



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



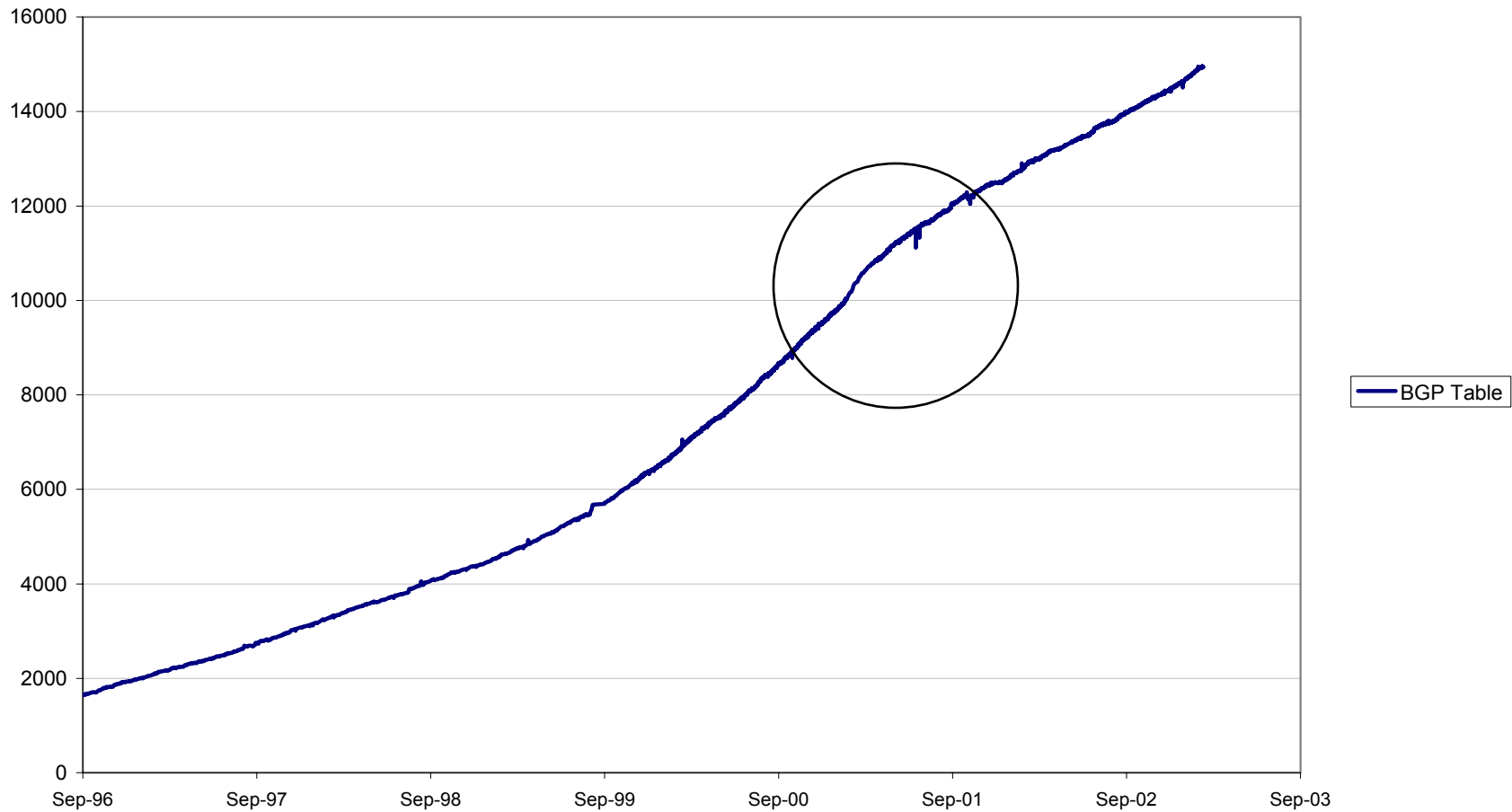
When?

- 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

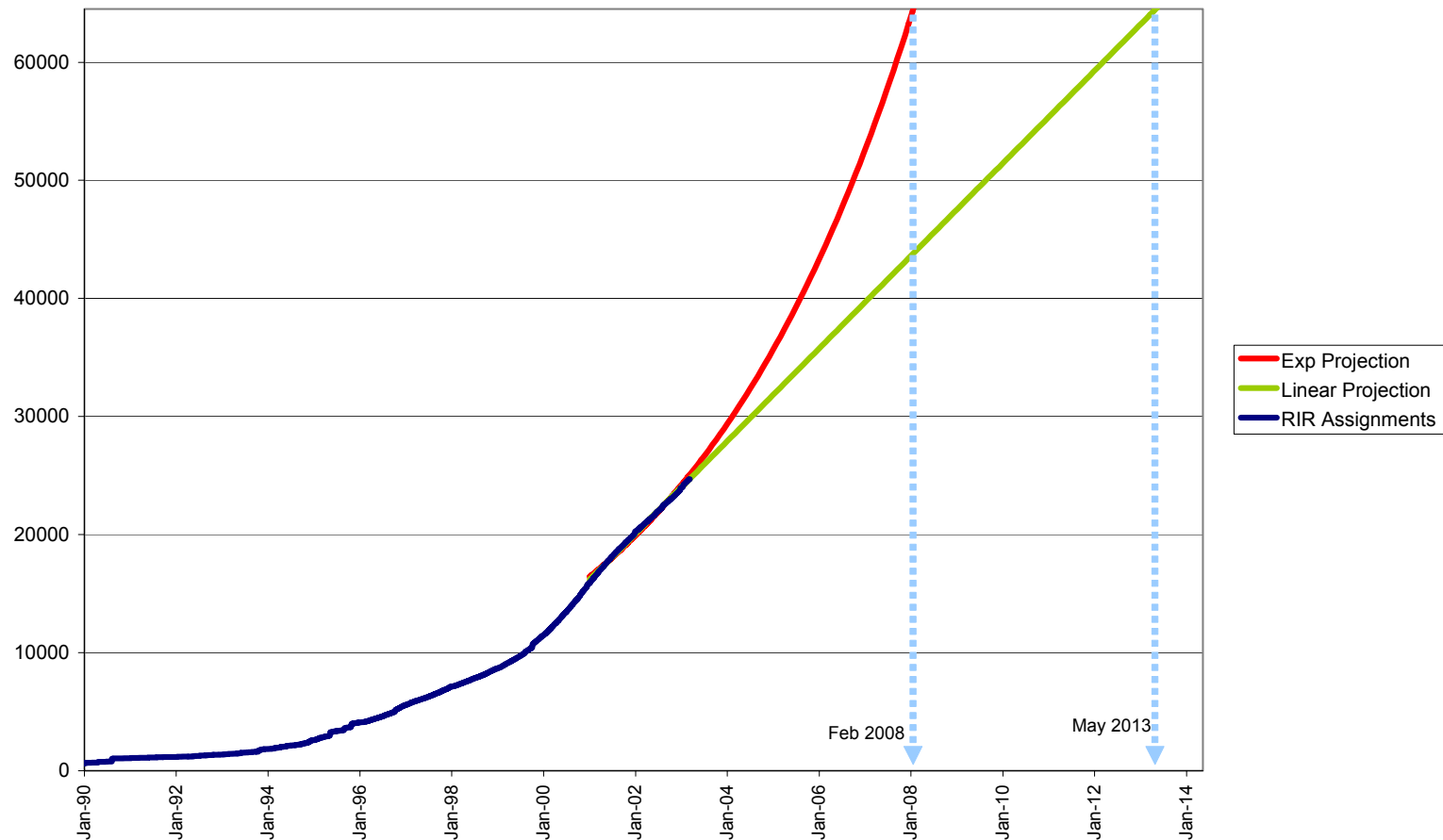
The BGP Routing Table Announced AS's



BGP Table - AS Count

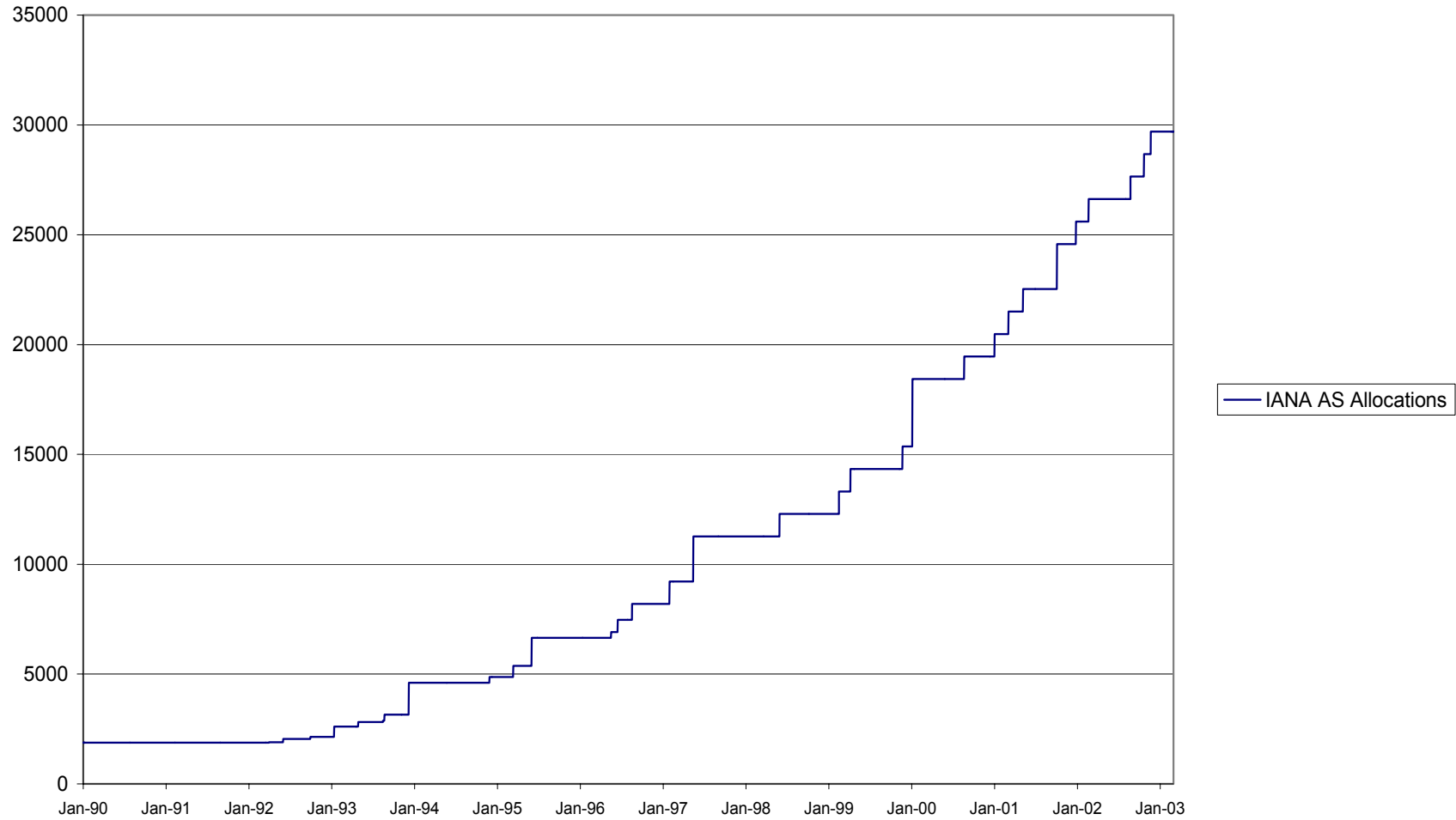


The BGP Routing Table Growth Projections

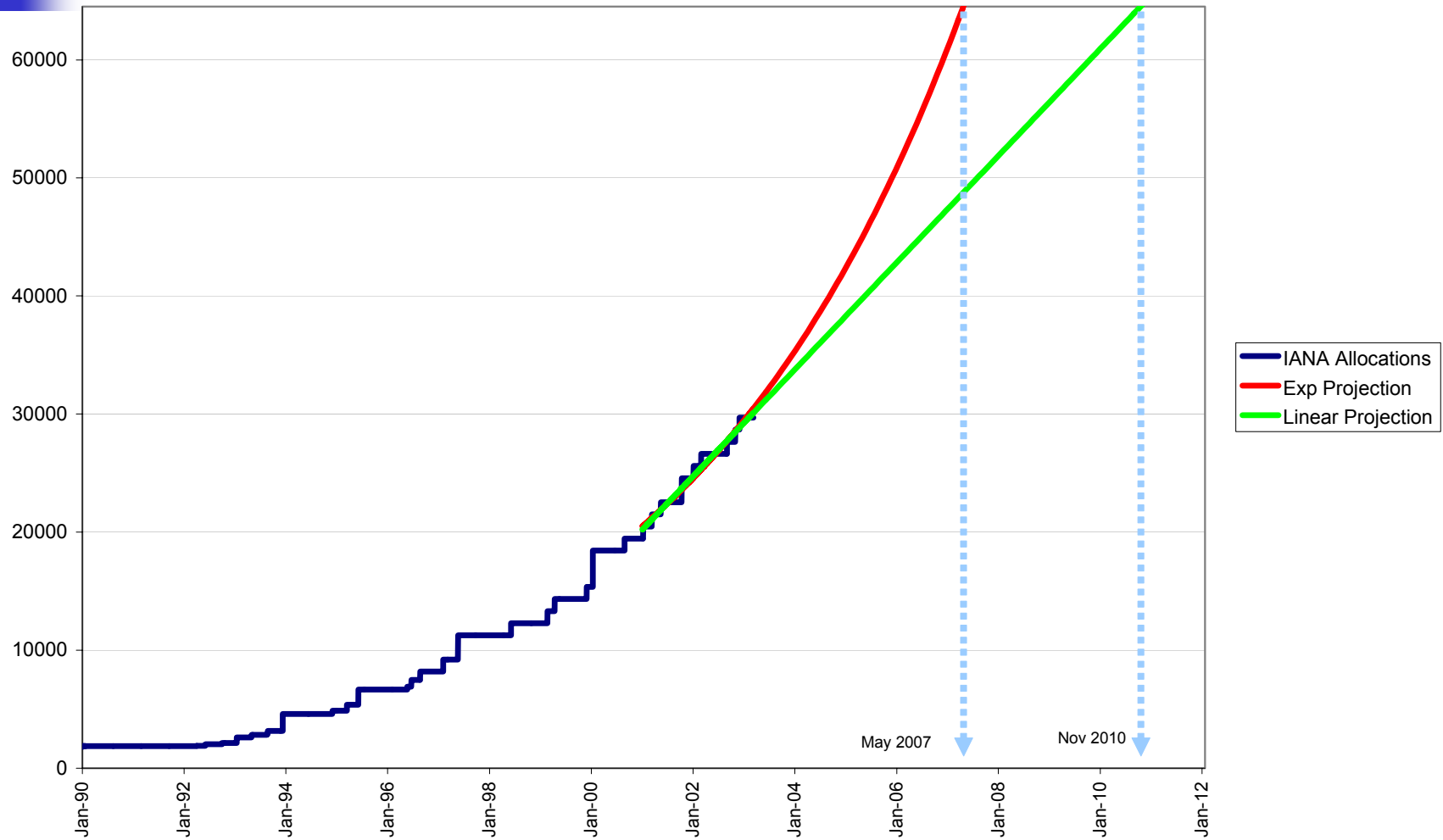


IANA AS block Allocations

IANA AS Allocations



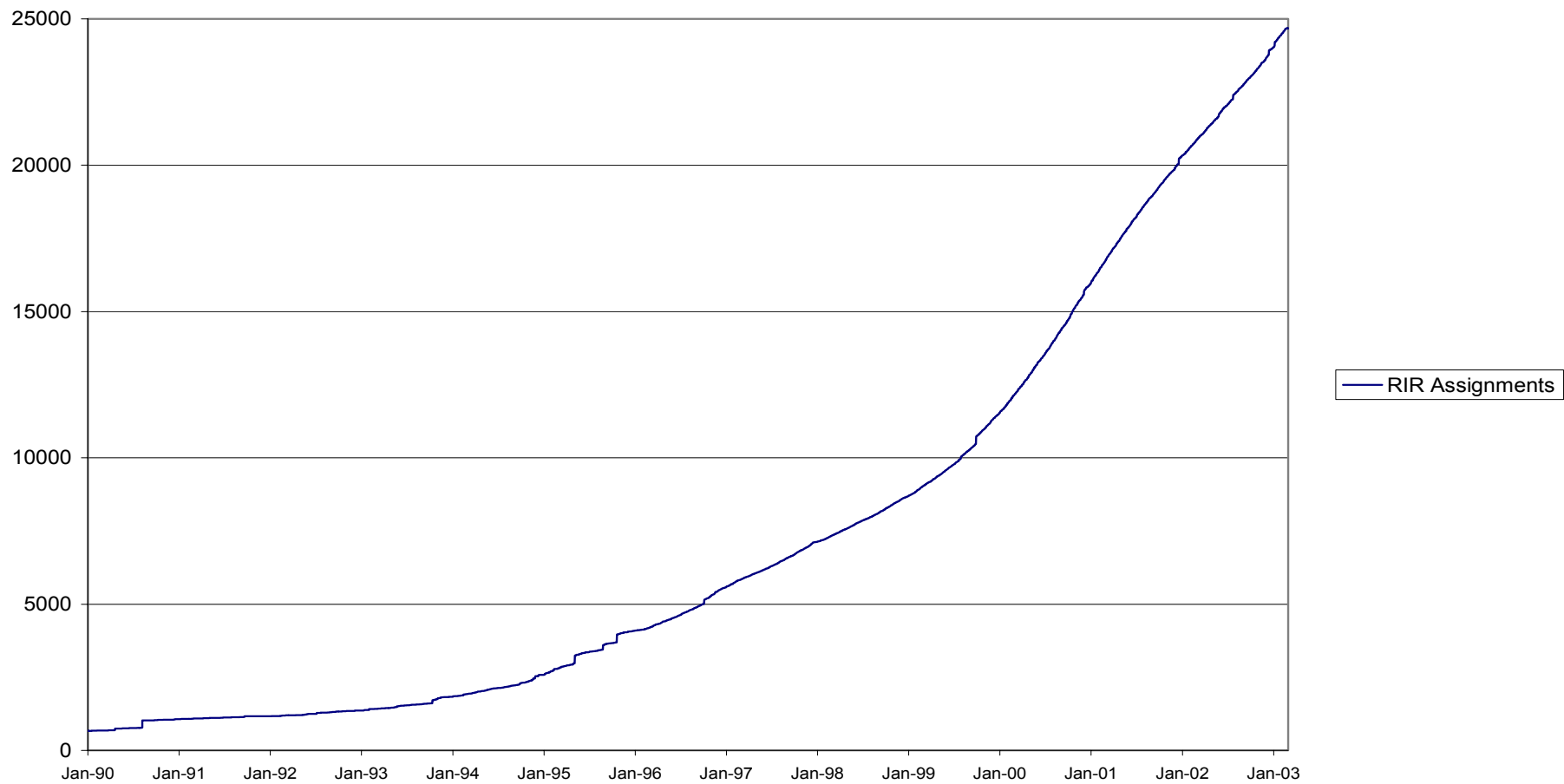
IANA AS Allocation Projection



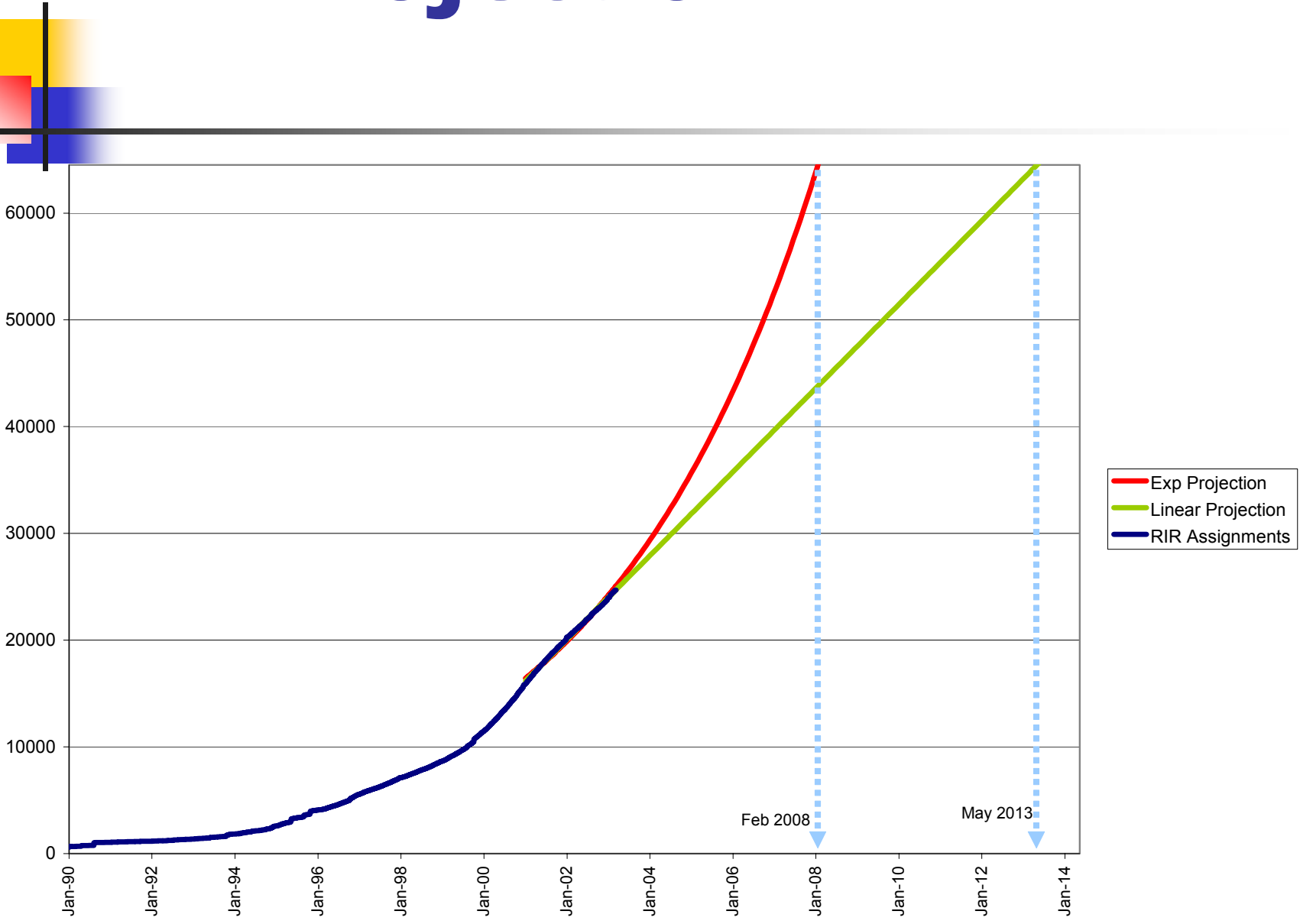
RIR Assignments



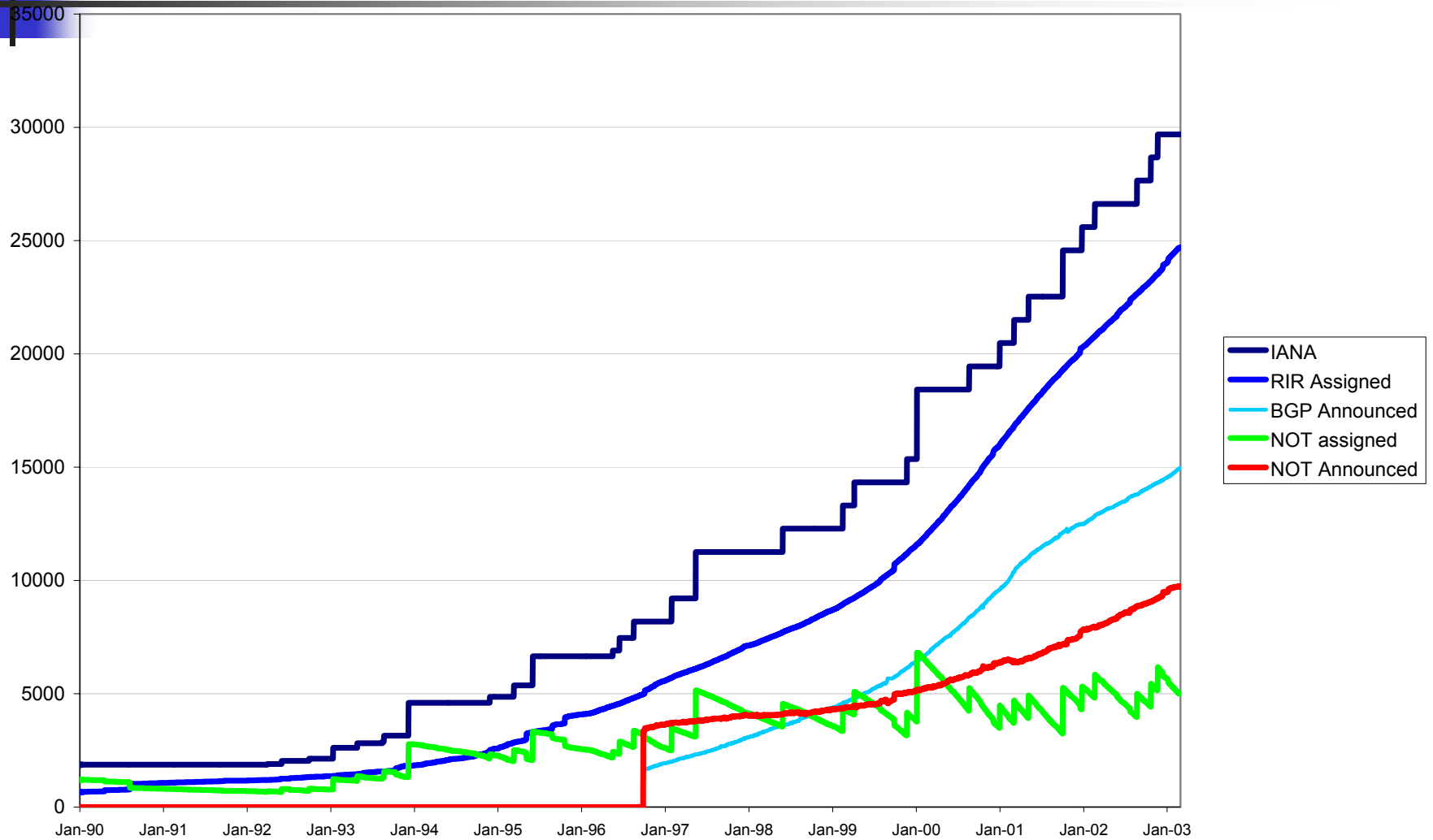
RIR Assignments



RIR Projection



Combined View + differences

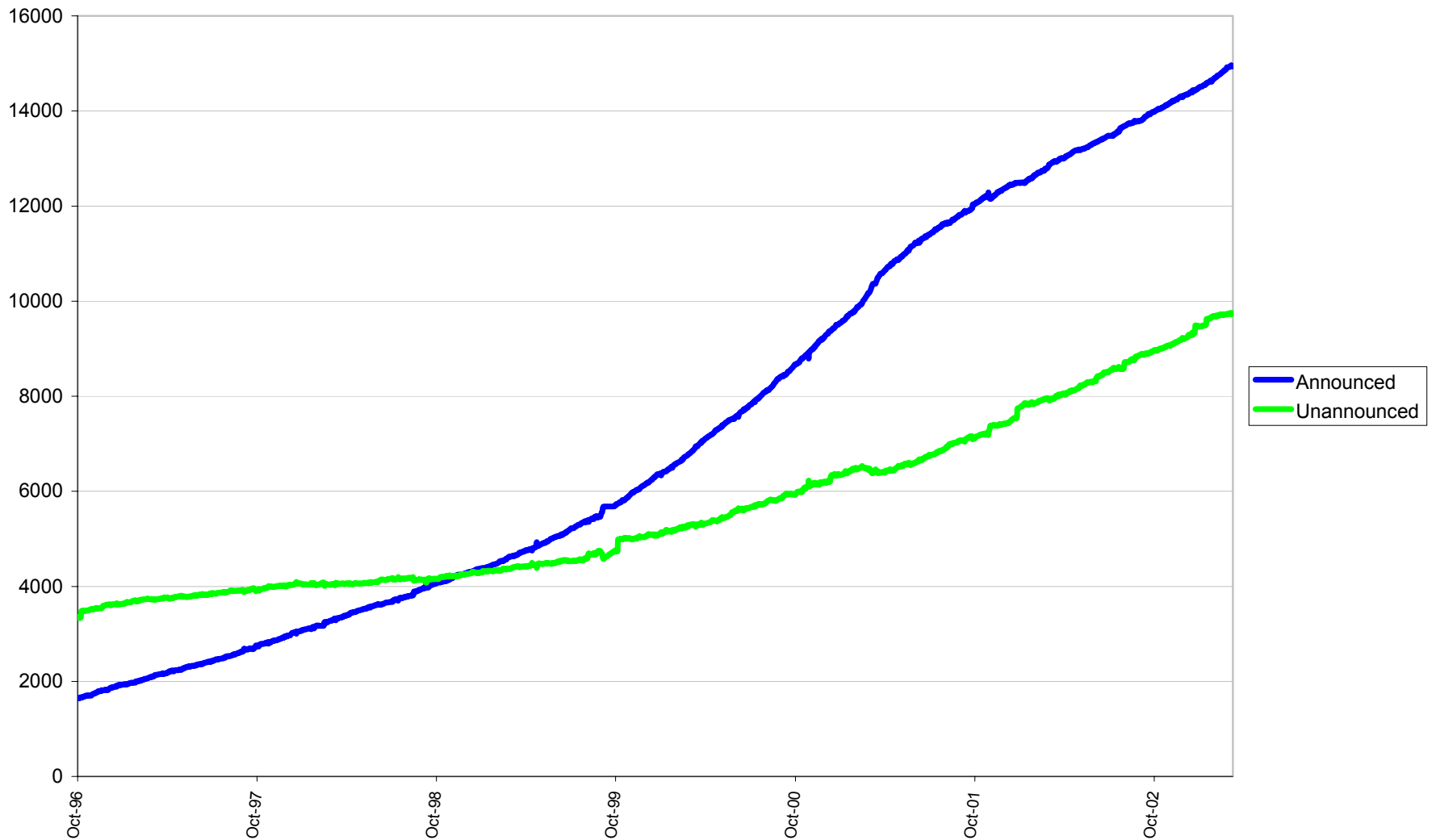


Observations



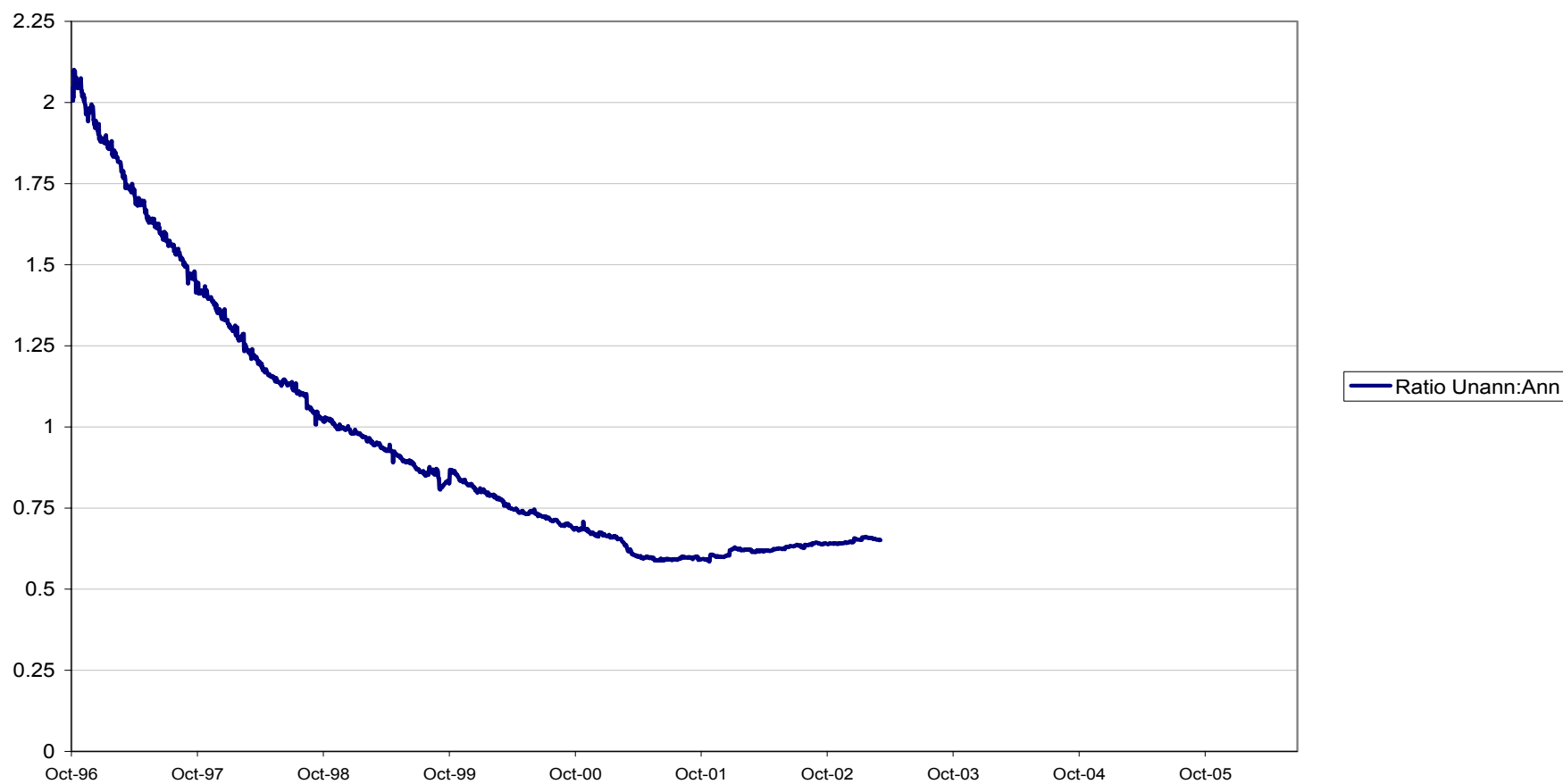
- RIRs operate with an allocation buffer of around 5,000 numbers
- 10,000 AS numbers (40% of the assigned AS numbers) are not announced in the BGP table.
 - Is this the result of old AS assignments falling into disuse?
 - Or recent AS assignments being hoarded?
 - This pool creates uncertainty in 2 byte AS number pool exhaustion predictions

Announced and Unannounced ASs

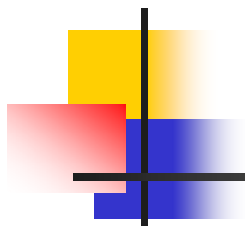


Unannounced : Announced AS's

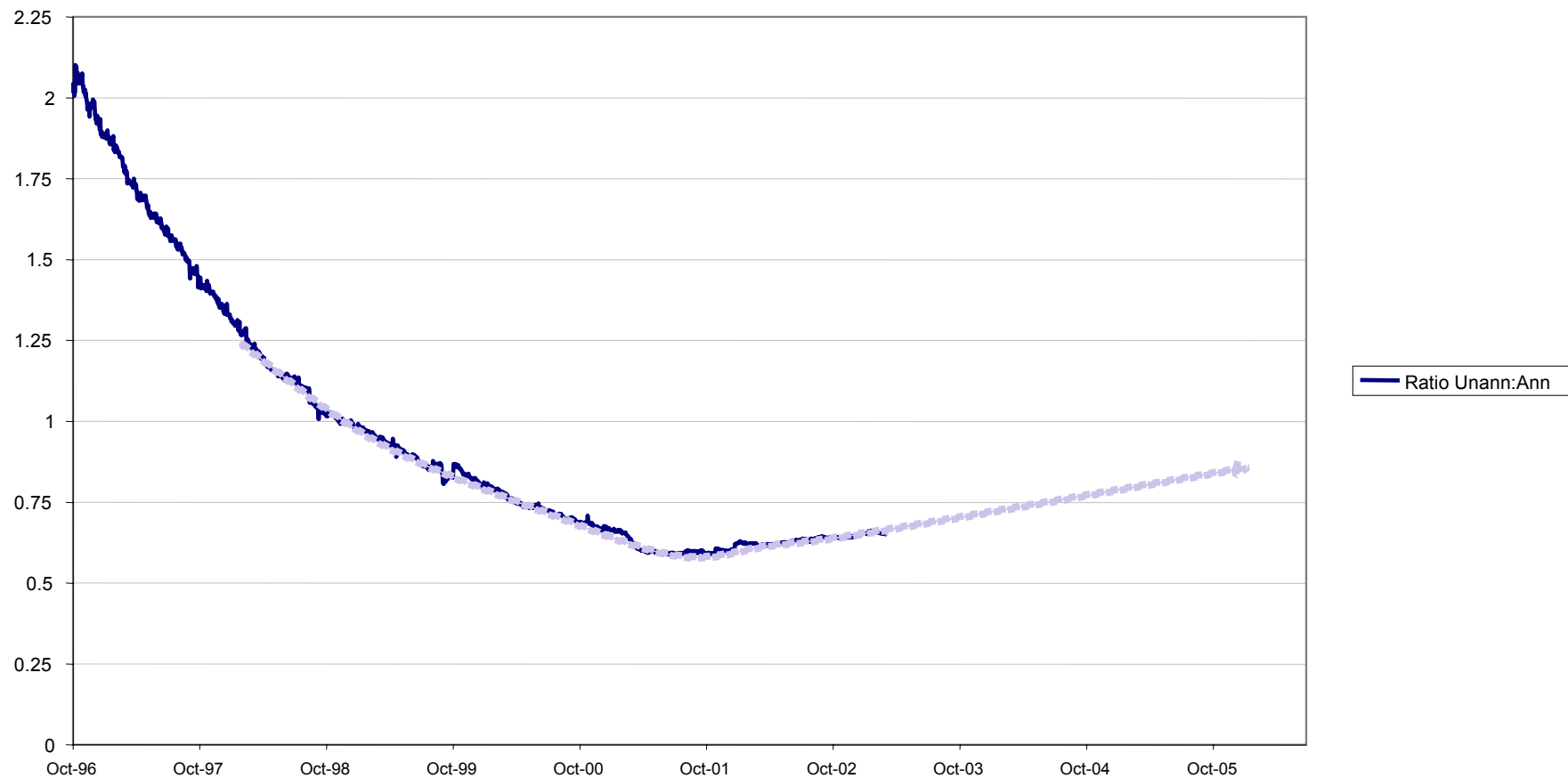
Ratio Unann:Ann



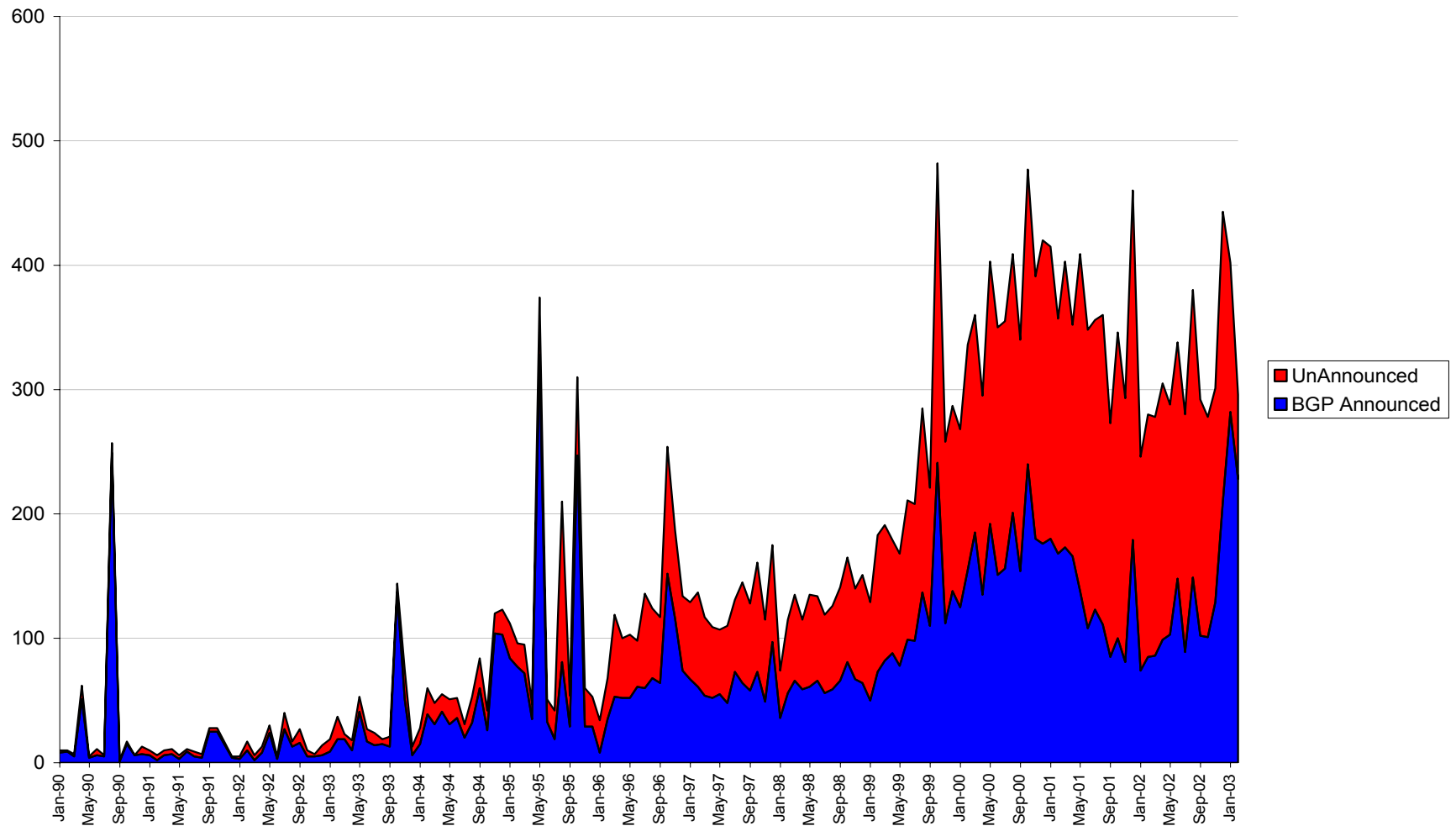
Trend: unannounced : announced ratio



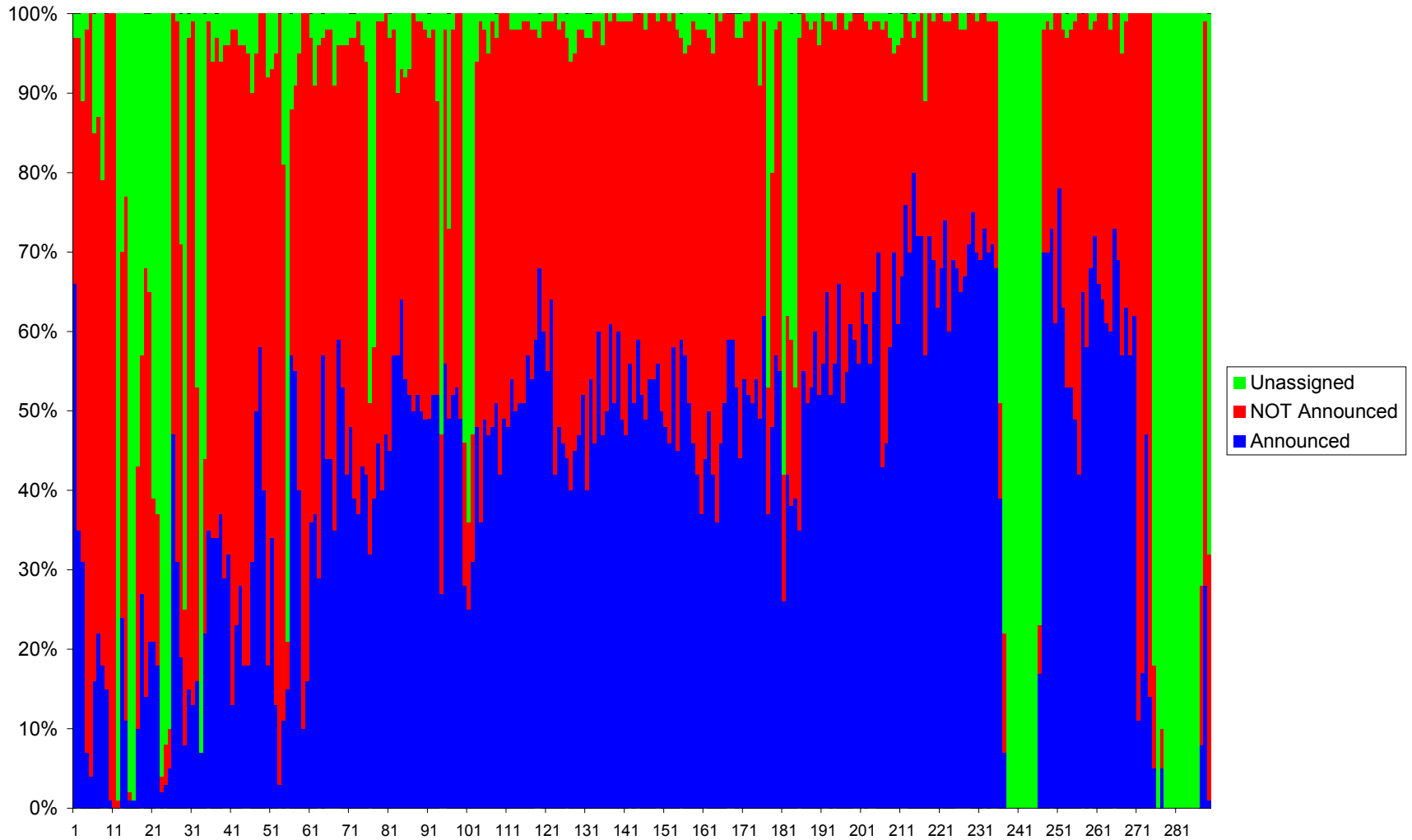
Ratio Unann:Ann



Announced / Unannounced Distribution by Date



Distribution by AS Number Range



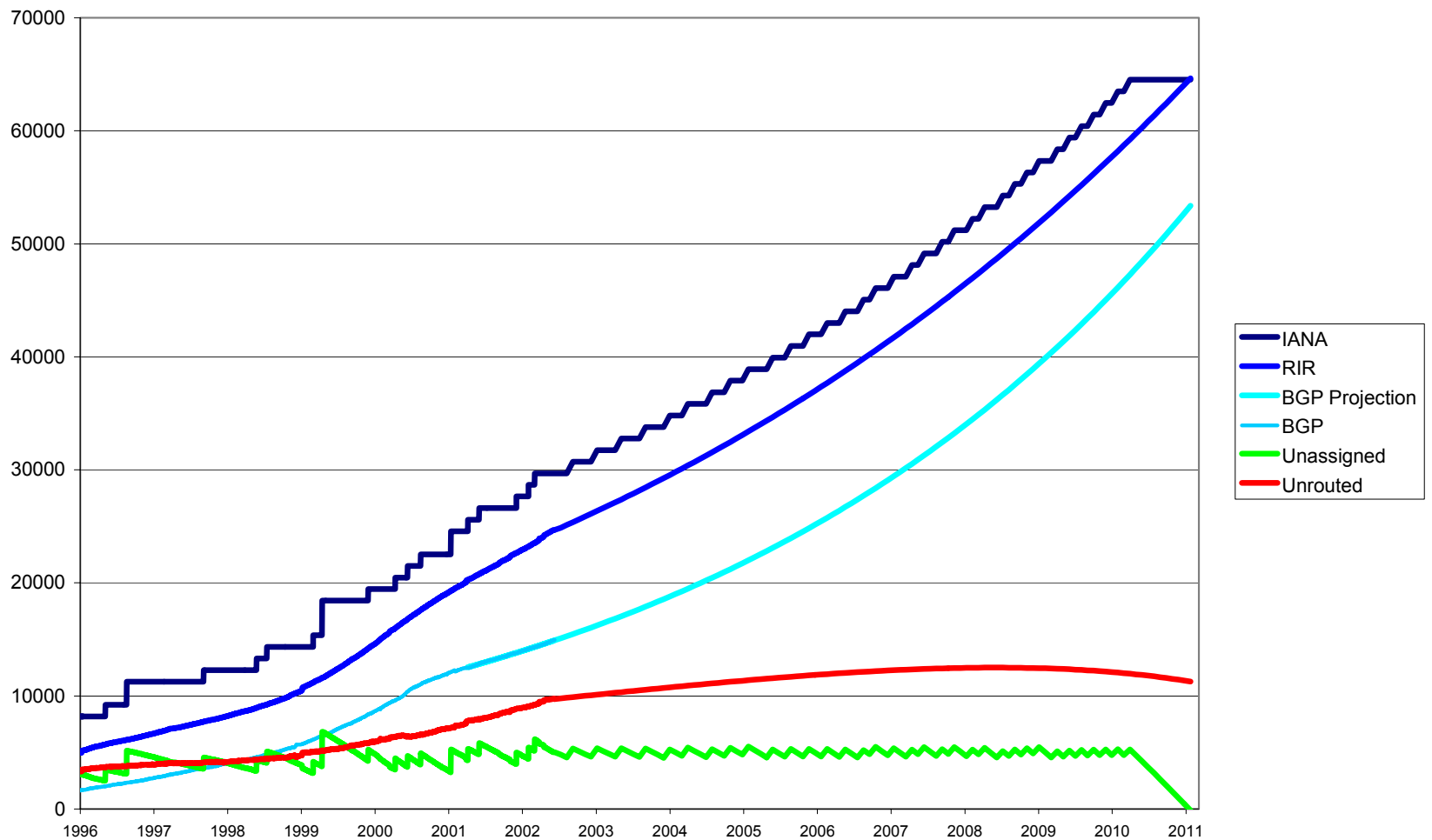


Observations

- 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 60% announcement utilization ratio for AS numbers
 - LIR staging point factors
 - Inadequate incentives to return if no immediate requirement for deployment

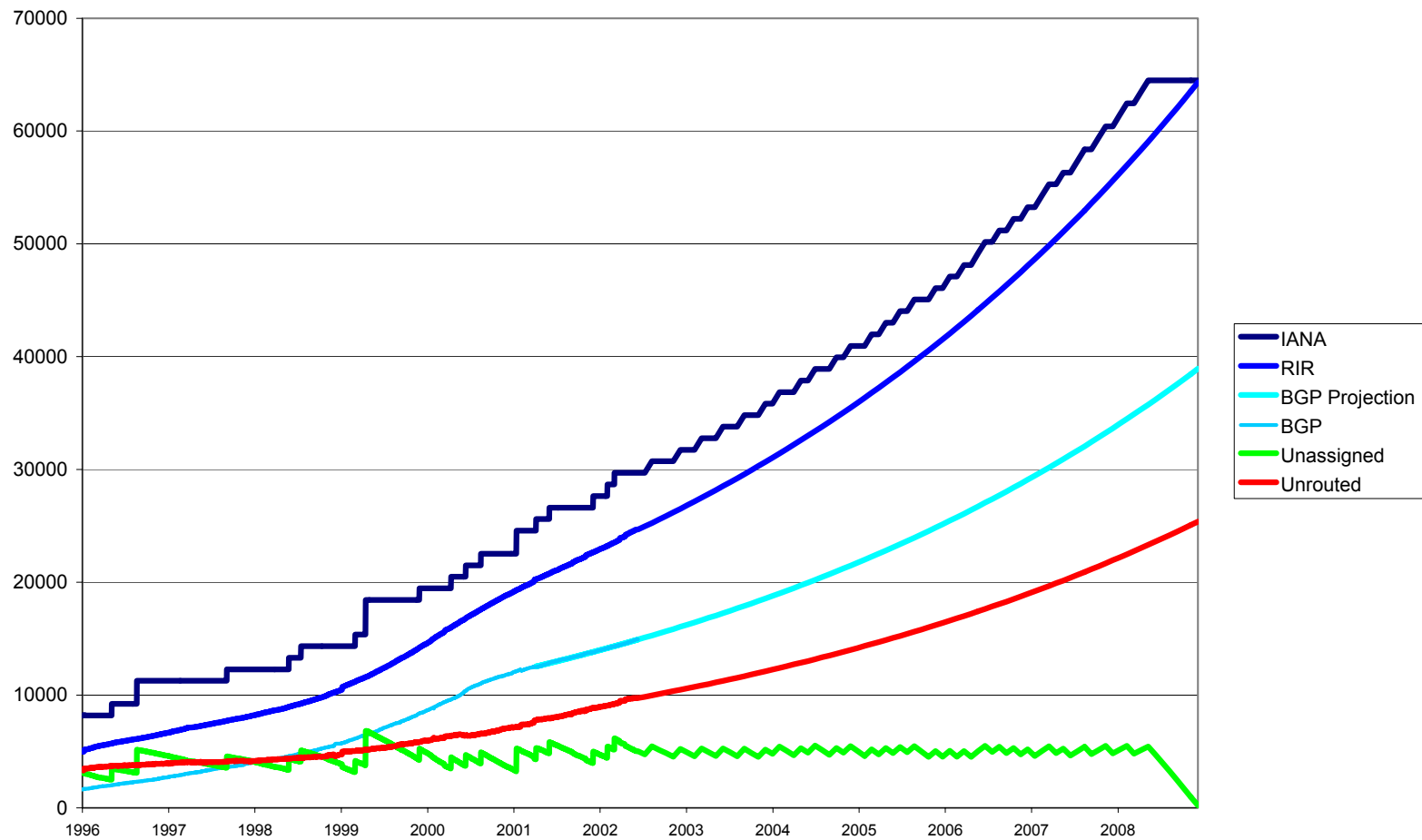
Forecast

1 – AS recovery in effect - 2011



Forecast

2 – No significant recovery – 2009



Current AS 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