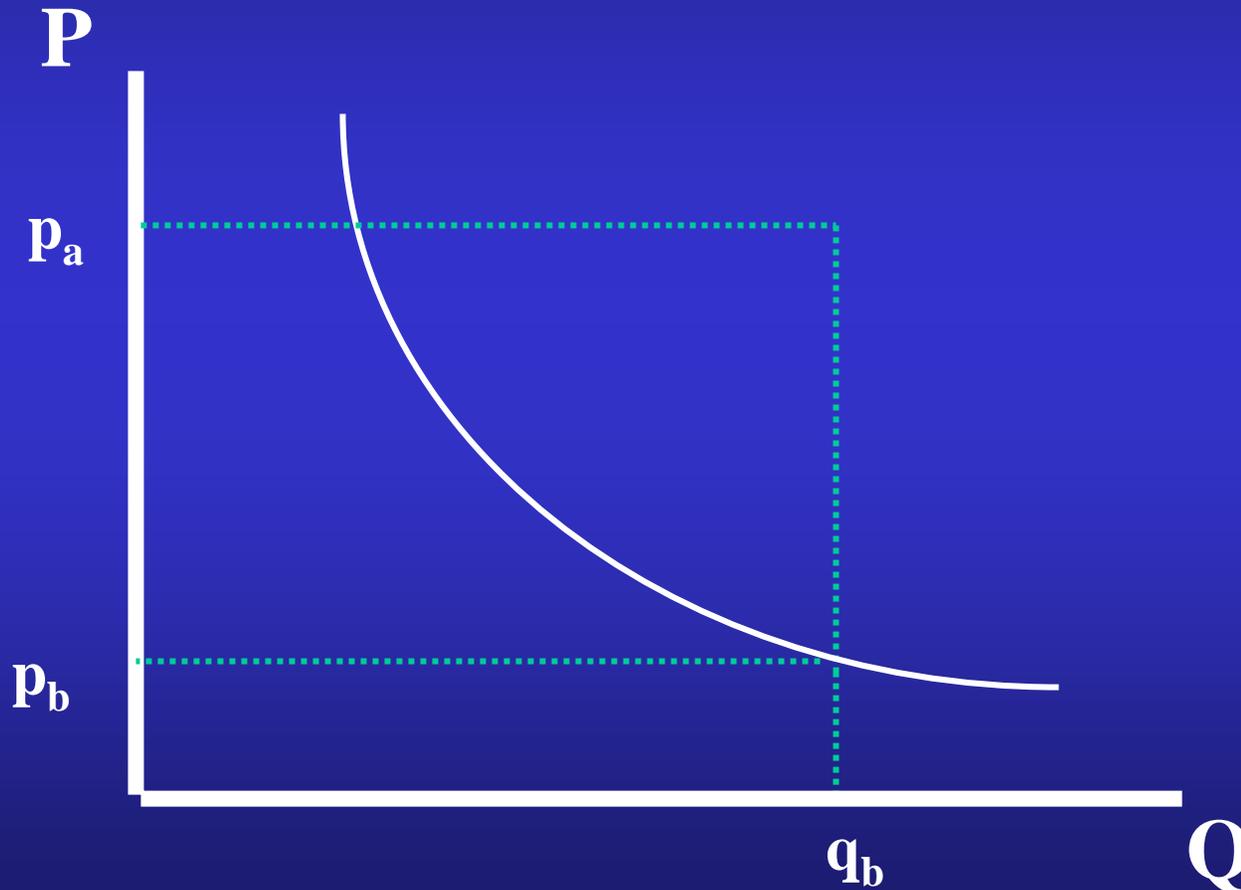
## ESSENCE





# Demand Function

US Army Corps of Engineers® **Mid-America Grain Study - Survey Model**





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# Mid-America Grain Study

- **Econometric analysis using survey results as input into a theoretical shipper's modal choice model**
- **Used to estimate arc elasticities of shippers' responses to both rate and time increases**



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# Mid-America Grain Study

- **Changes in transportation rate and transit time both affect level of shippers demand for a mode or destination**
- **Arc elasticities decrease at a decreasing rate with larger percentage increases in both time and rate**
- **A large share of shippers is insensitive to changes in transportation rates and time**

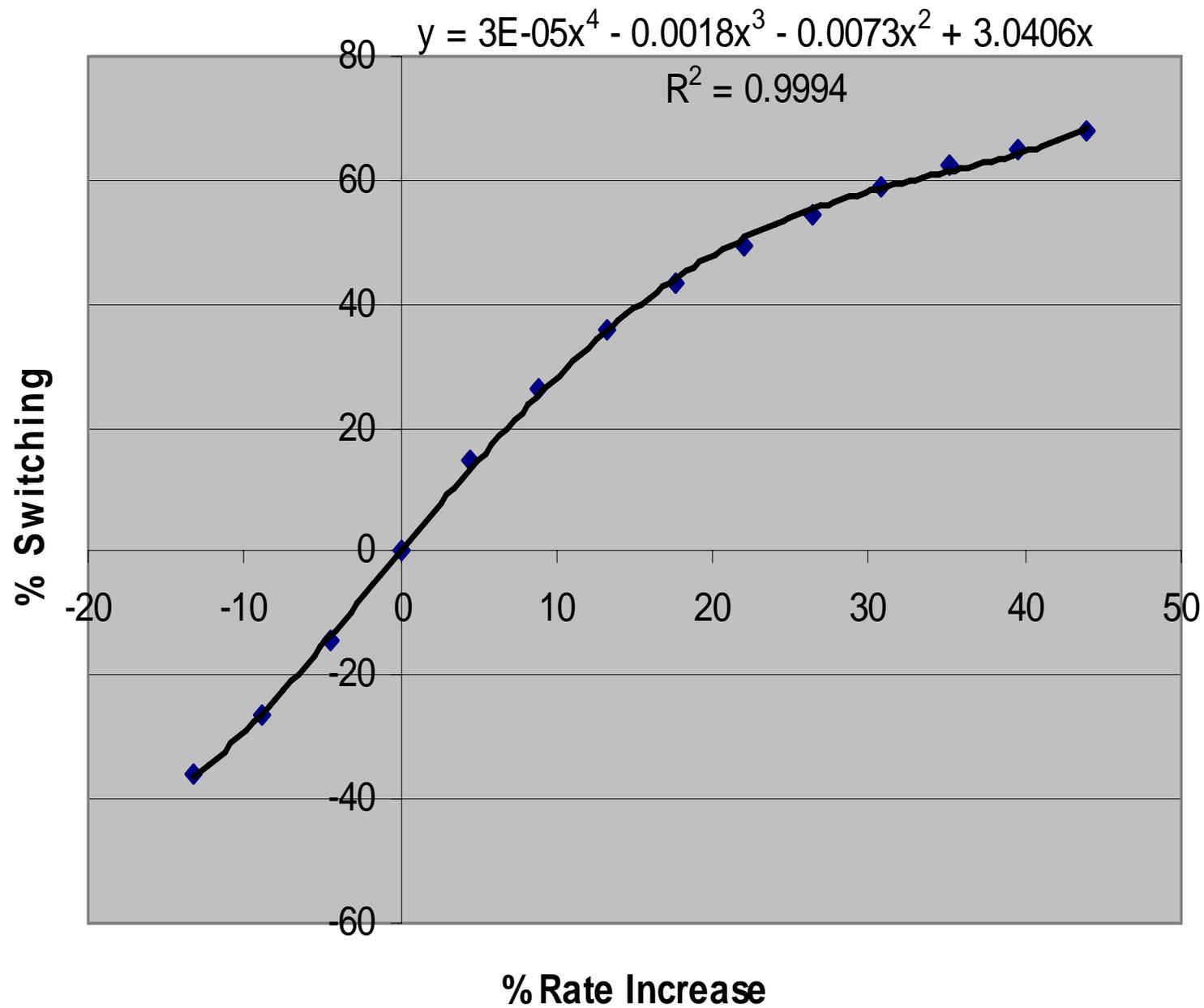


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# Shipper Response to Rate Change

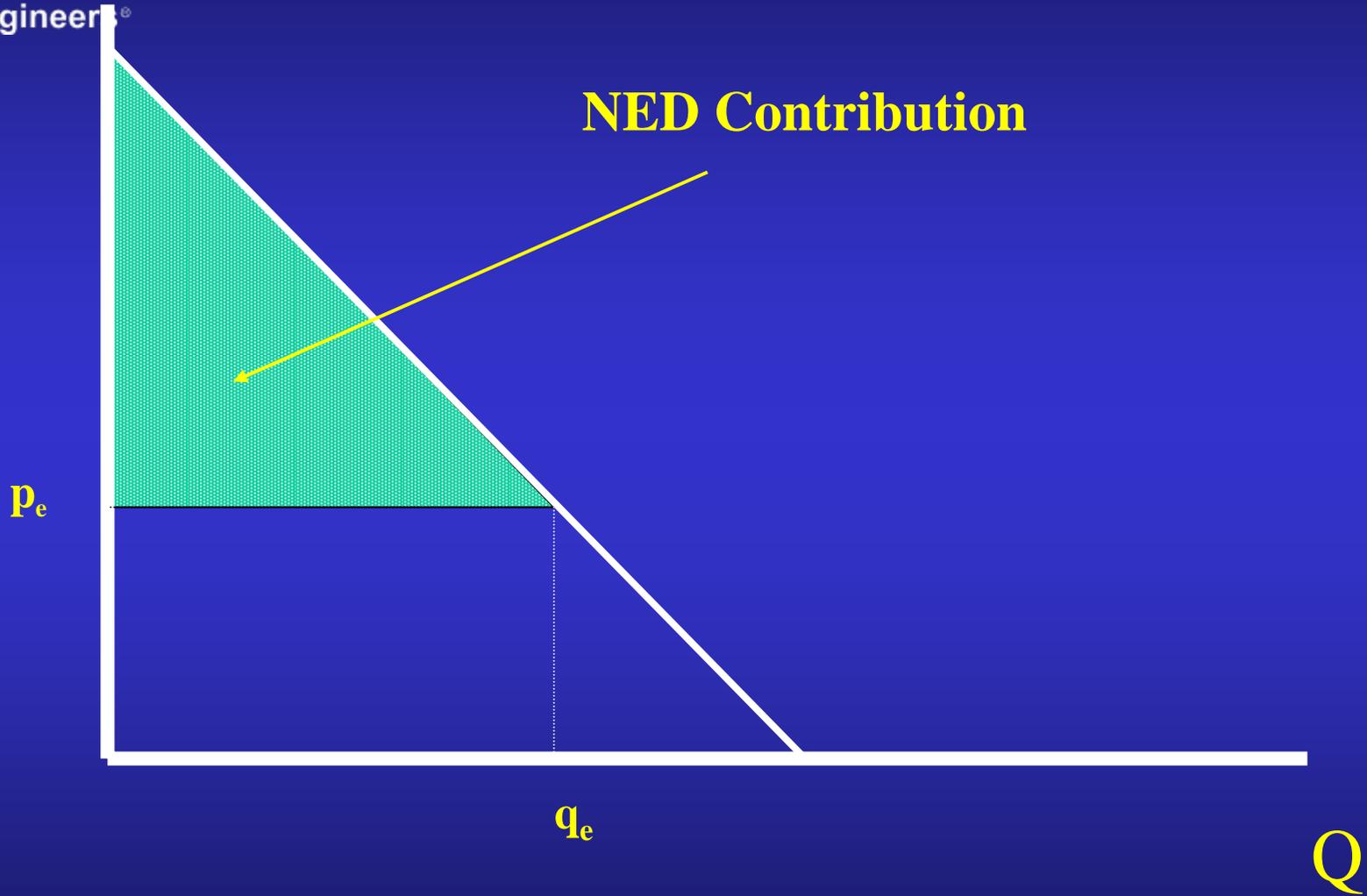
Percent Rate Increase	Percent Switching
-13.20	-35.85
-8.81	-26.37
-4.40	-14.54
0.00	0.00
4.40	14.54
8.81	26.37
13.20	35.85
17.60	43.45
22.00	49.59
26.40	54.61
30.80	58.76
35.20	62.24
39.60	65.19
44.00	67.71

# Total Shippers' Response





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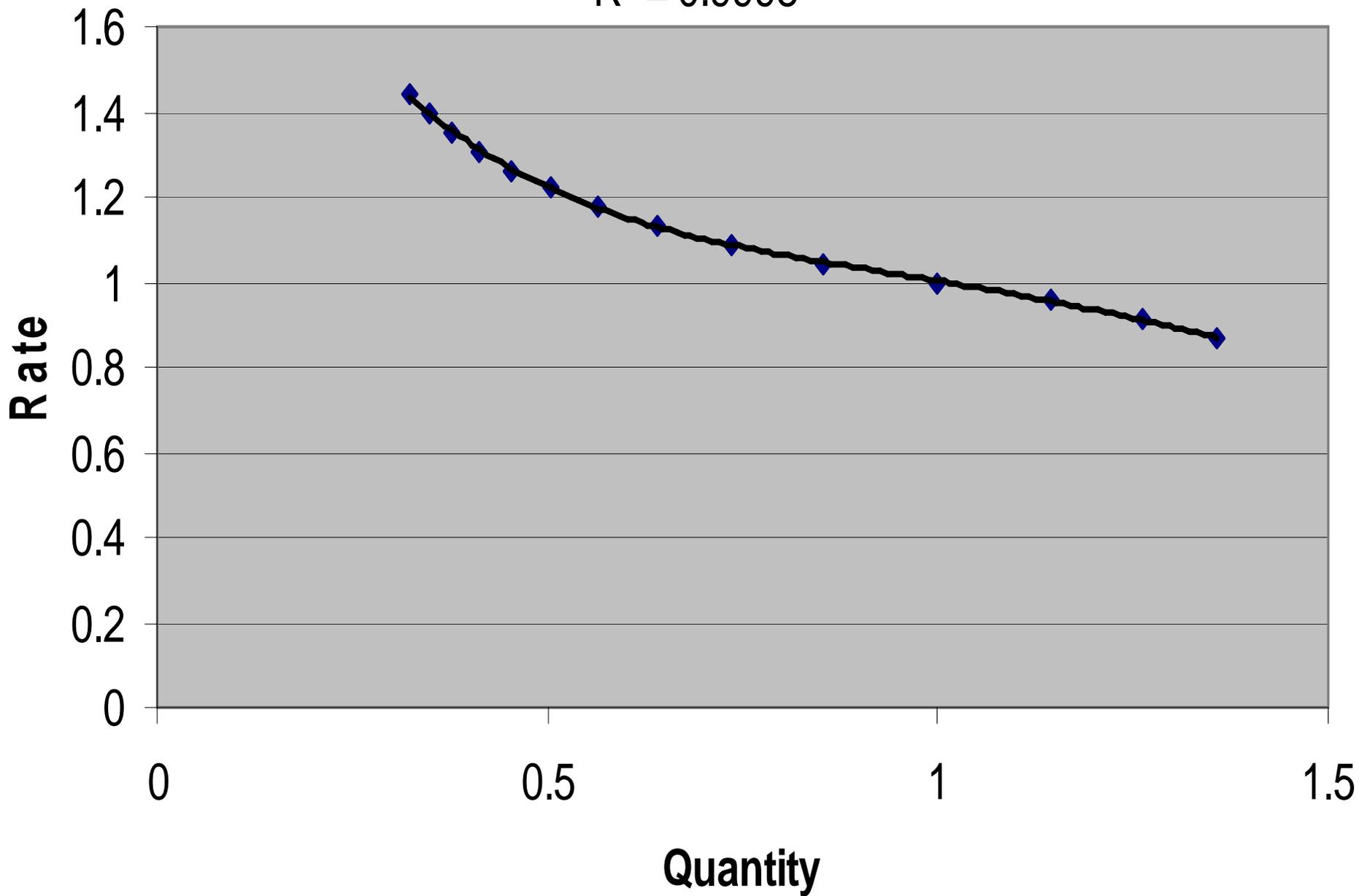
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# Shipper Response as Inverse Function of Rate

Proportion of Rate	Proportion of Shipments
0.868	1.3585
0.912	1.2637
0.956	1.1454
1.000	1.0000
1.044	0.8546
1.088	0.7363
1.132	0.6415
1.176	0.5655
1.220	0.5041
1.264	0.4539
1.308	0.4124
1.352	0.3776
1.396	0.3481
1.440	0.3229

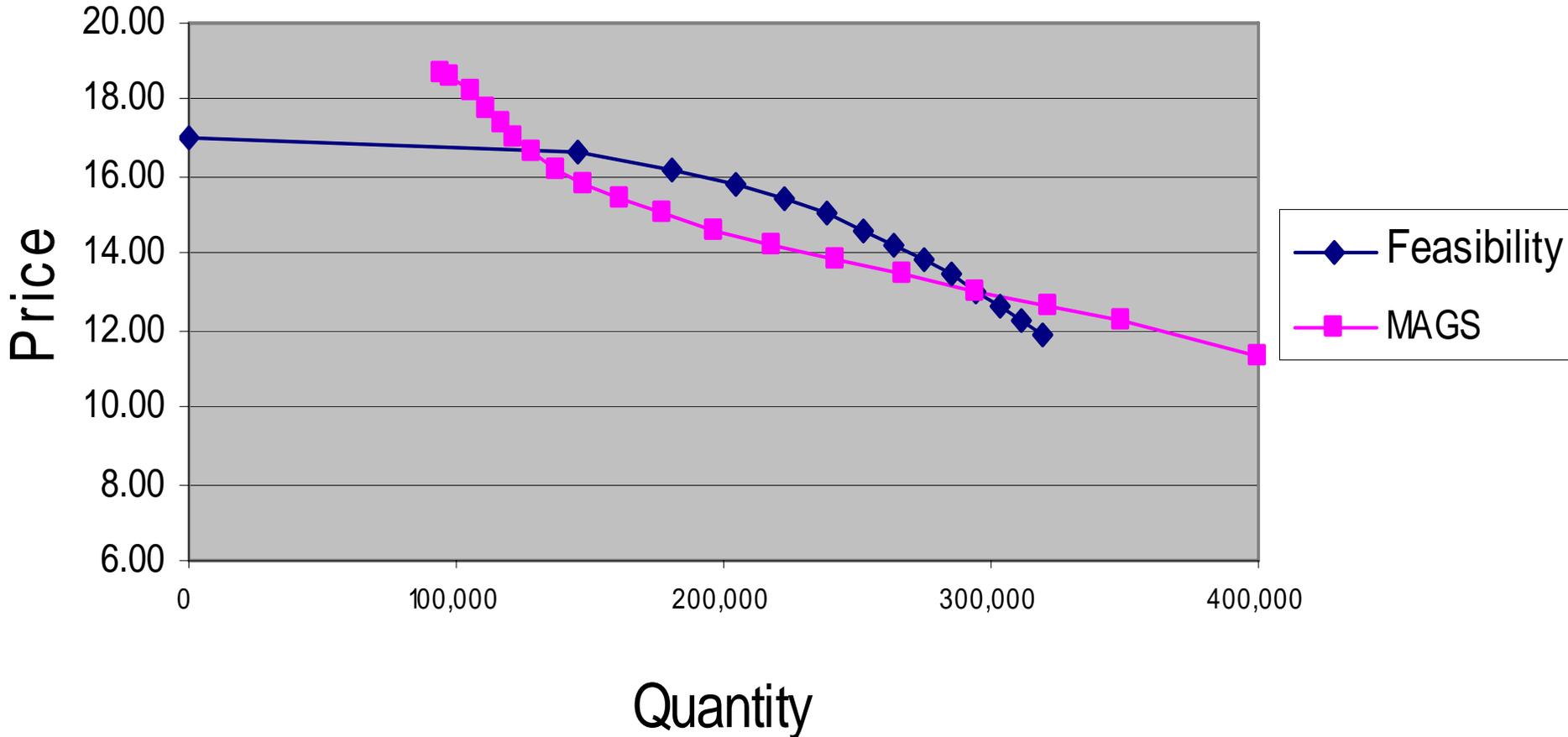
$$y = 0.7257x^4 - 3.3132x^3 + 5.4624x^2 - 4.1964x + 2.3244$$

$$R^2 = 0.9998$$



# Demand Function Comparison

Feasibility Specification and Mid America Grain Study  
Selected Movement





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# Survey Model Execution

- **All model inputs scheduled by March 2007**
  - **Traffic Base**
  - **Traffic Forecasts: Grain**
  - **Traffic Forecasts: Non-Grain**
  - **Transportation Rates**
  - **Water Transportation Demand Functions: Grain**
  - **Water Transportation Demand Functions: Non-Grain**
  - **Lock Performance**
  
- **Model evaluations performed by June 2007**



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# Model Certification

- **Accomplished jointly by NETS and NESP through the Corps' Planning Center of Expertise for Inland Navigation (PCXIN).**
- **Model documentation and other relevant information under preparation for submission to PCXIN.**
- **PCXIN will determine appropriate level of review to address certification.**