



CITY OF PORTLAND, OREGON  
BUREAU OF  
**Planning**

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**AIRPORT FUTURES**  
CHARTING A COURSE FOR PDX

*Forecast Peer Review  
Status Report*

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# *Scope of this Presentation*

- Objectives of the Forecast Peer Review
- General comments on the forecast process
- Comments on the technical analysis
- Forecast models
  - Passenger model
  - Cargo model
- Forecast assumptions
- Other aspects of the forecasts
- Recommendations for further work

# *Objectives of Forecast Peer Review*

- ➔ Provide the City, Port, PAG and Forecast Subcommittee with an independent assessment of the forecast methodology, forecast scenarios, and associated assumptions
- ➔ Work closely with the Port's aviation consultant team to develop and refine the methodology
  - Raise concerns at an early stage while there is time to address them
  - Provide opportunity for Peer Review Consultant to make suggestions as the work is proceeding
- ➔ **This has been a very productive relationship**

## *Goals of the Current Presentation*

- ➔ Identify aspects of the technical analysis that need to be understood and considered in deciding whether the current forecasts should be accepted or further analysis is warranted
  - The implications of the technical details of the models are not at all obvious, but critical to how the models forecast future traffic
- ➔ Identify technical issues that appear to have the greatest impact on how well the current forecasts represent the likely future traffic growth at PDX
  - These are the issues that the PAG may want to give particular consideration as it decides whether it is comfortable with the current forecasts

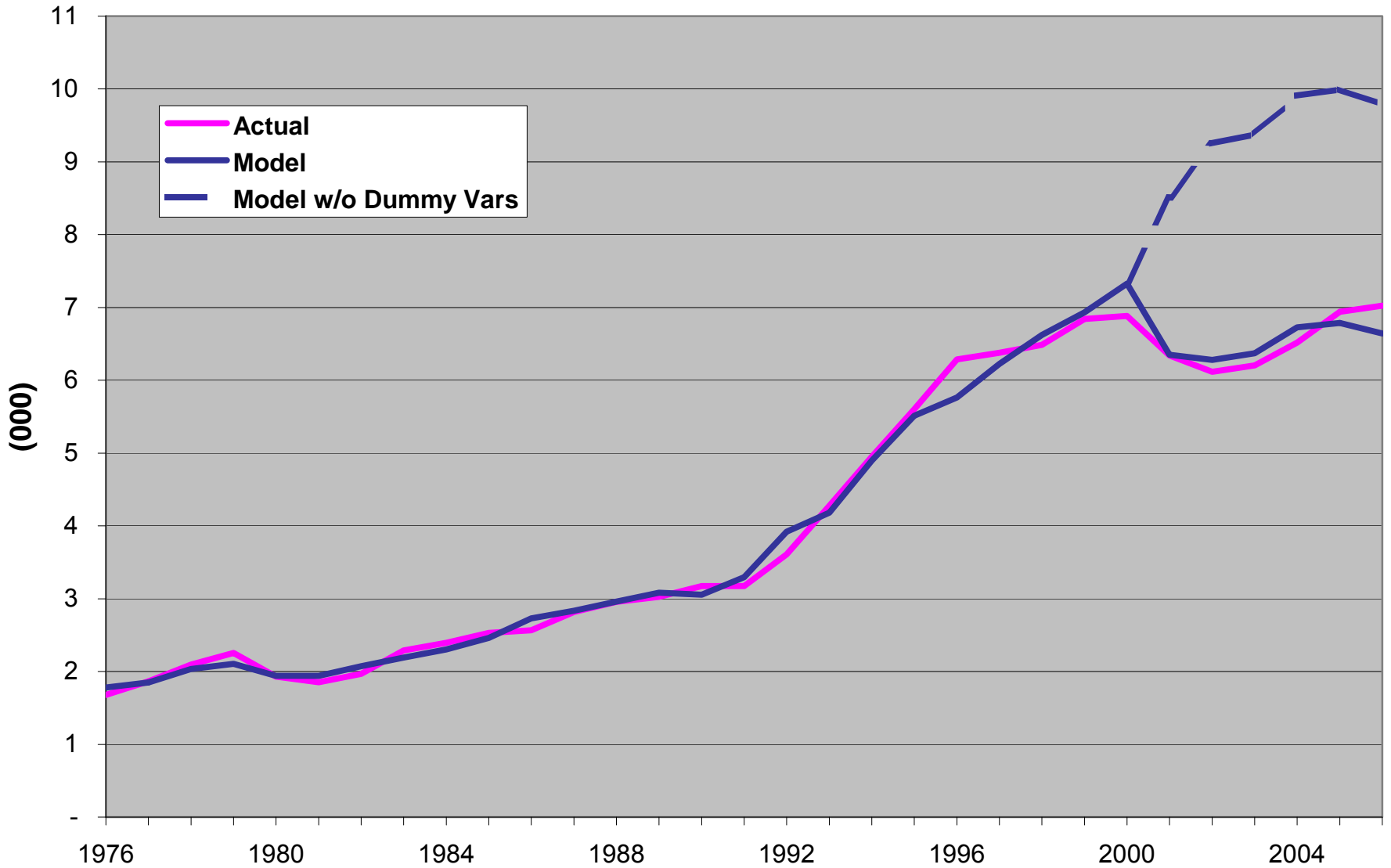
# *The Forecast Development Process*

- ➔ Based on a probabilistic approach
  - Significant technical improvement over traditional approach
  - Improved representation of uncertainty
  - Required development of analytical techniques
- ➔ Address key issues identified by Forecast Subcommittee
  - Oil prices
  - Impact of policies to address climate change
- ➔ Use of aggregate forecast models
  - Total enplaned passengers and cargo tonnage
  - Fairly standard approach in master plan forecasting
  - Ability of such models to forecast future traffic dependent on choice of variables and model structure

# *Enplaned Passenger Model*

- Multiplicative formulation
  - Coefficients can be interpreted as demand elasticity
- Three continuous variables
  - Regional population
  - Regional average per capita income
  - Airline yield (PDX yield since 1990, US domestic yield prior)
- Three dummy variables
  - Adjust for use of US domestic yield before 1990
  - Account for reduction in traffic since 2001
  - Dummy variable for 2002 on reduces traffic by 32% from relationship to causal variables prior to 2001

# PDX Enplaned Passengers



# Comments

- ➔ Model fits the actual traffic fairly well up to 2000
  - Higher growth rate than actual from 1996 to 2000
  - Lower growth rate than actual from 2002 to 2006
- ➔ Aggregate model assumes that different market segments maintain a consistent relationship over time
- ➔ Demand elasticity
  - Population: 0.9
  - Per capita income: 1.04
  - Airline yield: -1.15
- ➔ Post-2002 dummy variable has a significant effect on future traffic
  - If the effect disappears, this would increase traffic by about 50%

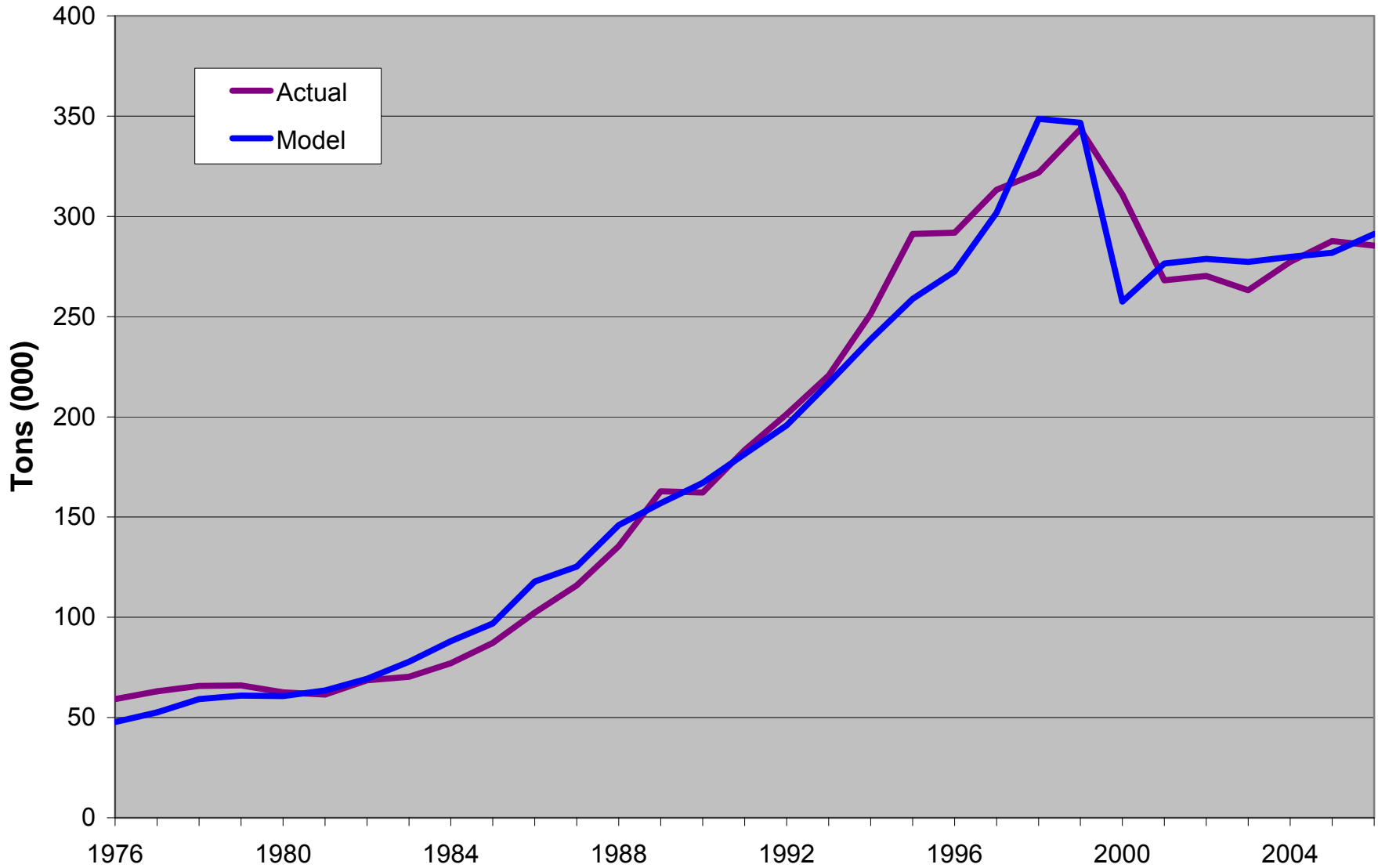
# *Issues to Consider for Passenger Model*

- Post-2002 traffic reduction
  - Is this likely to disappear over time?
    - ❖ This would give significantly higher forecasts
- Population and per capita income elasticity
  - Sensitivity of forecasts to higher future elasticity assumptions
  - Not likely to be as significant an issue as the post-2002 effect
- Effect of changes in traffic composition
- Projections of future airline yields
  - Does not explicitly consider improvements in aircraft fuel efficiency
    - ❖ Poor correlation with past oil prices

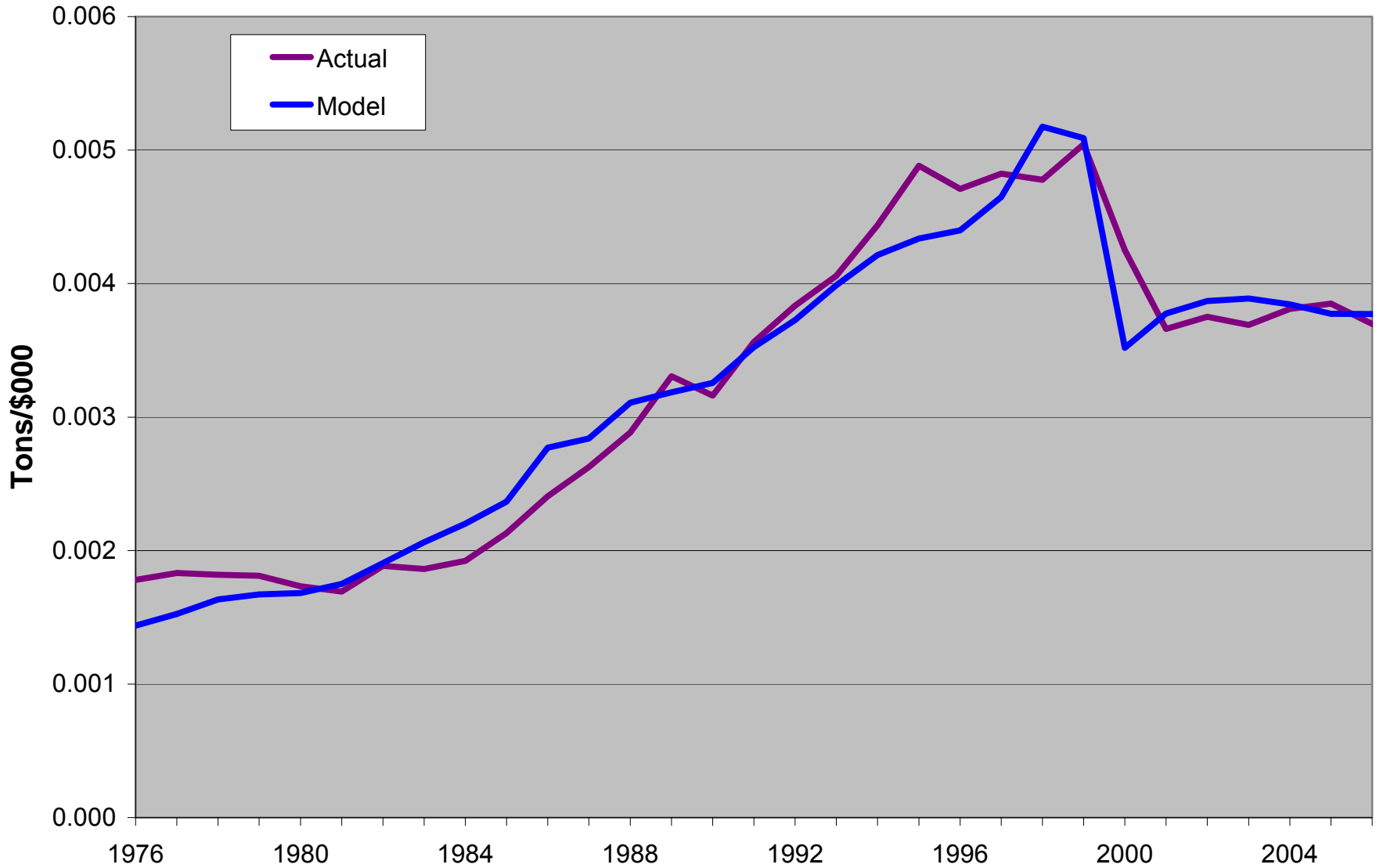
# *Revised Cargo Model*

- ➔ Model predicts cargo intensity
  - Total tons of cargo per thousand dollars of regional personal income
  - Cargo intensity multiplied by regional income to forecast cargo tonnage
- ➔ Based on a logistic growth curve
  - Cargo intensity increases over time following an S-shaped curve
- ➔ Includes factor for oil prices
  - Elasticity  $-0.164$
- ➔ Dummy variable for years after 1999
  - Reduces predicted cargo by 28%

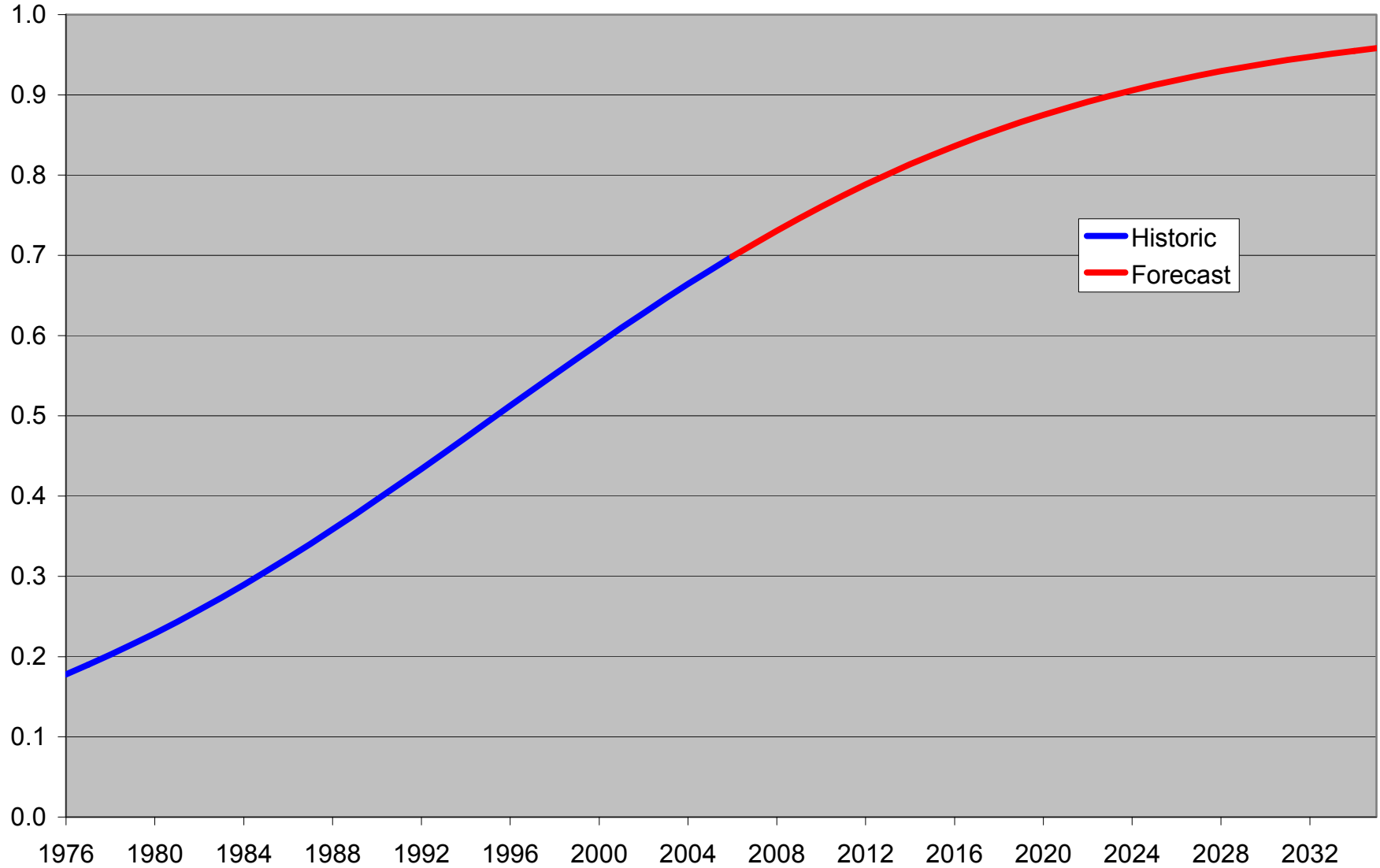
# PDX Cargo



# PDX Cargo Intensity



## Cargo Growth Logistic Curve



## *Issues to Consider for Cargo Model*

- ➔ Model does not consider the effect of any causal factors other than regional personal income and oil prices
  - Demand elasticity with respect to oil price seems reasonable
- ➔ The logistic curve is the best fit to the data given this causal structure
  - Implies that the increase in air cargo intensity will continue to increase in the future, reaching 37% above 2006 levels by 2035
- ➔ Reduction in traffic level after 1999 explained as a constant percent reduction from the level predicted by the logistic growth curve and changes in oil price
  - Is this effect likely to remain constant in the future?

# *Forecast Assumptions*

## → Oil prices

- Range in 2035 of \$44 to \$128 per barrel in 2006 dollars
- Based on latest US Department of Energy forecasts
- Higher oil price assumptions will reduce forecast traffic

## → Carbon offset costs

- Range in 2035 of \$35 to \$109 per metric ton carbon
- Assumed only 25% to 75% passed on to airlines
- No factor included for radiative forcing effect

## → Distributions for probabilistic analysis

- Assumed to be independent
- Oil price limited to range of scenarios considered by DOE
- Per capita income distribution gives average somewhat lower than Metro forecast

# Other Aspects

- ➔ Forecast of aircraft operations
  - Based on assumed market shares of total traffic
    - ❖ International traffic projected independently based on assumed growth rates
  - Based on assumed airline market shares and fleet mix
  - Assumed growth in average aircraft size and load factor
  - Market shares and airline shares of a given market assumed to remain constant at 2007 levels
- ➔ Use of probabilistic forecasts in the master plan process
  - Transparency of the uncertainty inherent in the process
  - Allows a quantification of the likelihood of particular outcomes
  - Can be viewed as showing “how likely is it that a given traffic level will be reached by a particular year”

# *Recommendations*

- ➔ Further work appears to warranted to clarify some of the issues identified in the review
  - Will require additional time and resources
  - Could probably be accomplished in 3 to 4 months
  - Other planning activities could proceed in parallel
- ➔ Would help establish whether these could have a material effect on the forecast values
  - If so, this could be an important consideration in the use of the forecasts in subsequent steps
- ➔ Would be better to know this in the near future rather than in several years time after the master plan has been prepared