ADDITIONAL MATERIALS FROM THE RECORD

NBF Report

Bank of Canada Benchmarks

Legend:
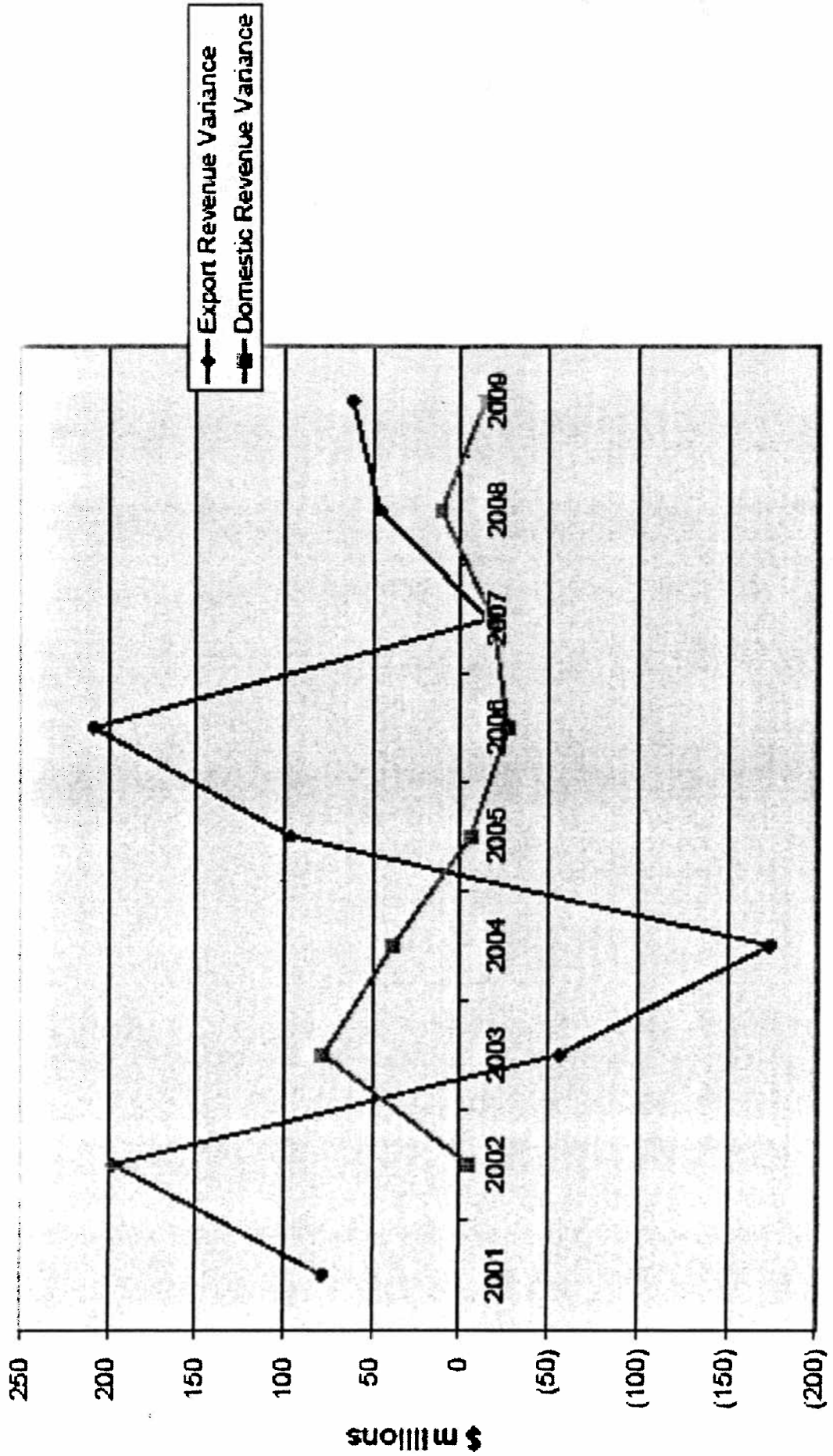- 1 Month BA
- 10 Year
- Long

Y-axis: 7%, 6%, 5%, 4%, 3%, 2%, 1%, 0%

X-axis: Jun 2001, Jun 2002, Jun 2003, Jun 2004, Jun 2005, Jun 2006, Jun 2007, Jun 2008, Jun 2009, Jun 2010

April 05

May 09

MH Export Revenue Variances
2001 - 2009

Legend: Export Revenue Variance

X-axis: Year (2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009)

Y-axis: $ millions (250, 200, 150, 100, 50, 0, (50), (100), (150), (200))
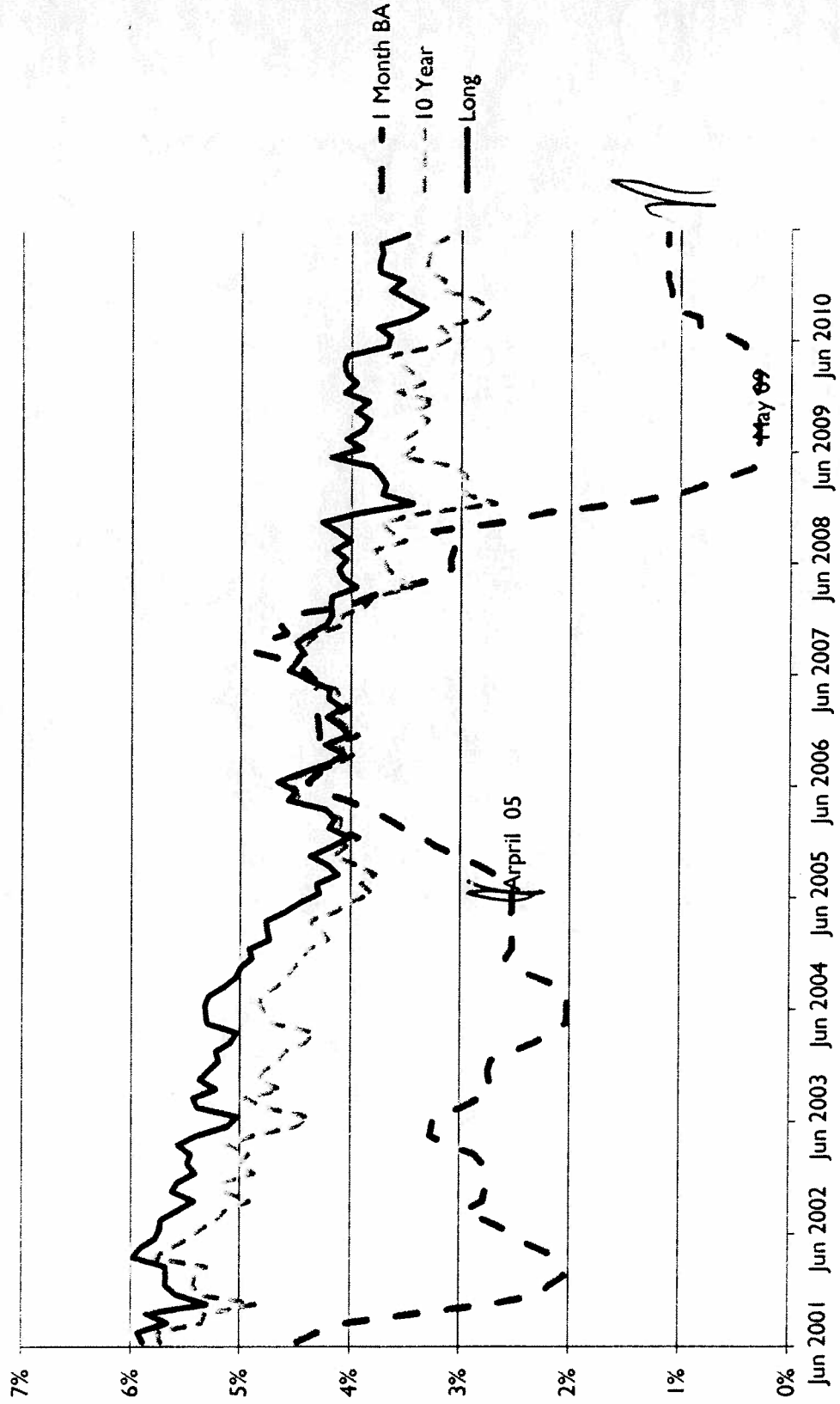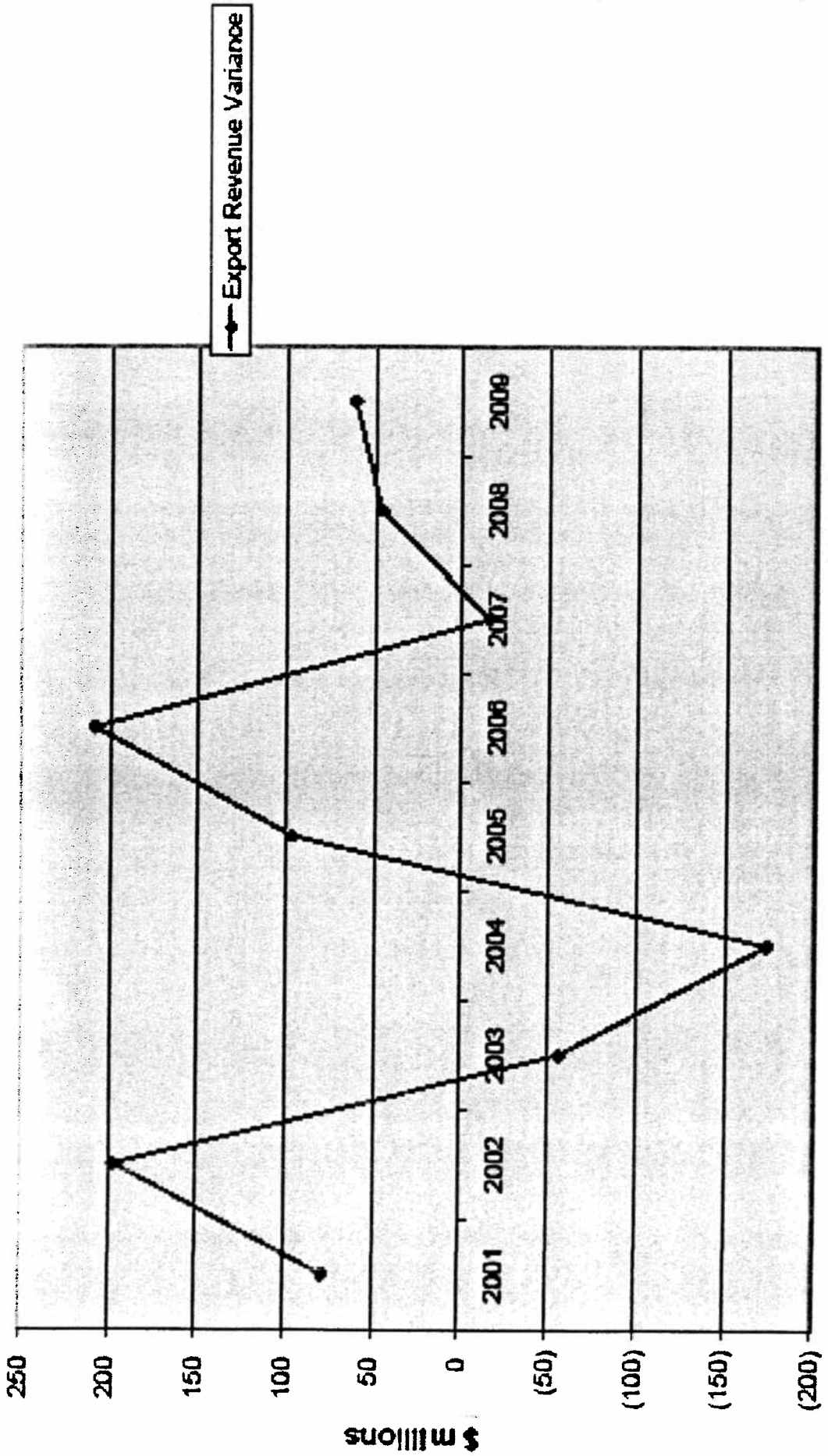
MH Export Revenue Variances
&
MH Domestic Revenue Variances
2001 - 2009

Export Revenue Variance
Domestic Revenue Variance

$ millions

250
200
150
100
50
0
(50)
(100)
(150)
(200)

2001 2002 2003 2004 2005 2006 2007 2008 2009

Year

Illustrative Example
to
Compare Export Revenue Variances to Refunds/Recovery Under Recommended RSR

Legend:
- Annual Export Variance
- Net Refund/Recovery

Y-axis: $ millions — 250, 200, 150, 100, 50, 0, (50), (100), (150), (200)

X-axis: Year — 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008, 2009
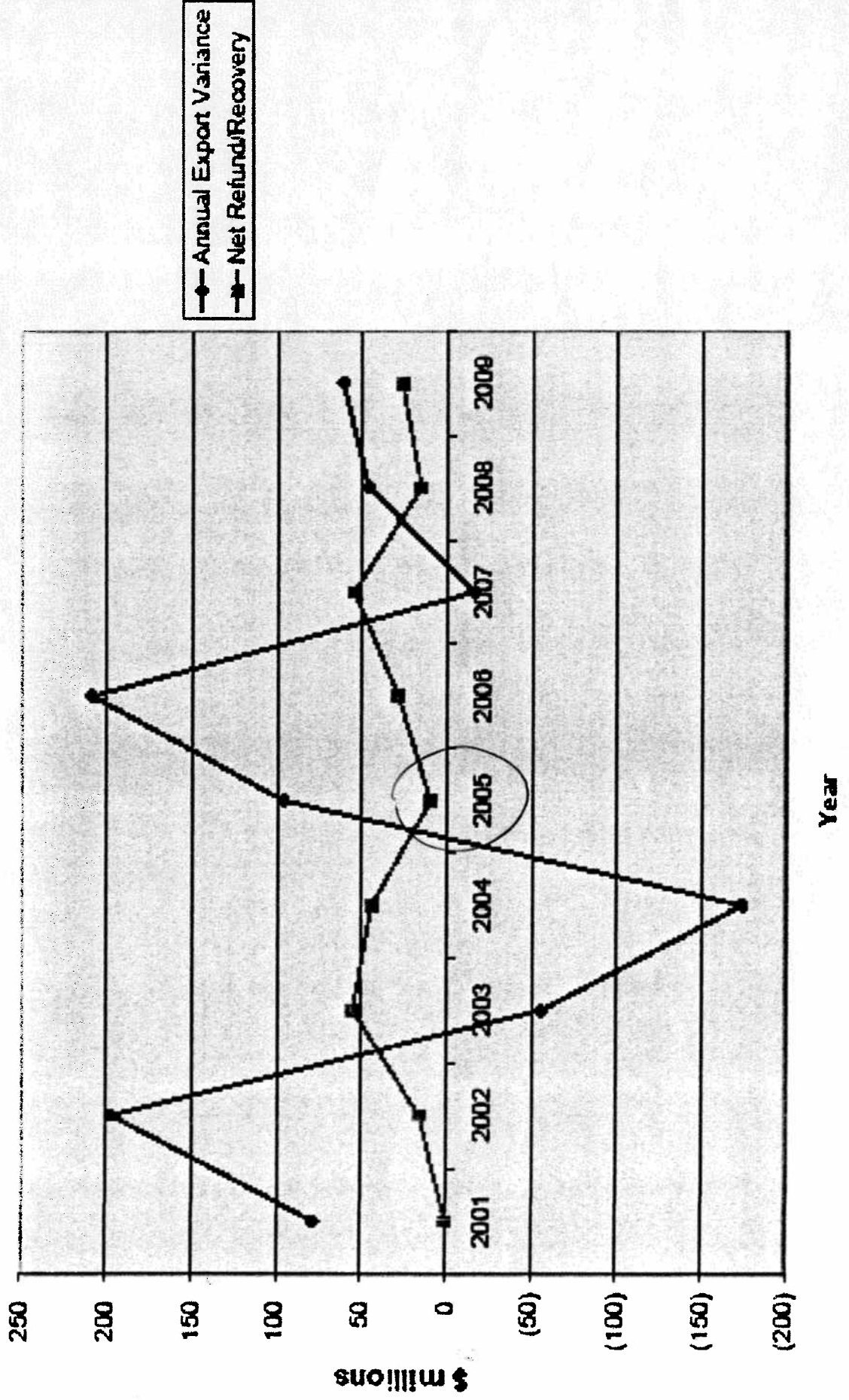
Reference: Pages 176-177

Preamble: "The Consultant recommends dropping the data points from year 1912 to year 1942. That would be unfortunate. In contrast, we suggest that the data should be used as a single sample series from a large set of statistically developed series using different autoregressive processes."

Question:

a) Please explain why "different autoregressive processes" would be needed, how these might differ for different periods, and how different periods would be determined.

b) Might a more general ARIMA approach be able to capture changes in the series over time that could not be captured by a single autoregressive process?

ANSWER:

a) If there was evidence that the process changed at some point in time, both statistical and/or from direct historical anecdotal evidence, then it is possible that different models for different periods would be more suitable than a single model. But this would require strong evidence of a change, and is not likely unless there is quite a bit more data than in the current problem, or if the process had smaller errors and could hence be estimated with more precision than is the case with this data set.

b) Yes, but as stated above, there is a trade-off between having a model that captures changes and features (needing more parameters) and having imprecisely estimated parameters (a consequence of using more parameters).

Reference: Page 139

Preamble: "The AR model is standard in many disciplines, including hydrology. For the annual water flow data, significance tests suggested an AR(3) model"

Question:

a) Please indicate what significance tests were performed.

b) Were tests performed to reject more general specifications of the Autoregressive Integrated Moving Average (ARIMA) model typically used to analyze time series data?

ANSWER:

(a) The number of lags to include was determined by "testing-down". In each specification, if p lags are used, then at an earlier stage a regression was run with p+1 lags and the coefficient on the (p+1) th regressor was not statistically significant at the 5% level.

b) The order of integration was set at zero, because the AR results clearly showed that there were no unit roots in the series. In every case, the sums of the coefficients on the lags was much less than one. Further, it is not plausible that water flow series would have a unit root.

We did not consider MA components to the process. The simulation method is more difficult to implement with MA components, and the regression estimation step is more complex as well. An ARMA process can be approximated by an AR process with extra lags, since an MA process can be inverted to produce an infinite-order AR process. Accordingly, if the testing-down procedure mentioned above leads to a small number of lags, this can be interpreted as evidence that there is not an important MA component.

Water Flows and MH Generation, 1912-2005

$y = 190.2x + 8499.4$
$R^2 = 0.8846$
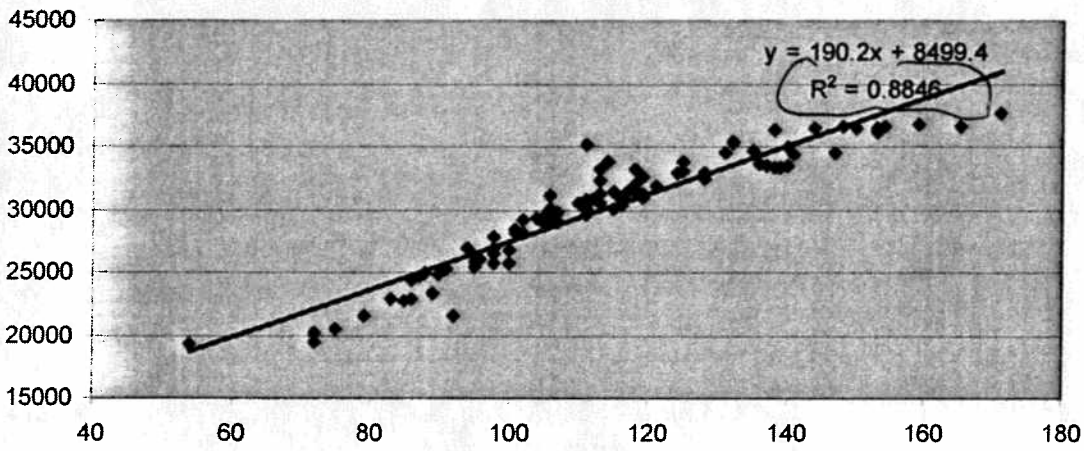
Measuring Collections NEBs through "Net Back"

⅋

"Net back is the total amount collected minus the total expenses involved with the collection technique."

Colton, 1997

Factors to consider: effectiveness, productivity, cost.

* Exclude → (cost $ rate supl)

Net back] — Total amont colled