BGP AS Number Exhaustion

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The Problem

- The 16 bit AS number field in BGP has 64,510 available values to use in the Internet's public routing space

- Some 30,000 AS numbers have already been assigned by the RIRs

- This BGP protocol field will be exhausted at some point in the future

The Solution

- Use a 32 bit field for this value
  - draft-ietf-idr-as4bytes-06.txt describes how
  - This is proposed for publication as an experimental RFC

The Issue

- At some point we will need to start testing various transition plans and vendor implementations, set up a new AS number registry, and commence deployment of these extended length protocol objects in BGP

When?

- Before we run completely out of 16 bit AS numbers!

- Need to allow a lead time for testing, deployment of 4-byte AS BGP implementations and development of appropriate transition arrangements
  - Allow 2 – 3 years to undertake this smoothly

- So we'd like to know when we have 3 years to go before we run out of AS numbers

When?

- A number of views can be used to make forward projections:
  - The growth of the number of announced AS's in the BGP routing table
  - The rate at which AS number blocks are passed from IANA to the RIRs
  - The rate at which RIRs undertake assignments of As's to LIRs and end users
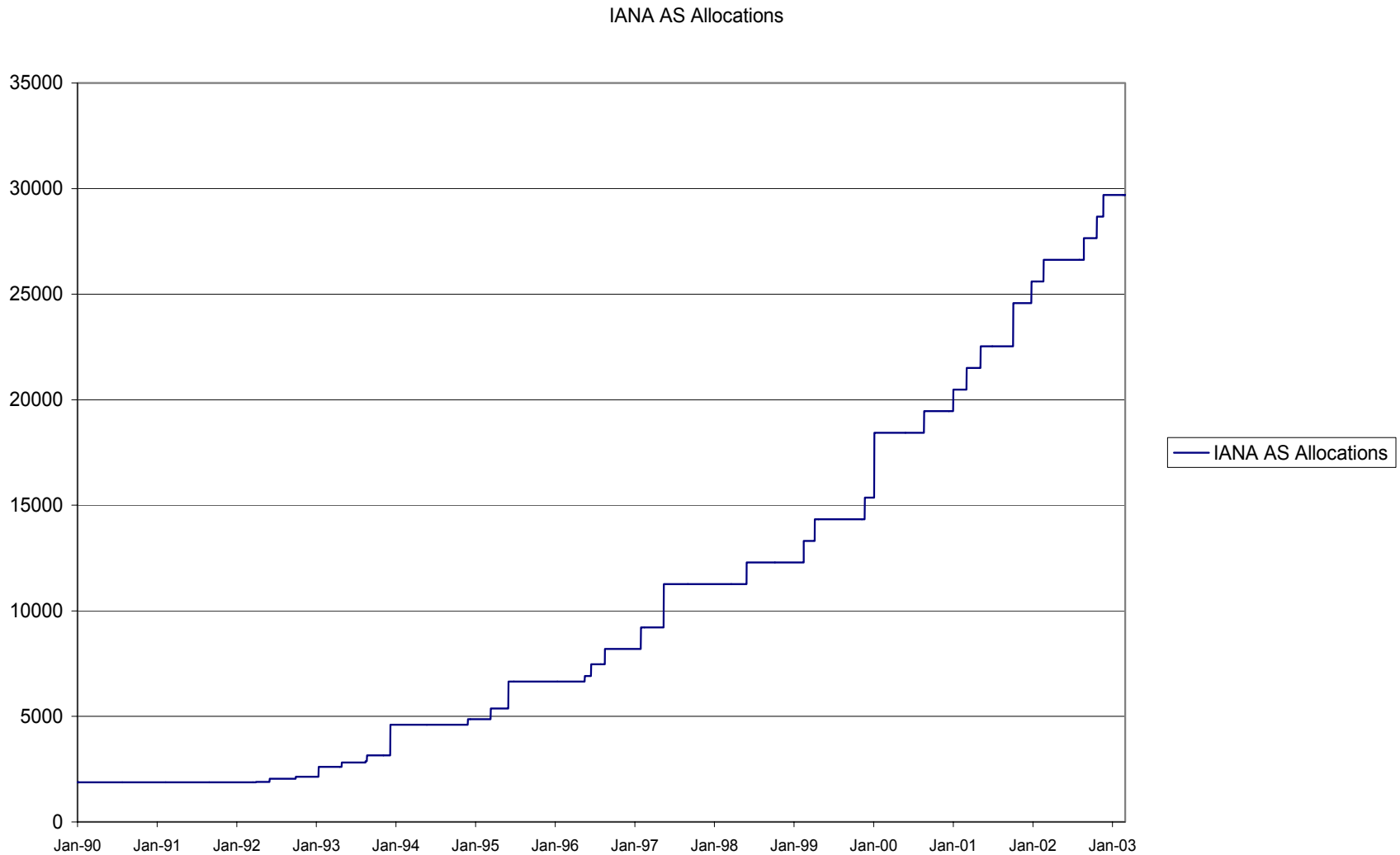
The BGP Routing Table Announced AS's
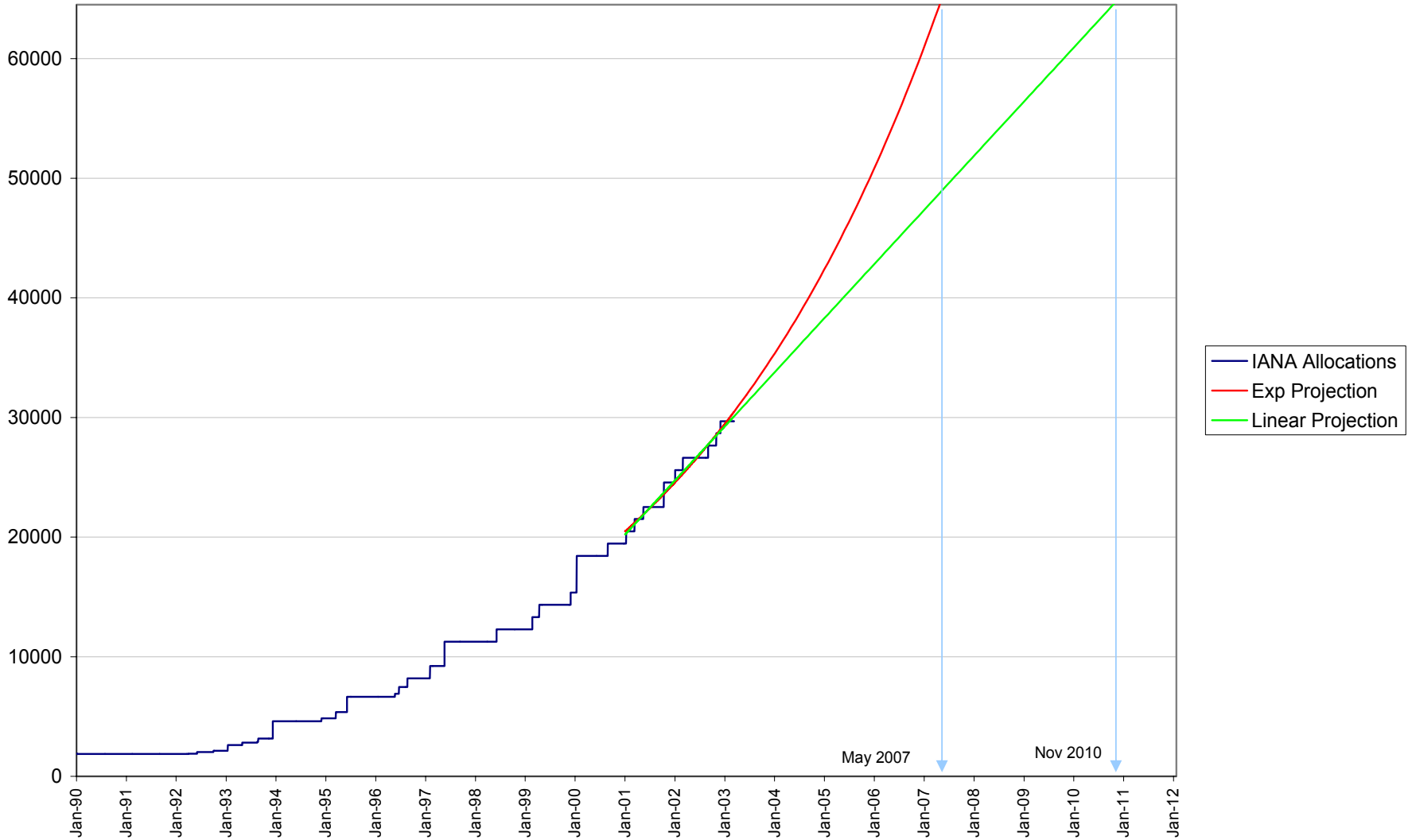

BGP Table - AS Count
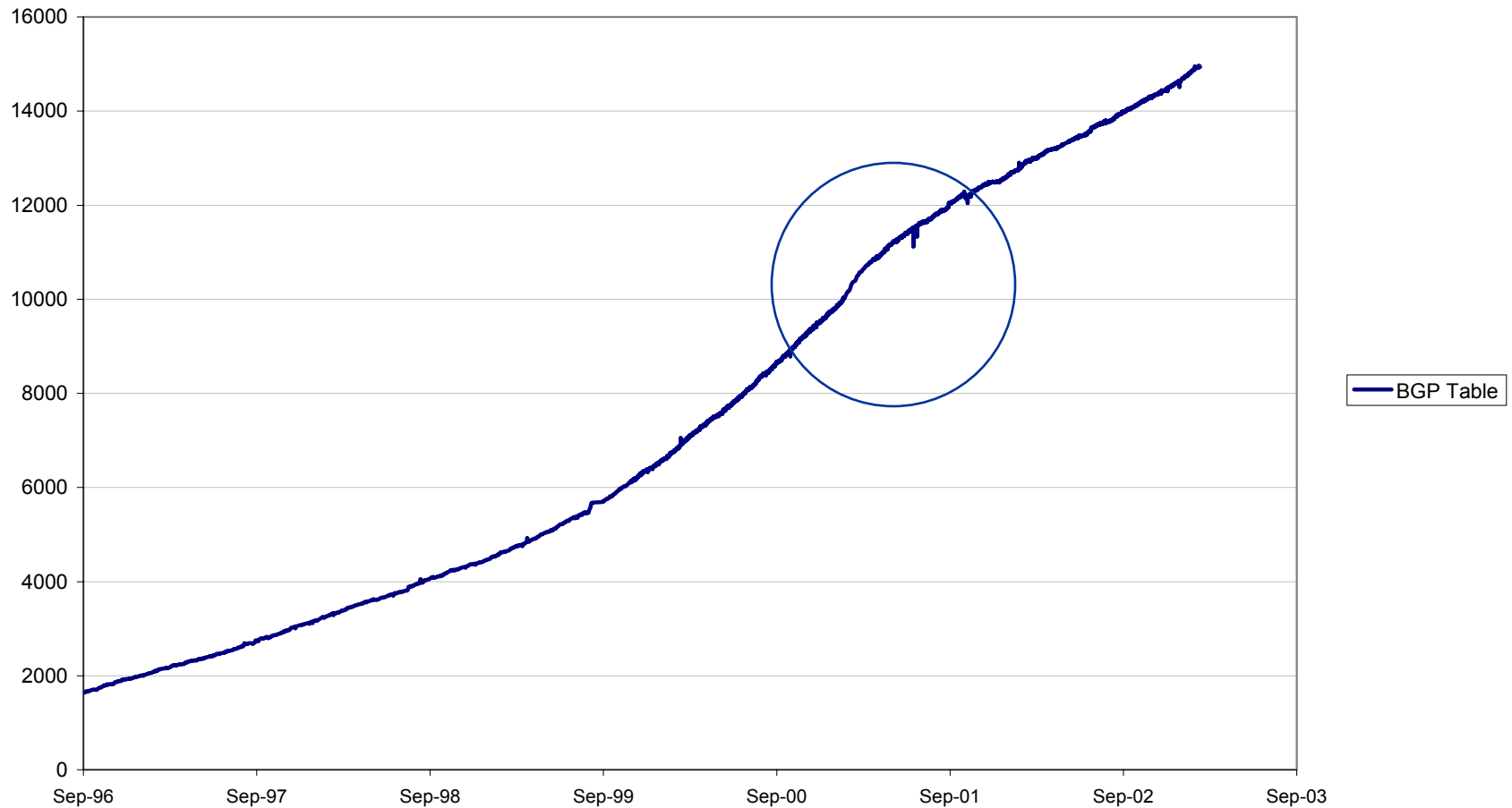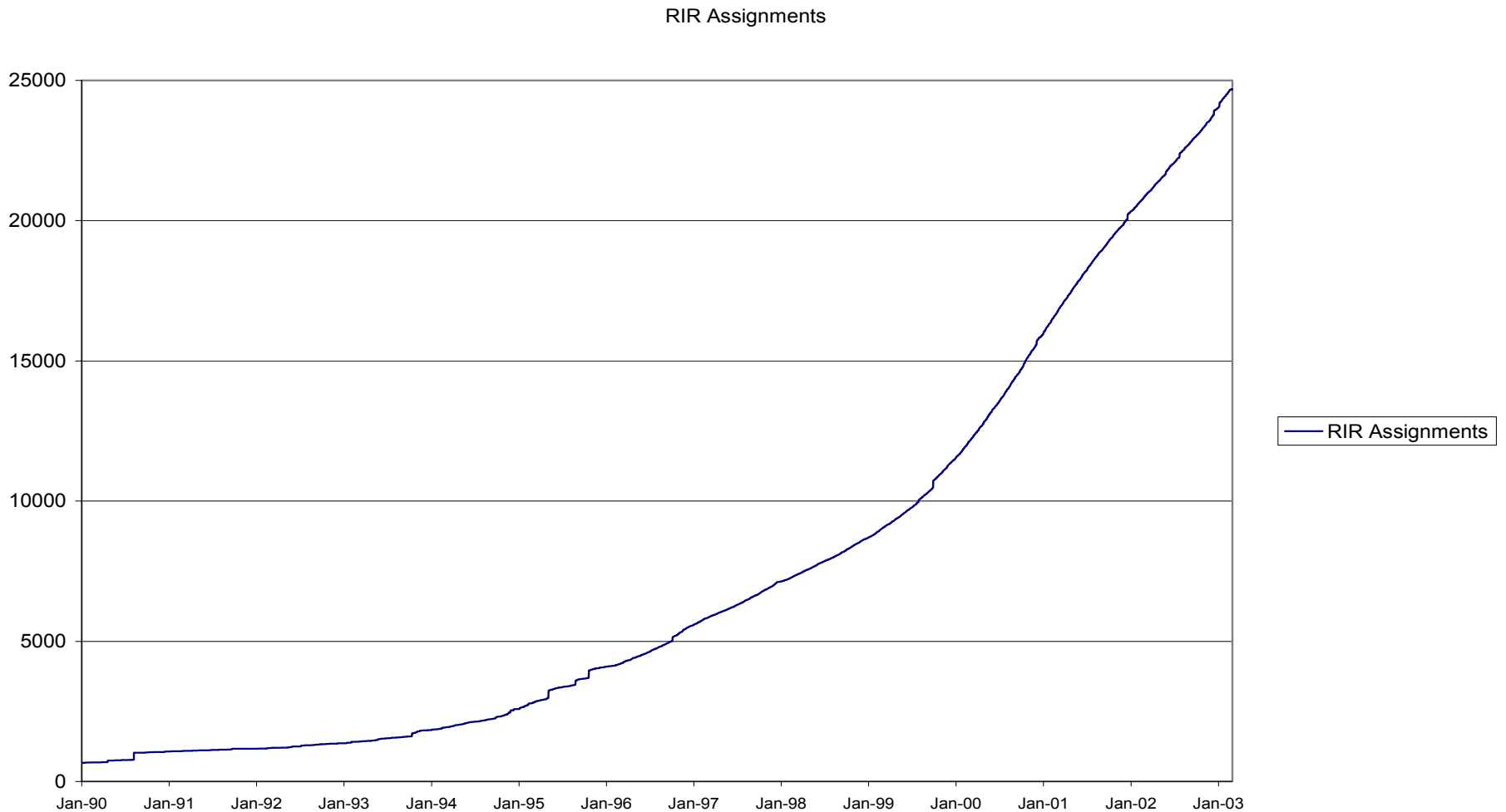
The BGP Routing Table Growth Projections
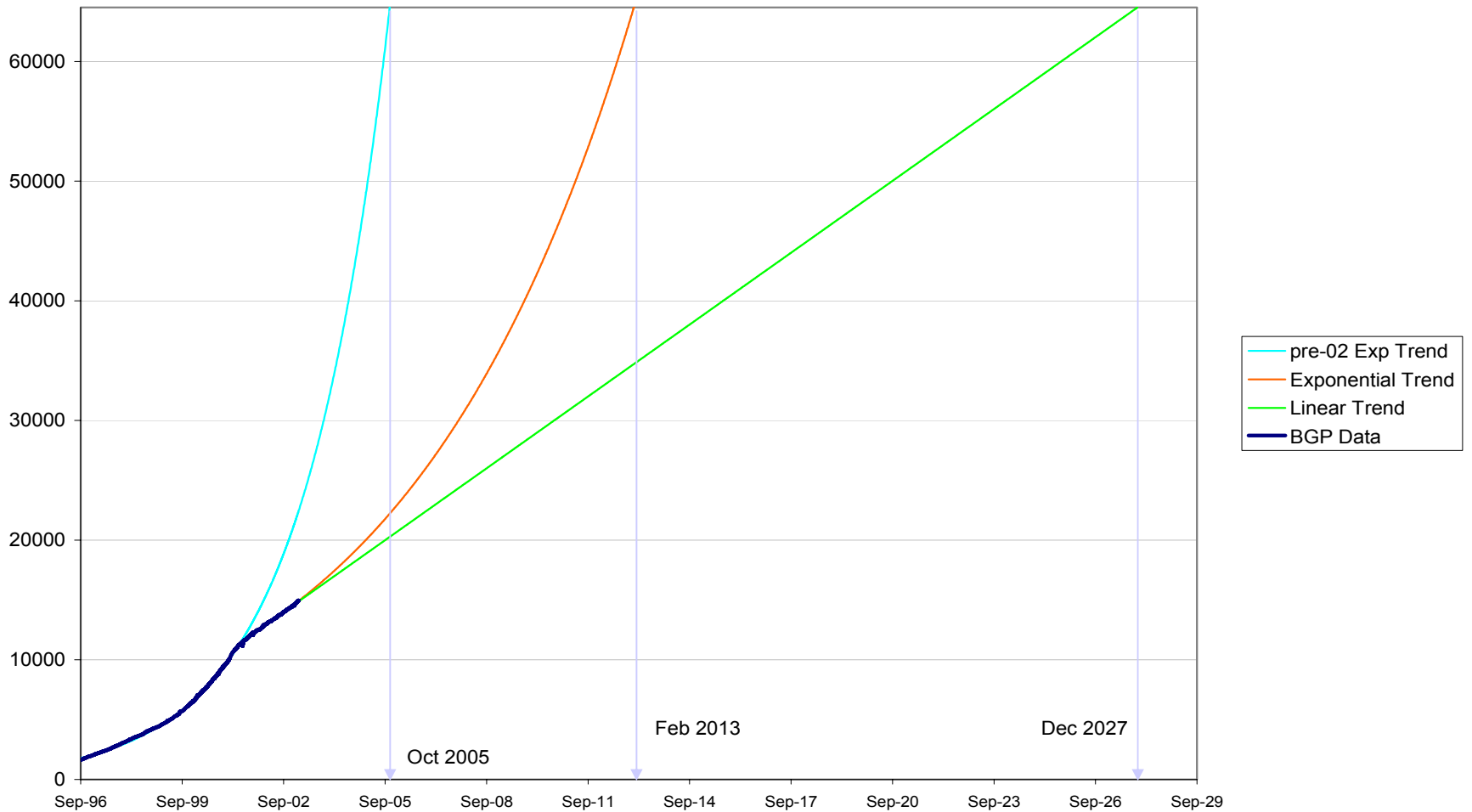
IANA AS block Allocations

IANA AS Allocations

From the IANA AS number Registry

IANA AS Allocation Projection

RIR Assignments

RIR Projection

Legend:
- Exp Projection (magenta)
- Linear Projection (yellow)
- RIR Assignments (dark blue)

Annotations: Feb 2008, May 2013

Combining these views

Legend:
- IANA
- IANA EXP
- IANA Linear
- RIR
- RIR Exp
- RIR Linear
- BGP
- BGP exp 96-01
- BGP exp 02
- BGP Linear 02
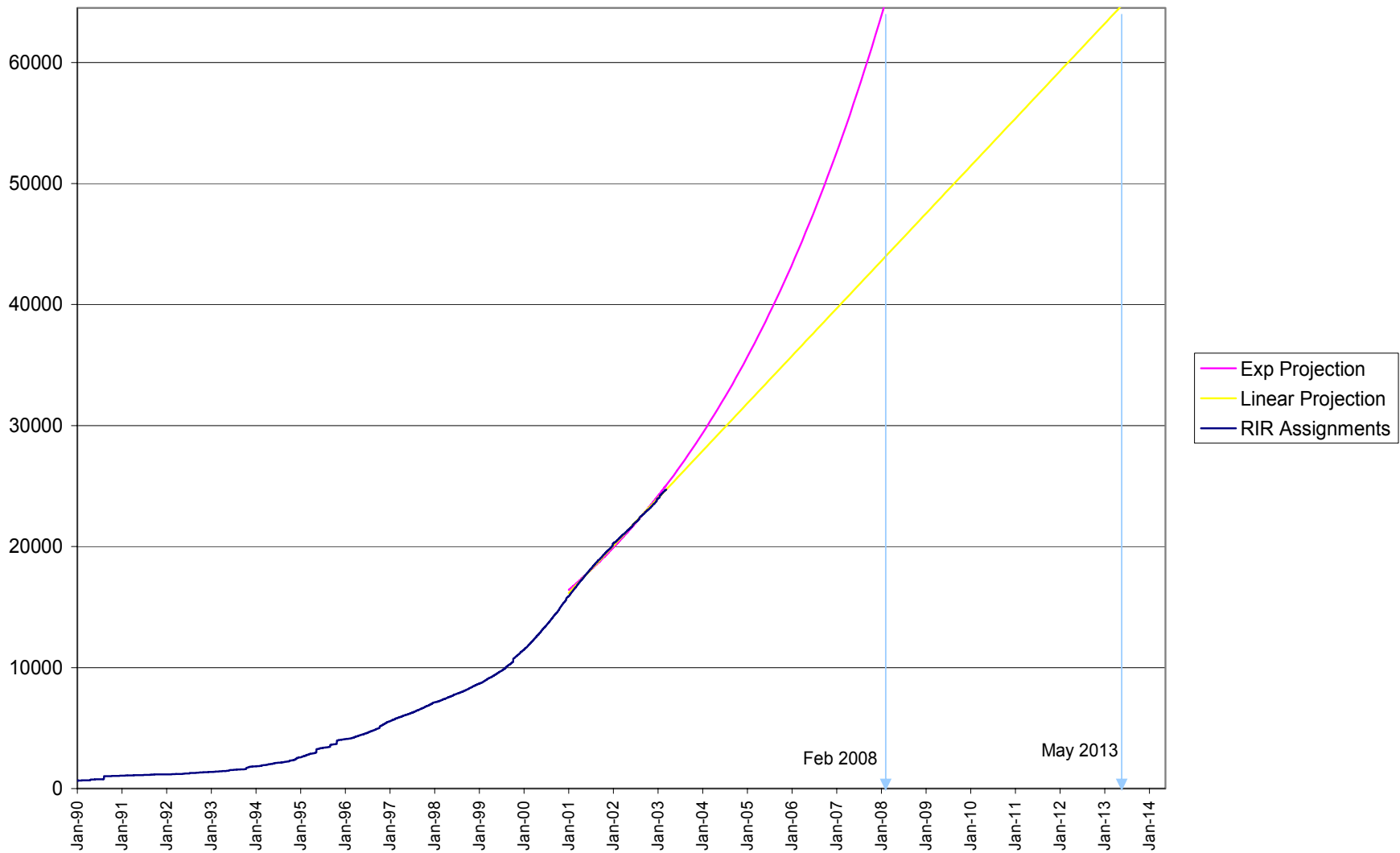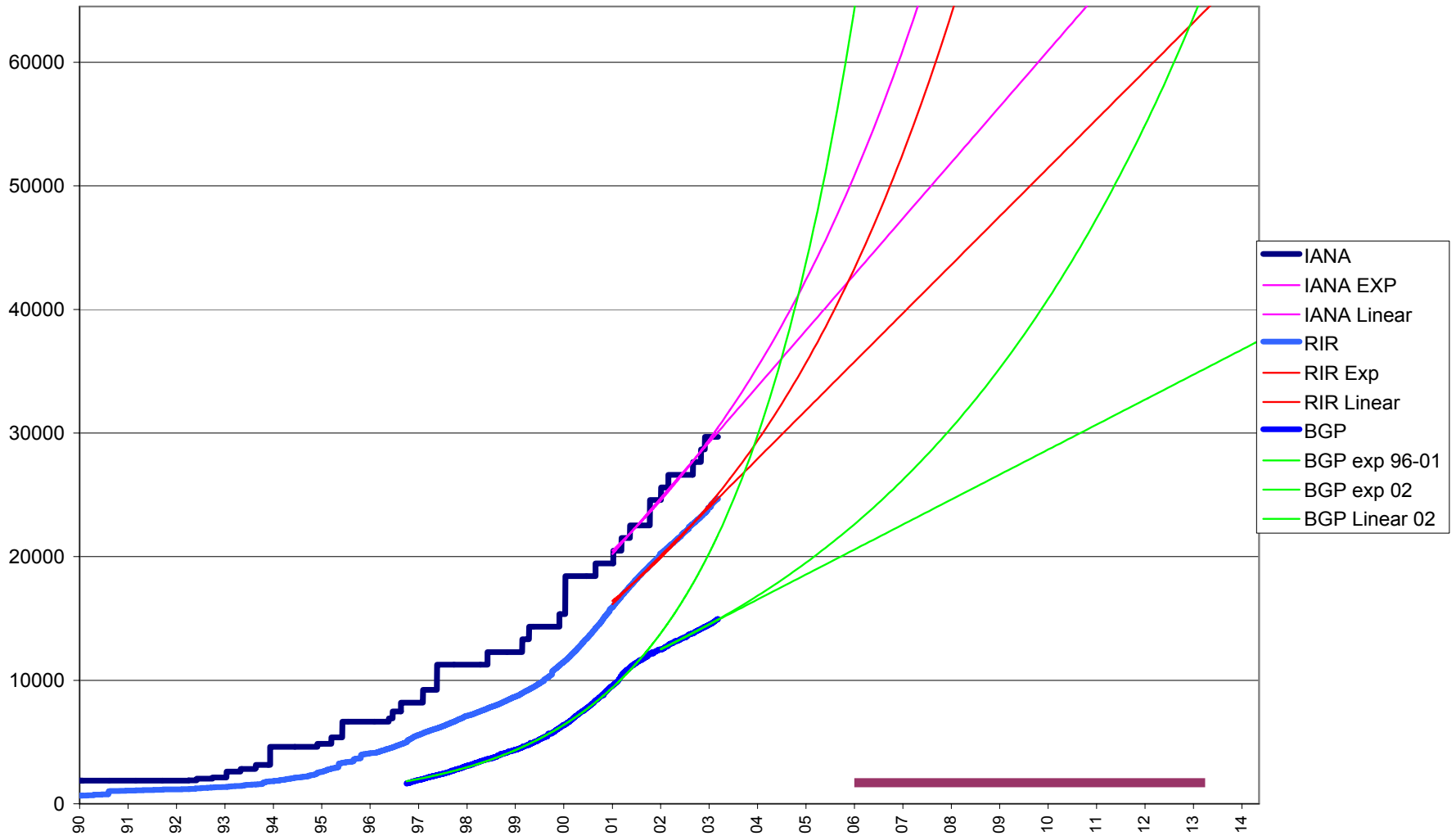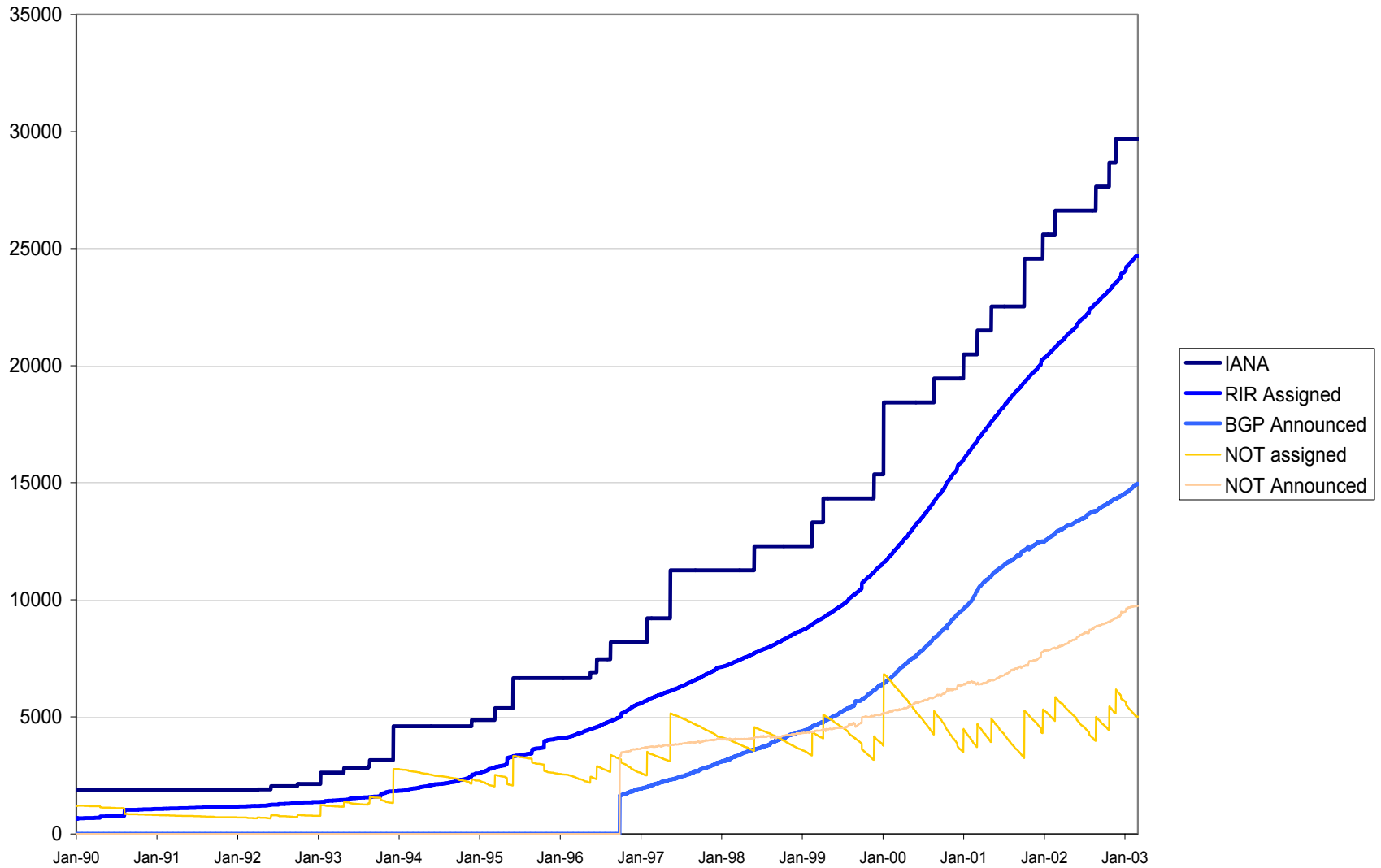
Combined View + differences

Observations

- RIRs operate with an allocation buffer of around 5,000 numbers

- 10,000 AS numbers (40% of the assigned AS numbers) are not announced in the BGP table.
  - Is this the result of old AS assignments falling into disuse?
  - Or recent AS assignments being hoarded?
  - This pool creates uncertainty in 2 byte AS number pool exhaustion predictions
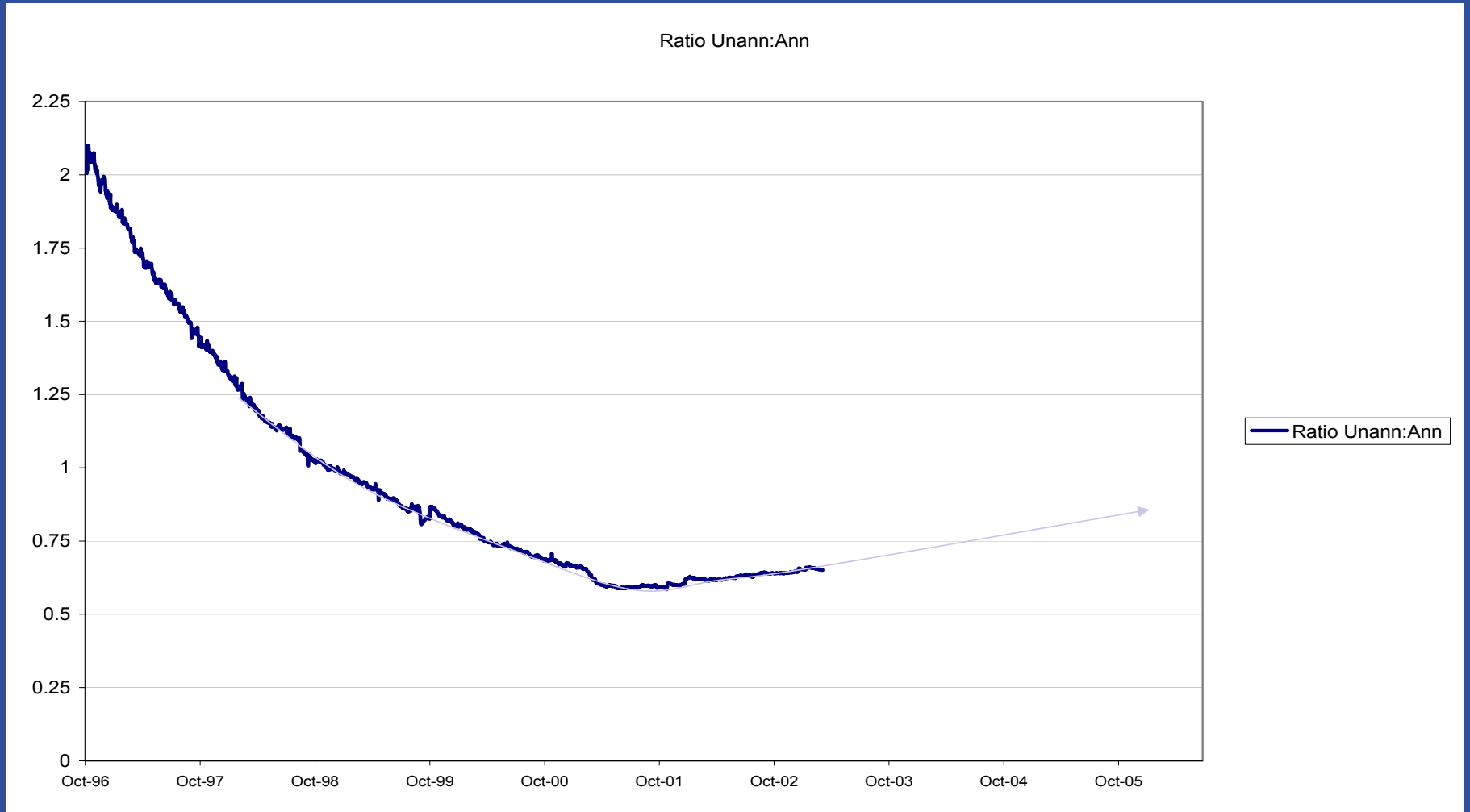
Announced and Unannounced ASs
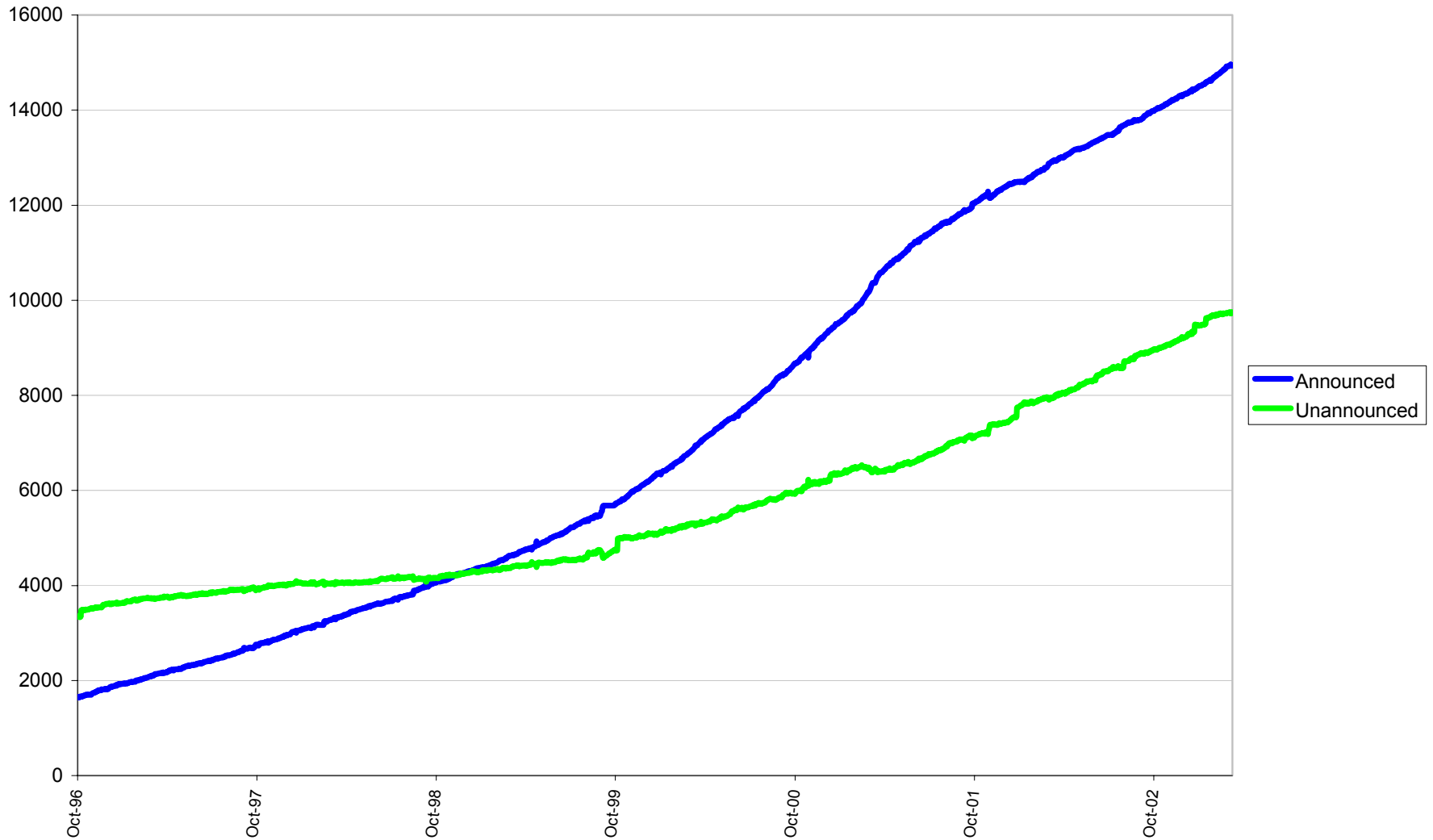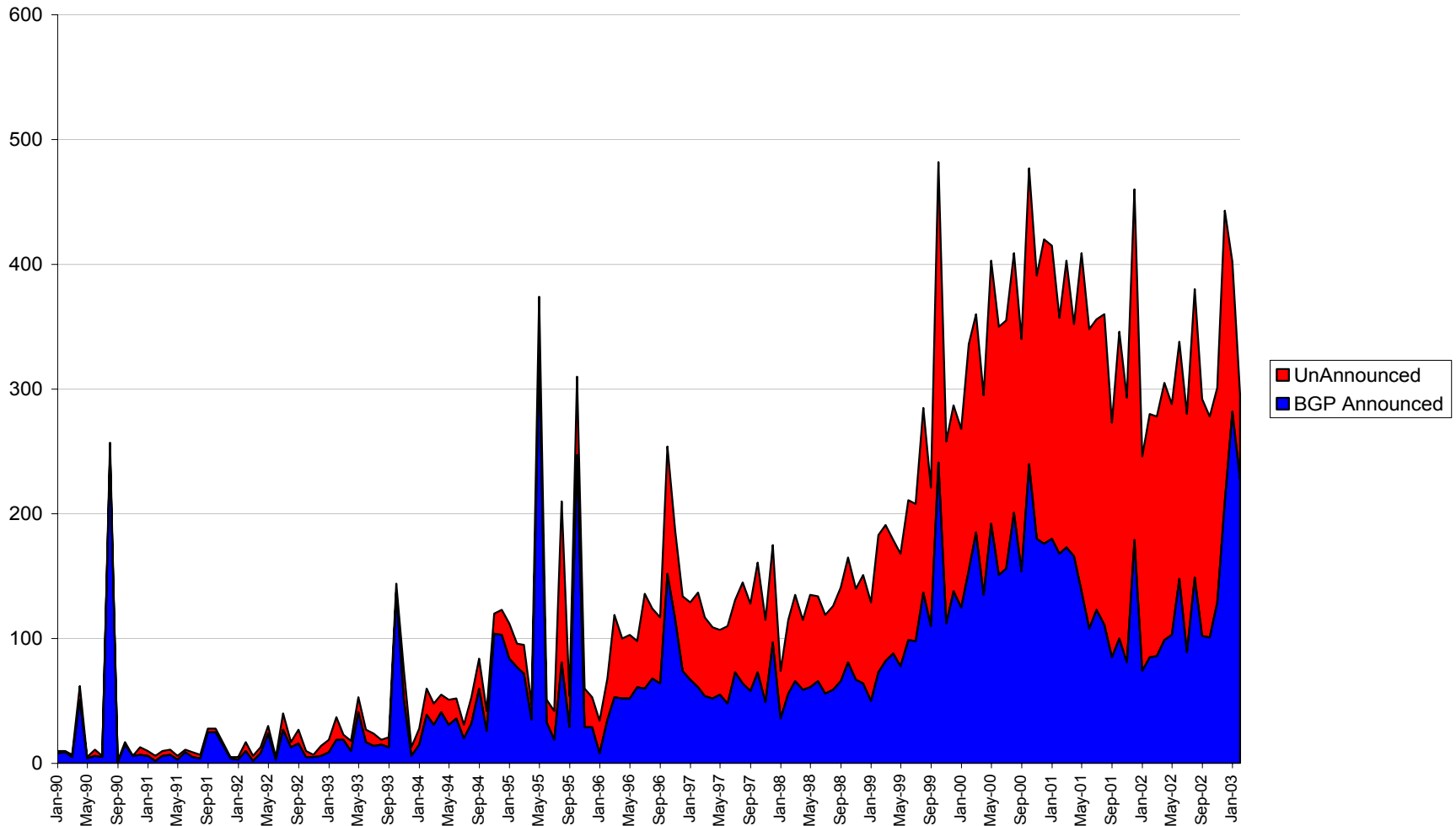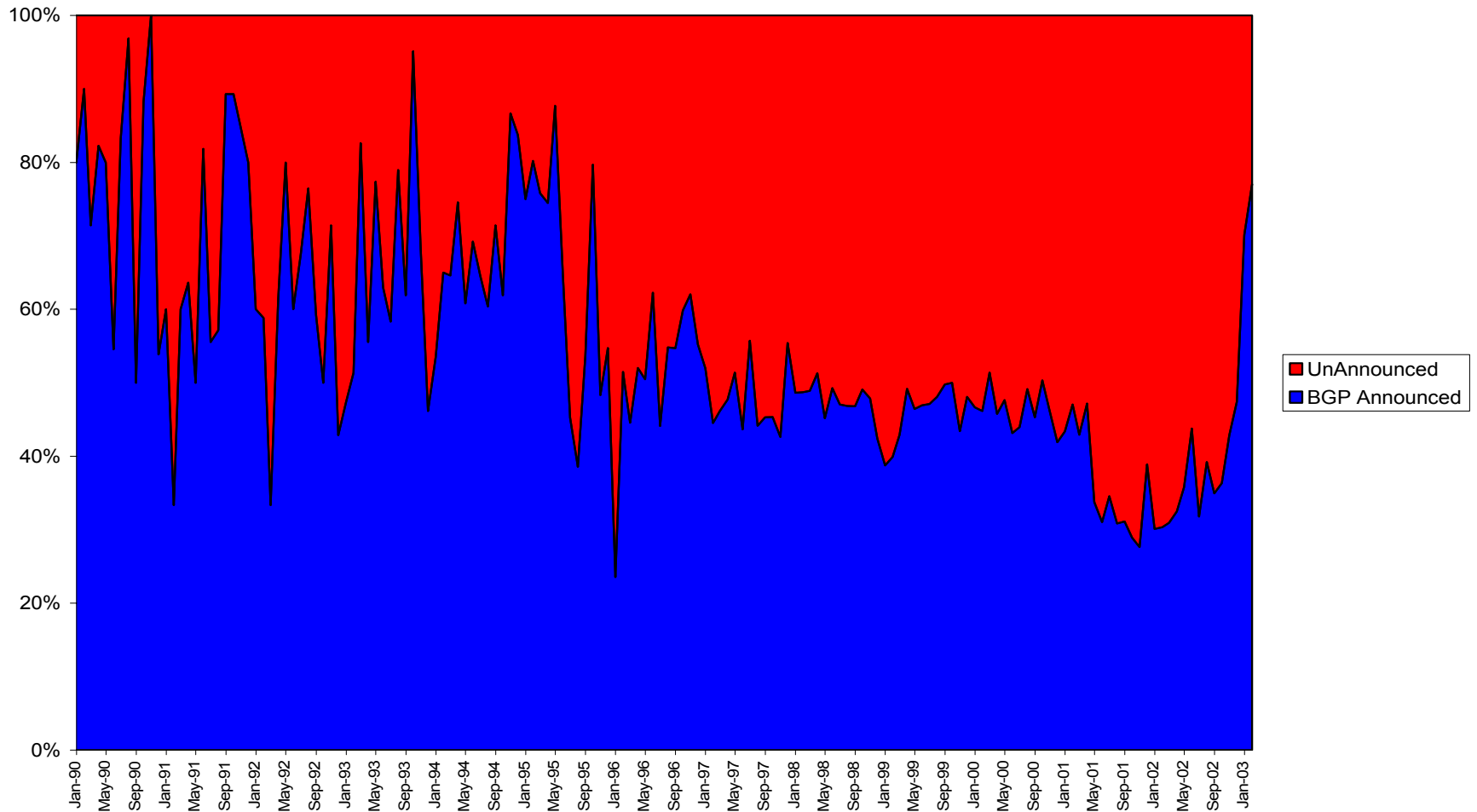
Unannounced : Announced AS's

Ratio Unann:Ann
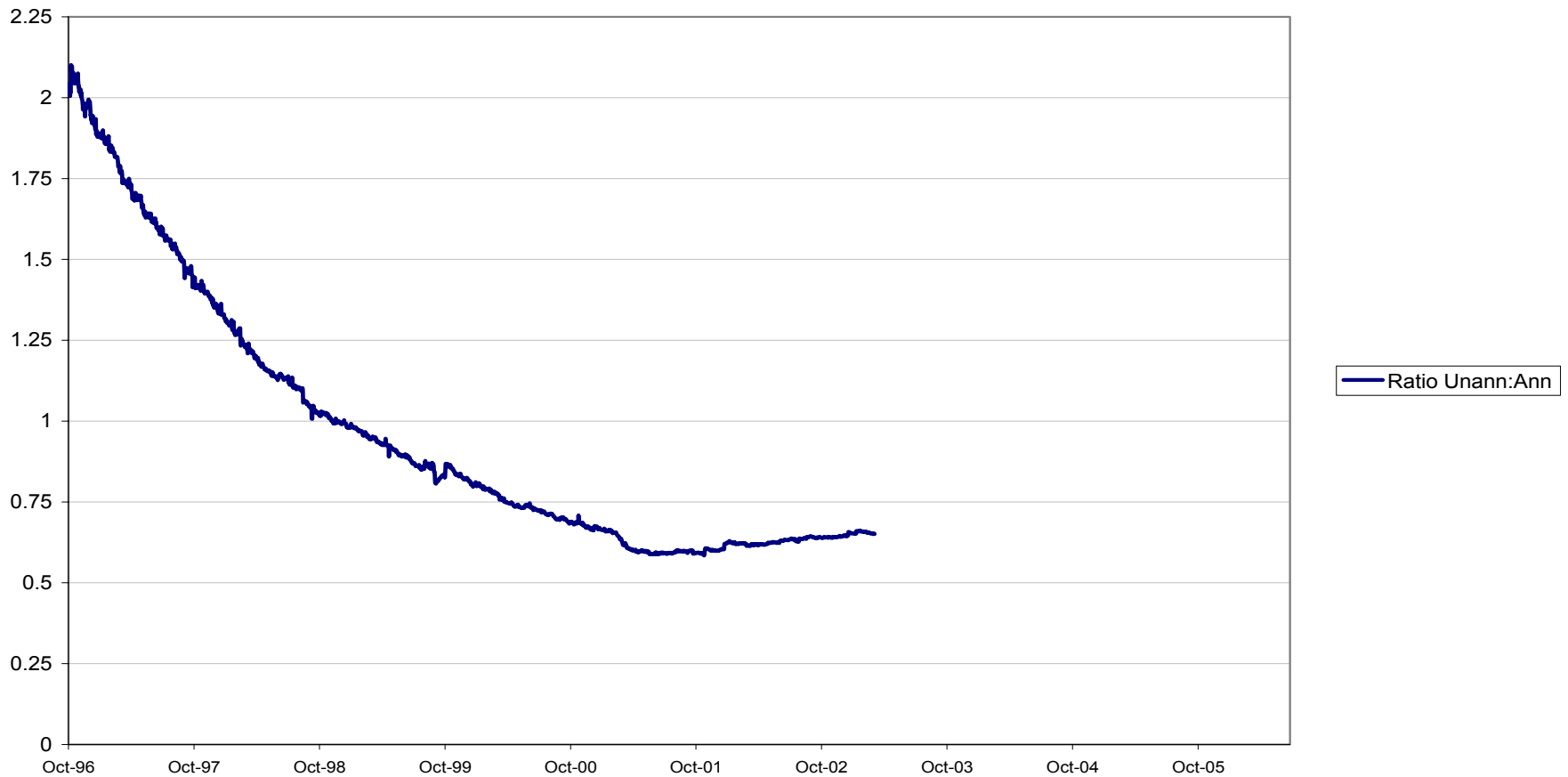
Trend:
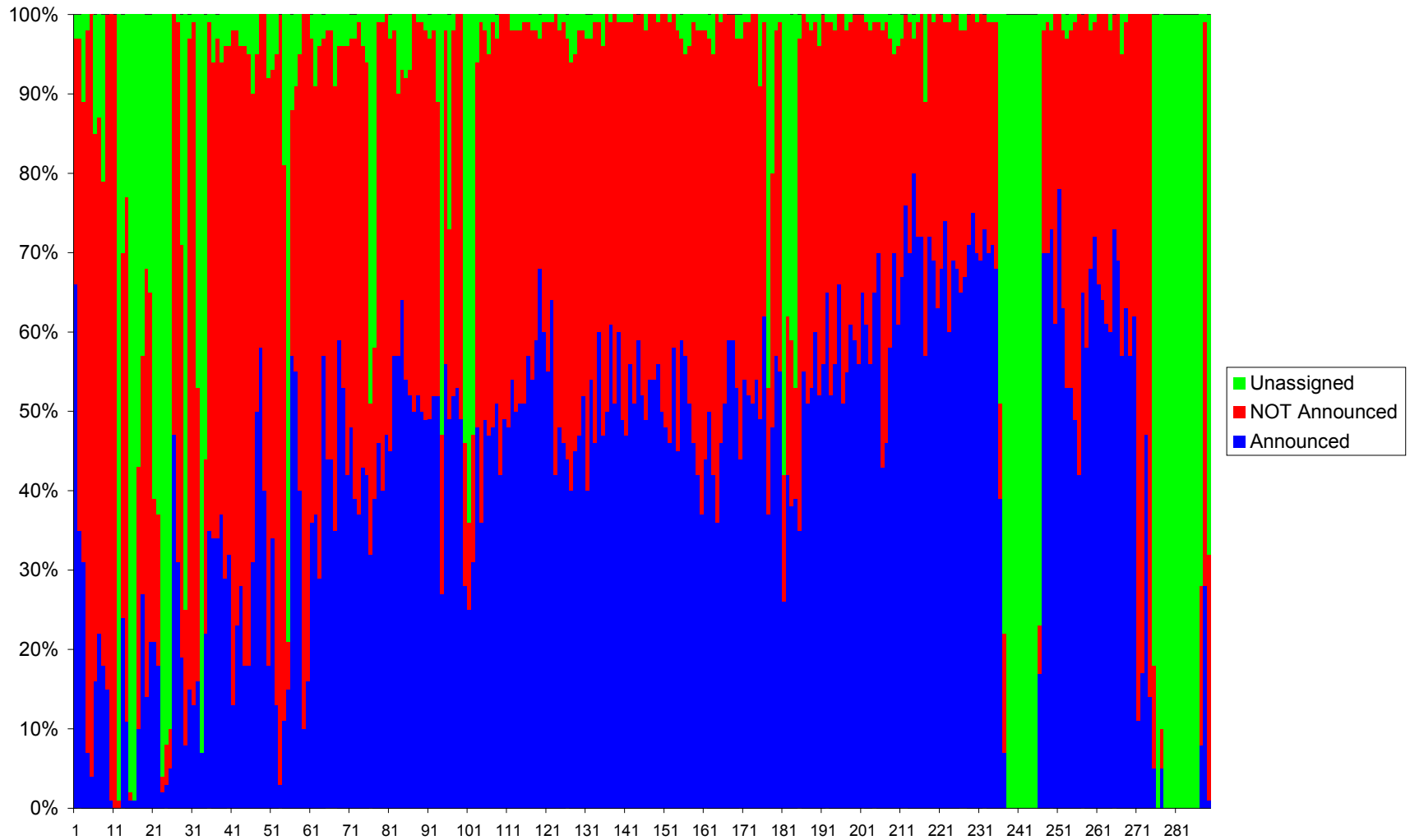# unannounced : announced ratio

Ratio Unann:Ann

Announced / Unannounced Distribution by Date

Normalized Announced / Unannounced

Distribution by AS Number Range

Observations

- Low AS number ranges have the highest unannounced / announced ratios
  - Reclamation of unused AS numbers in the low number ranges is likely to be a useful exercise
- Recent assignments show a 45% announcement utilization ratio for AS numbers
  - LIR staging point factors
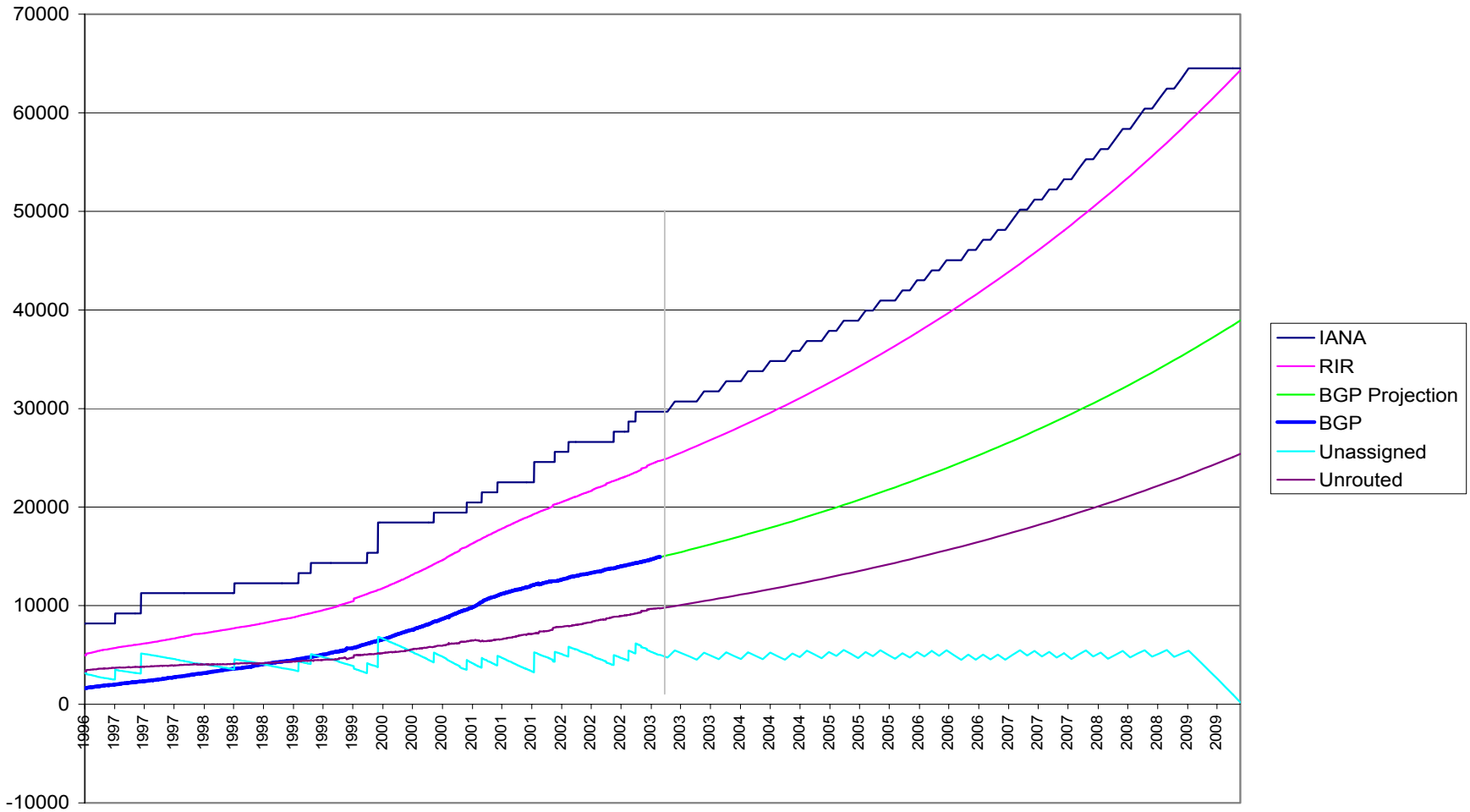 - Inadequate incentives to return if no immediate requirement for deployment

Forecast
1 – AS Reclamation in effect
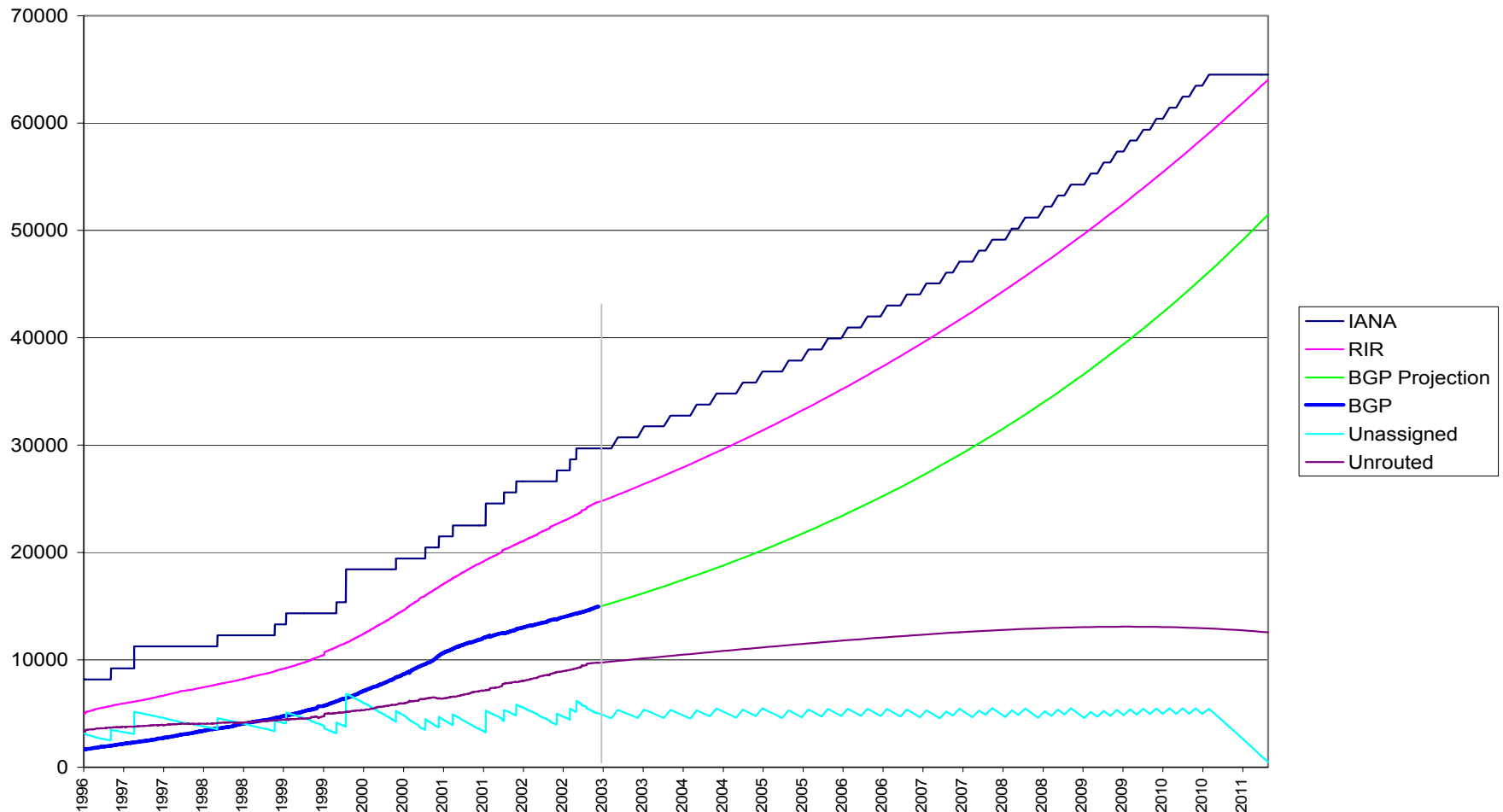
Forecast
2 – No significant reclamation

Current Forecast

- The available AS number pool will exhaust in the timeframe of 2009-2011 if current AS use trends continue

2009

  - no significant reclamation in old AS number space
  - No coordinated effort to increase utilization density of AS numbers

2011

  - reclamation and increased deployment efficiency