BdlR Foreign Reserves Strategic Asset Allocation

Central Bank of Colombia (BdlR)

International Investments Department (IID)

2019

I.   Foreign Reserves Tranches

II.   Currency Composition

III.   Asset Allocation

IV.   Active Management

Foreign Reserves Tranches

Liquidity tranche

Most likely to use in short term

Cover potential risks of balance of payments

1 Year horizon

Most Liquid

Investment tranche

Less likely to use in short term

Generate higher risk adjusted returns

3 year horizon

Less Liquid

Foreign Reserves Tranches

LIQUIDITY TRANCHE

- Adequate Reserves Level

- Estimate negative shocks to relevant variables

- i.e. ARA IMF

Short term debt
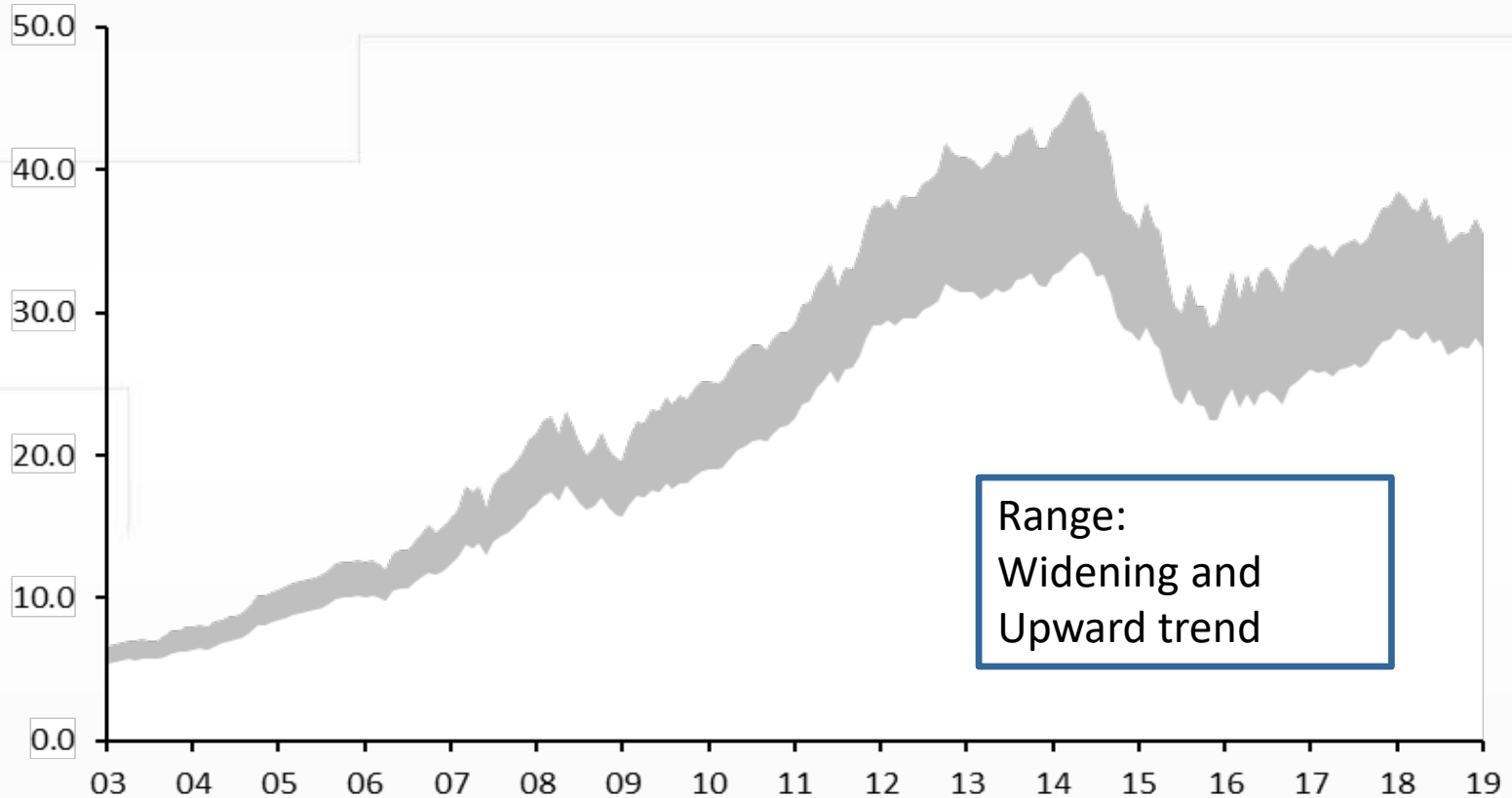
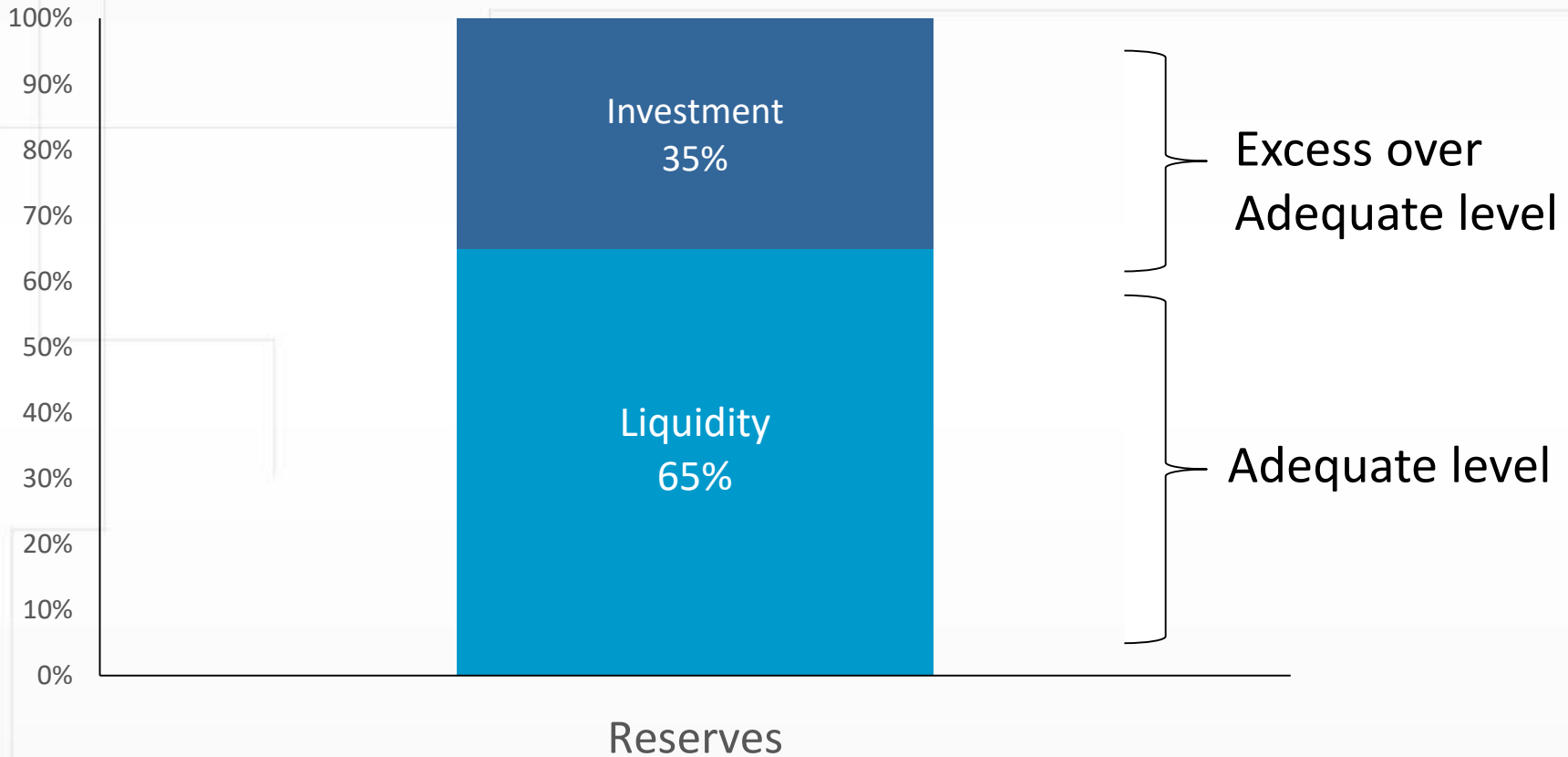Other portfolio liabilities (BoP)

Exports

M3

Remittances

Foreign Reserves Tranches

Liquidity tranche range   **1ˢᵗ to 10ᵗʰ percentile of shocks**

Range:
Widening and
Upward trend

Foreign Reserves Tranches

Tranche sizes

Reserves

I.   Foreign Reserves Tranches at BdlR

II.   **Currency Composition**

III.   Asset Allocation

IV.   Active Management

Currency composition

Different currency composition for each tranche

Liquidity Tranche

Result of Balance of Payments Outflows Replication

Cover Potential Risks Balance of Payments

Investment Tranche

Result of Portfolio Optimization

Generate higher risk adjusted returns

Currency composition

Defining Currency Universe

✓ Free Convertibility

✓ Minimum Credit Rating

✓ Liquidity: Fx and Goverments Volume
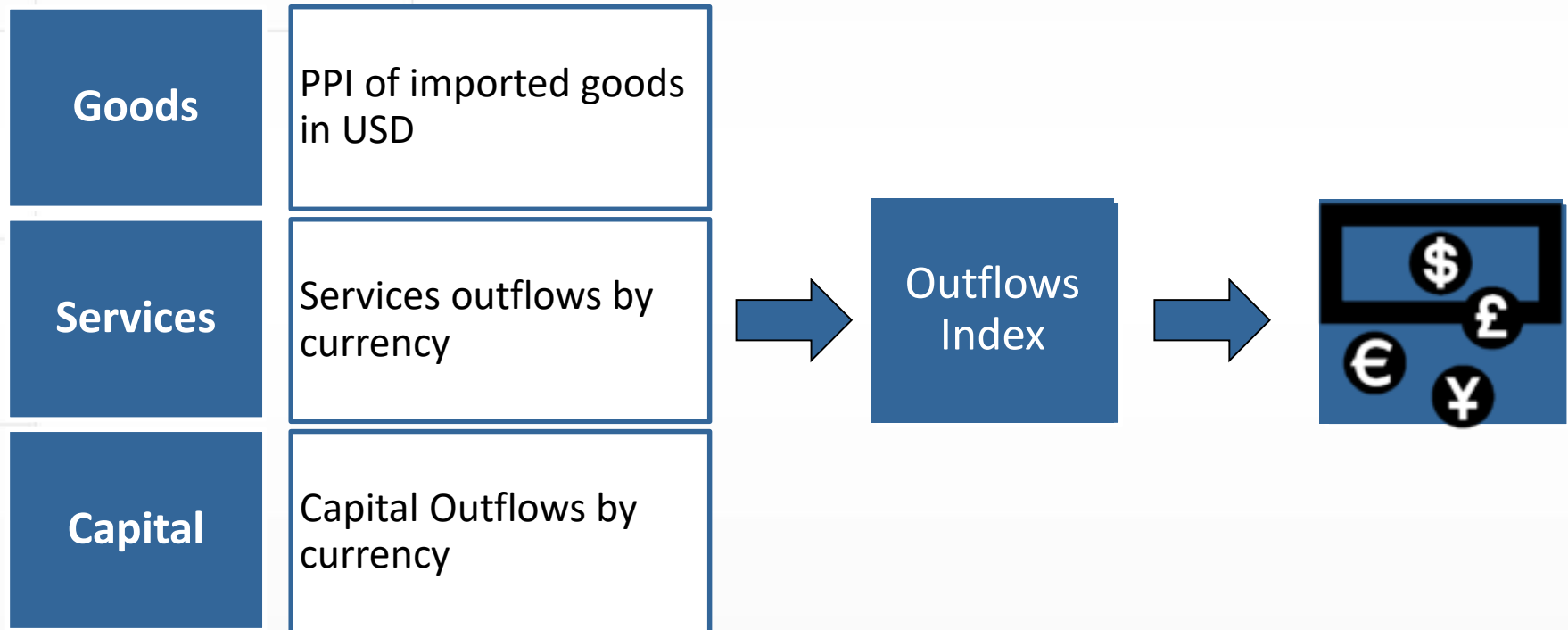
✓ Positive Yields

✓ USD, GBP, CAD, AUD, NZD, NOK, SEK, CNY, KRW, HKD, SGD
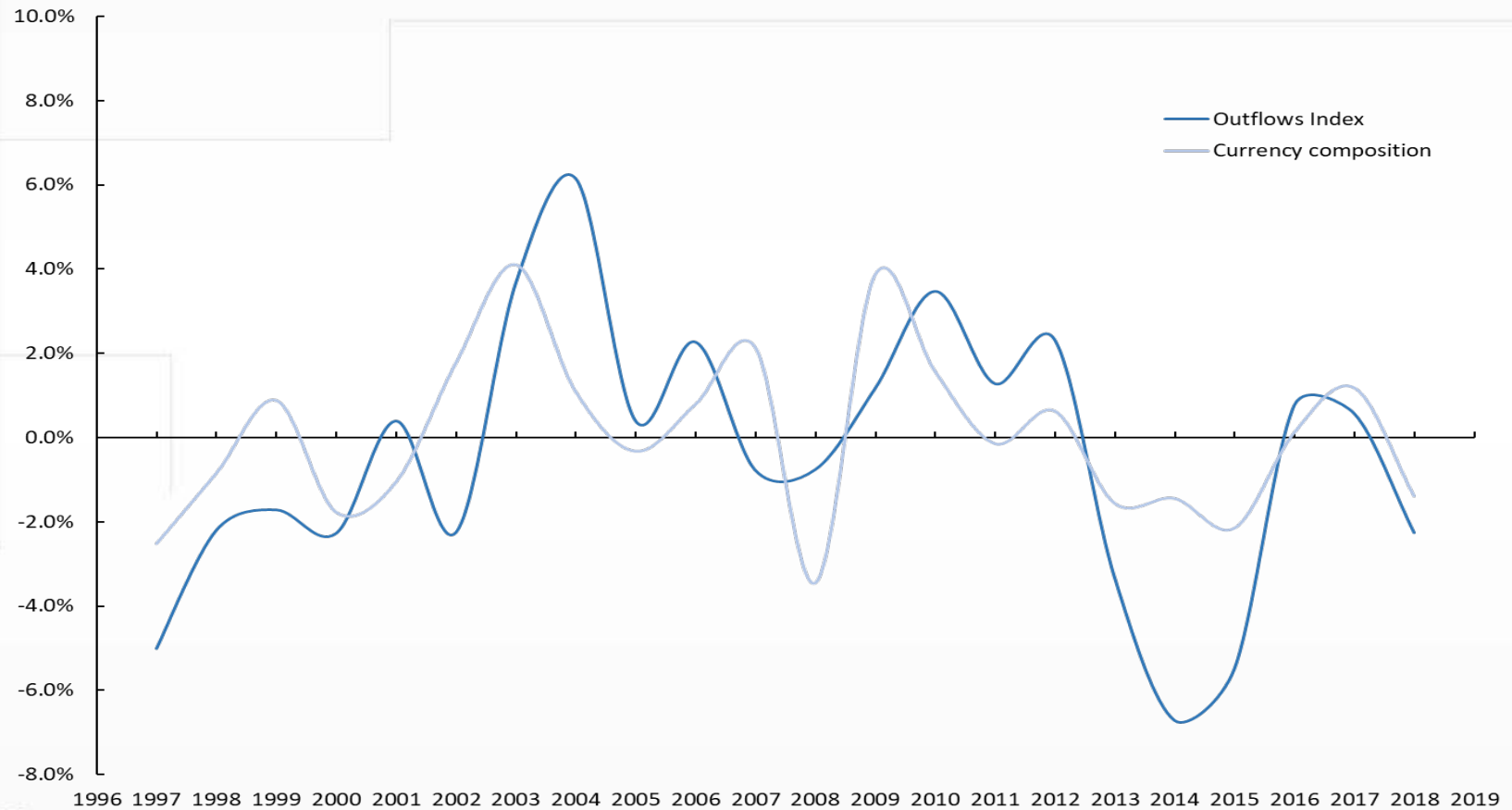
Currency composition
Liquidity Tranche

Replicate balance of payments outflows. Cover the payments volatility of the country derived from the movements of the exchange rates
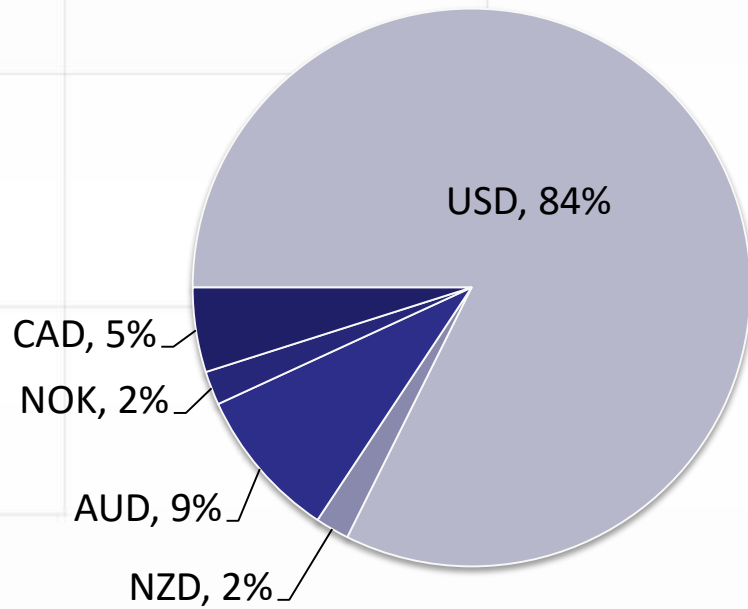
| Goods | PPI of imported goods in USD |

| Services | Services outflows by currency |

| Capital | Capital Outflows by currency |

→ **Outflows Index** →

Currency composition: Liquidity Tranche

Outflows Index and currency composition

Currency composition
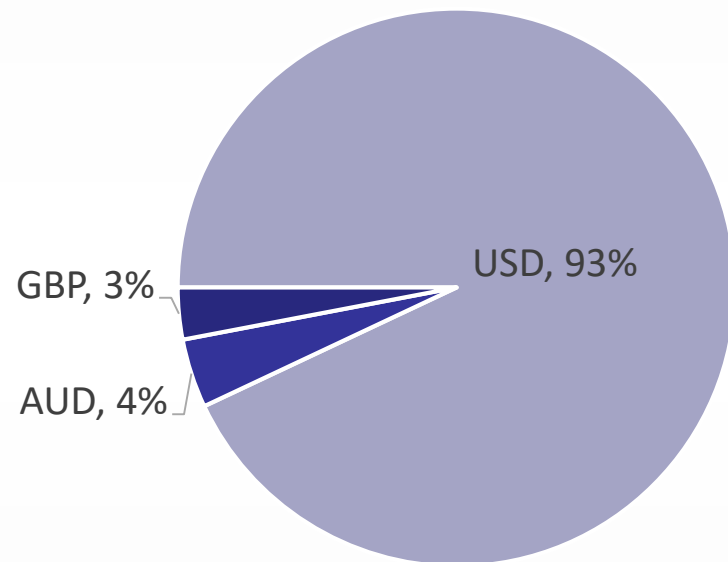
LIQUIDITY TRANCHE

USD, 84%

CAD, 5%

NOK, 2%

AUD, 9%

NZD, 2%

INVESTMENT TRANCHE

USD, 93%

GBP, 3%

AUD, 4%

How is the construction of the Benchmark?

Investment Policy Statement

Currency composition, Investment horizon, Risk tolerance, Eligible investments, Unit of measurement of wealth

↓

Equilibrium Expected Returns

Black-Litterman model

↓

Efficient Frontier

Set of portfolios which maximizes the utility under different levels of risk

↓

Portfolio that maximizes the utility function

Portfolio of the efficient frontier that maximizes the utility function

↓

Portfolio that meets the non-loss constraint

This step is only considered if the portfolio with maximum utility doesn't meets the non-loss and CvaR constraint

SAA: ASSET UNIVERSE

US
- Treasury Notes and Bonds
- TIPS
- Mortgages

Australia
- Treasury Notes and Bonds

New Zealand
- Treasury Notes

Canada
- Treasury Notes and Bonds

Norway
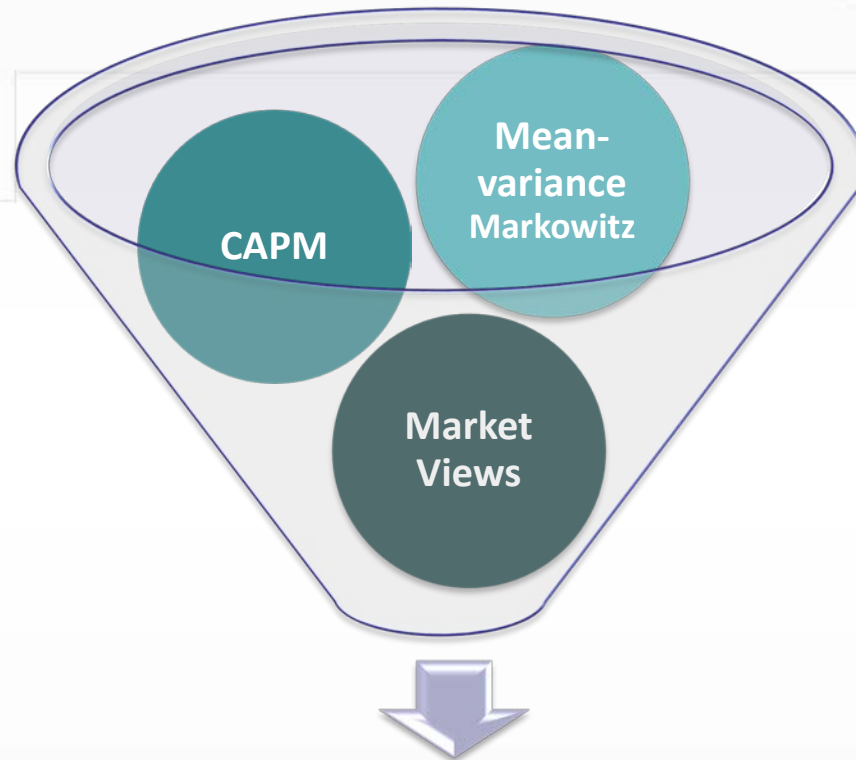- Treasury Notes and Bonds

UK
- Treasury Notes and Bonds

Other
- Supranational bonds
- Gold

SAA MODEL

SAA BLACK-LITTERMAN

Estimate covariance matrix	Estimate equilibrium returns	Market Views (If needed)	Calculate efficient frontier
• **Historical data** • **Exponential decay** • **Hurst exponent**	• **Reverse optimization** • **Capitalization weights**	• **Bayesian approach** • **Equilibrium return**	

BL Advantages

Results stability

Avoid corner solution

Smooth rebalancing

Duration adjusts to the level of the interest rates
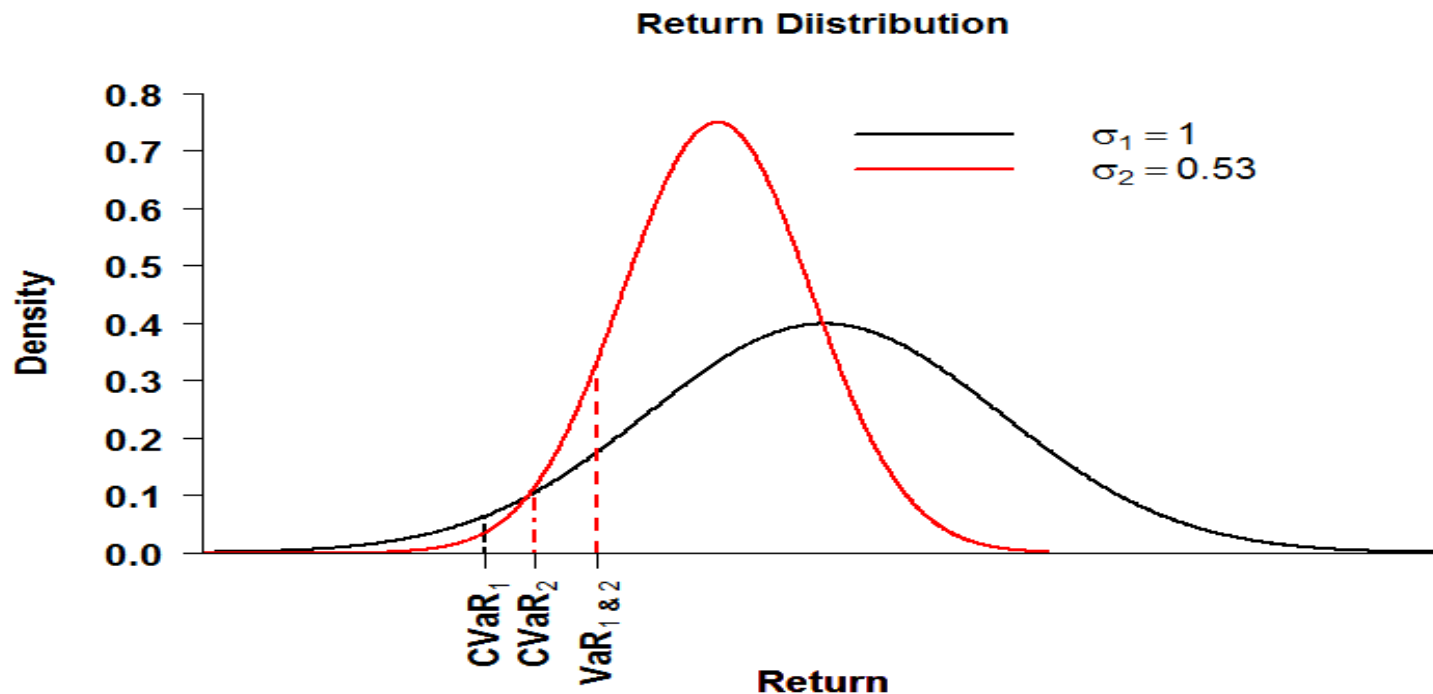
Allows for investor's views

SAA Risk Constraints: VaR and CVar

Distribution of Returns
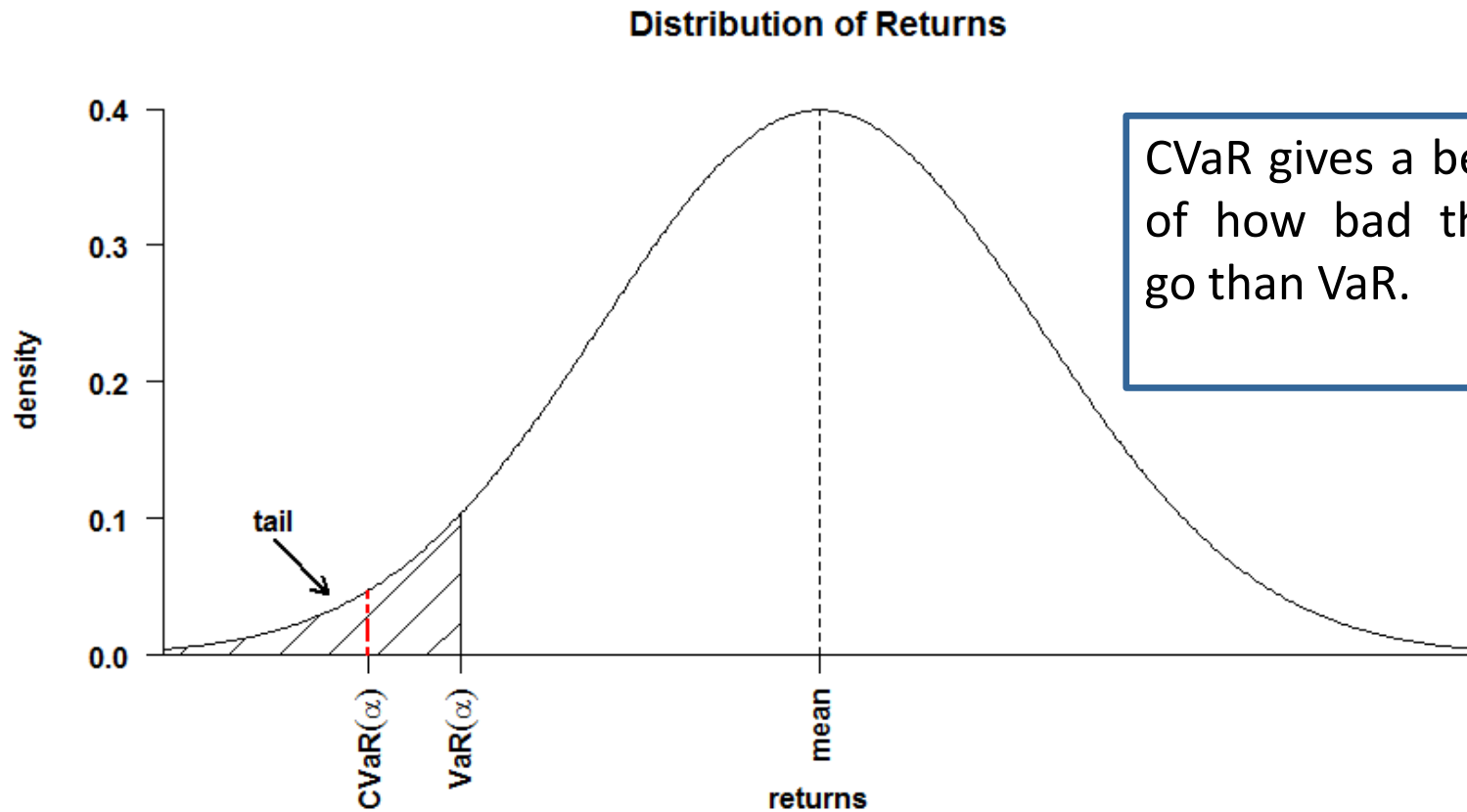
CVaR gives a better idea of how bad things can go than VaR.

SAA Risk Constraints: VaR and CVar

Return Diistribution

For different market conditions, the same VaR restricted portfolio may be exposed to different expected losses.

SAA Optimization Parameters

|	**Liquidity Tranche**	**Wealth Tranhce**
Investment Horizon	1 year	3 years
Currency Composition	External Input	Optimization Solution
Unit of Measurement	Currency Basket	USD
VaR Constraint Non-Loss	Positive Return 95%	Positive return 95%
CVaR Constraint	1%	1%

SAA

EFFICIENT FRONTIER IN MEAN-VARIANCE SPACE
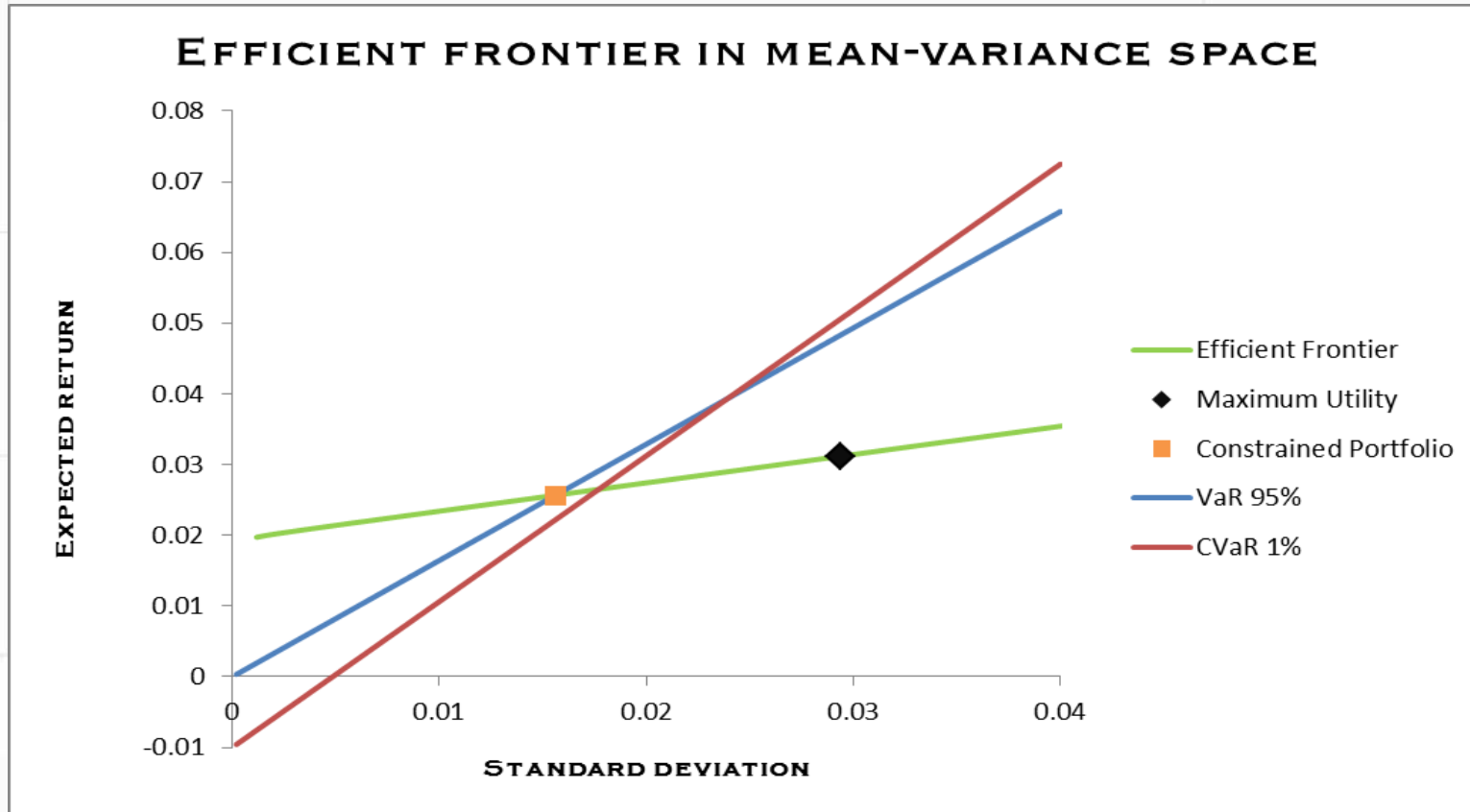
Both VaR and CVaR lines represent all mean-variance combinations that meet each constraint (indifference curves).
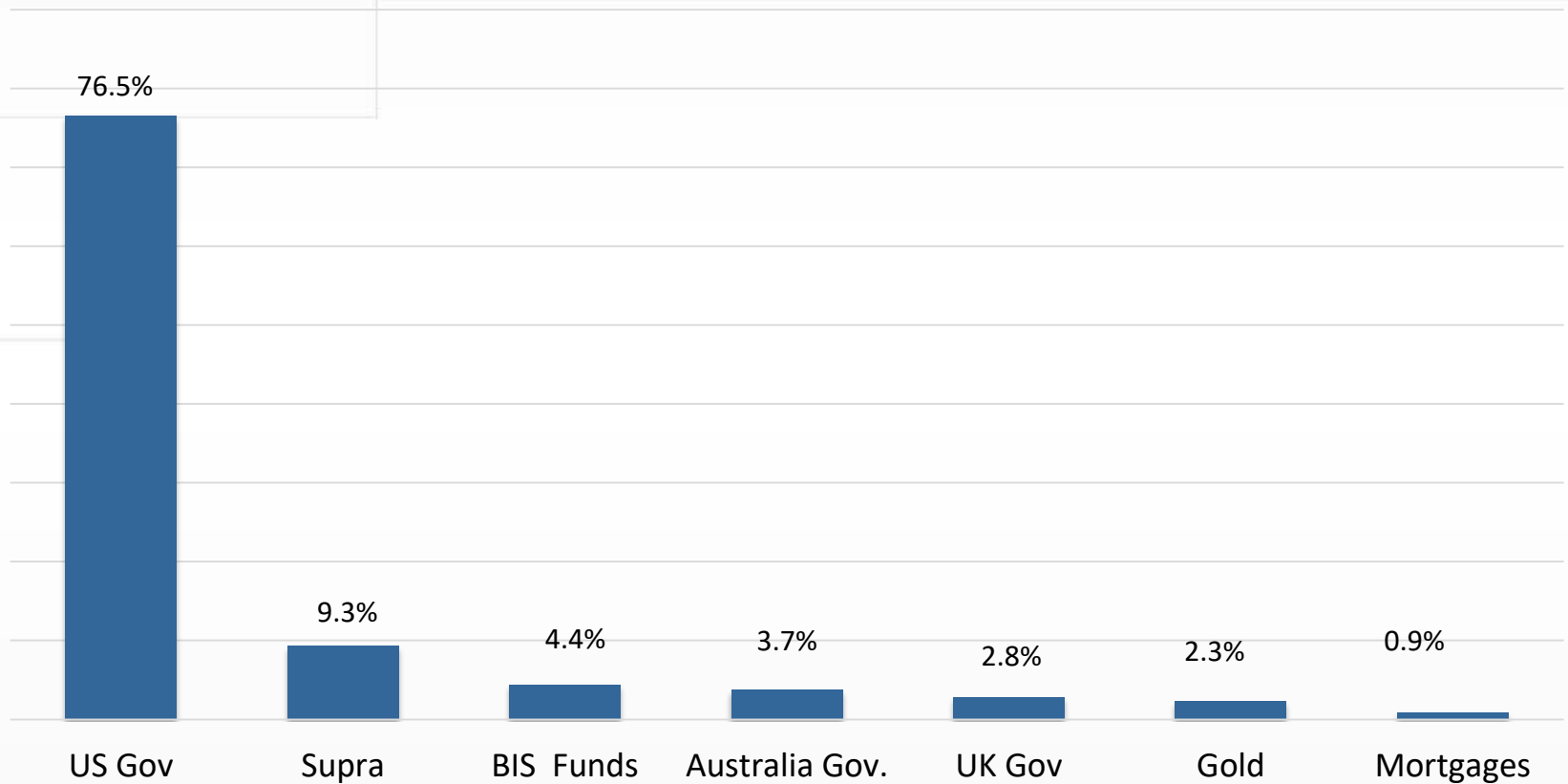
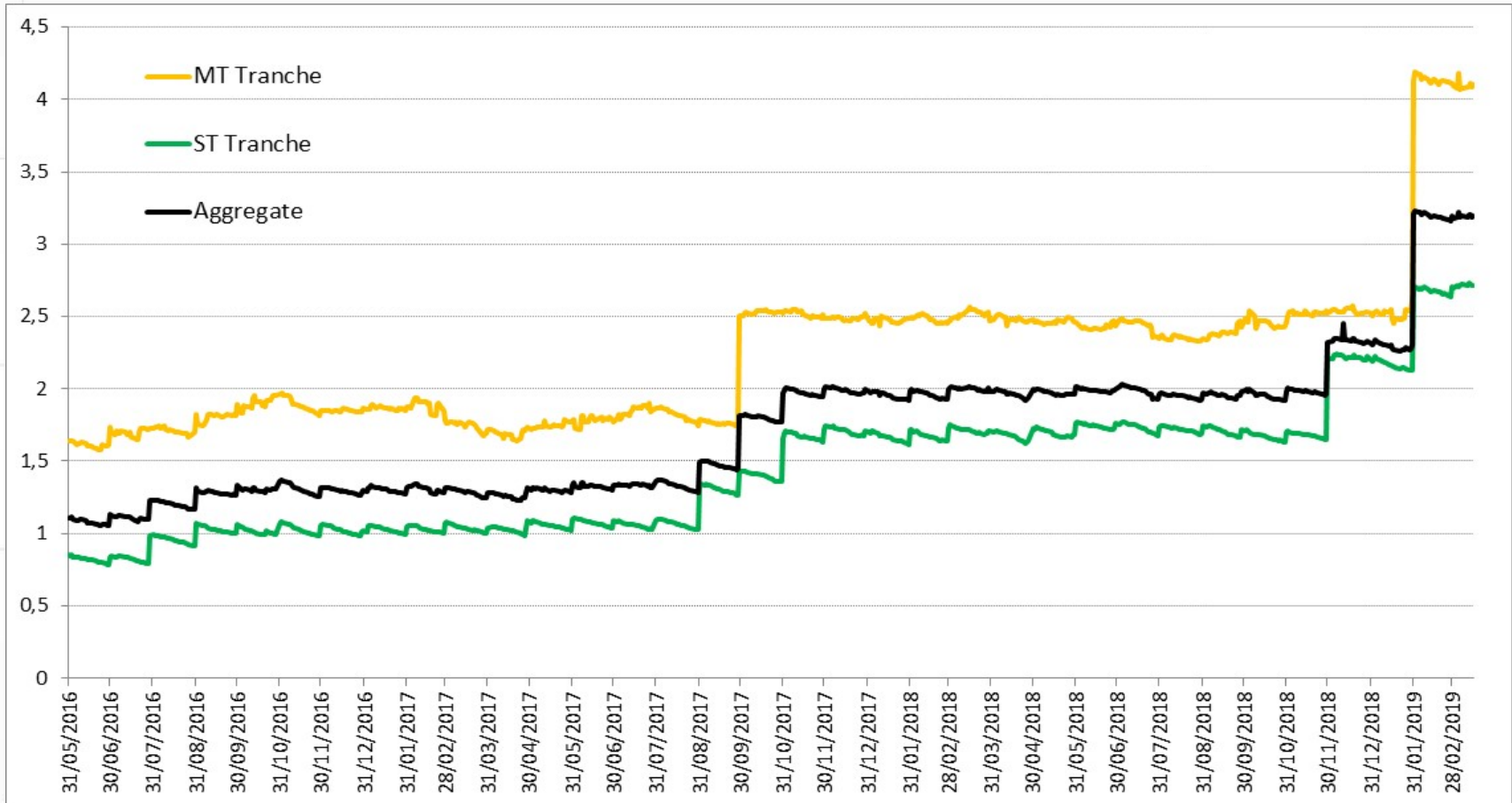# Strategic Asset Allocation

Liquidity Tranche
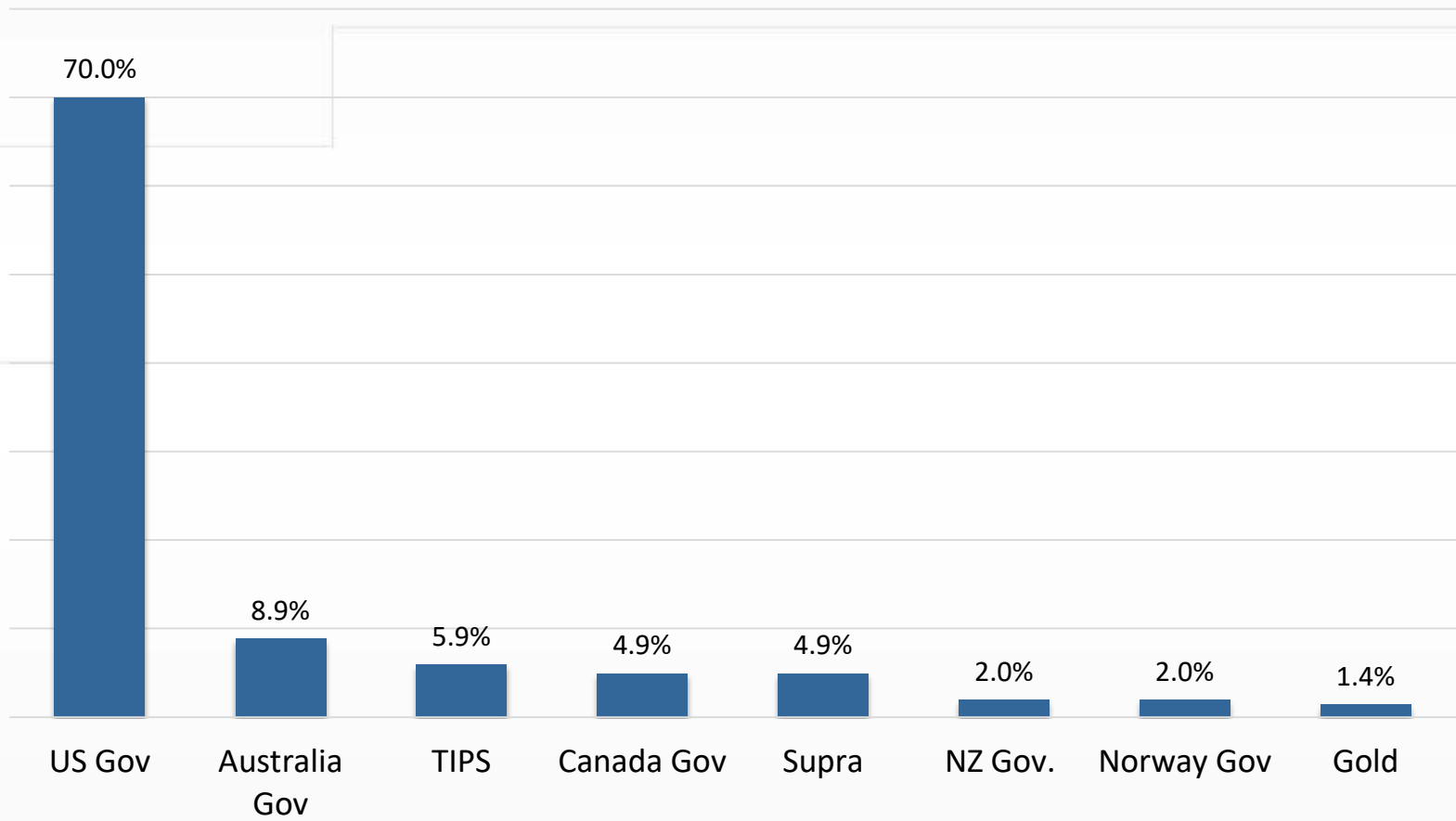
Strategic Asset Allocation

Investment Tranche

Strategic Asset Allocation

I.   Foreign Reserves Tranches at BdlR

II.   Currency Composition

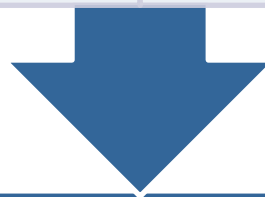III.   Strategic Asset Allocation

IV. Active Management

Active Management

Objectives

Excess Return Alpha	Diversification

Questions

What proportion of the foreign reserves should be actively managed?	What is the best number of managers for actively managed reserves?

Active Management
Optimization Model Approach

Find Combination of

- Number of managers
- Active Risk Budget

That:

- Maximizes Net Information Ratio of Active Program

Constrains:

- Benchmark (SAA) + Active Program meet Market Risk Constrains (Var, CVaR)
- Liquidity Constraints and Minimum Portfolio Risk

Active Management
OPTIMIZATION MODEL APPROACH

- The model captures the trade off between diversification benefits and economies of scale in management fees.

- Estimation of returns (ER) using Grinold's fundamental law of active management.

  - Expected Return for each manager
  - Skill on selecting managers
  - Correlation among managers' strategies
  - Fee structure charged

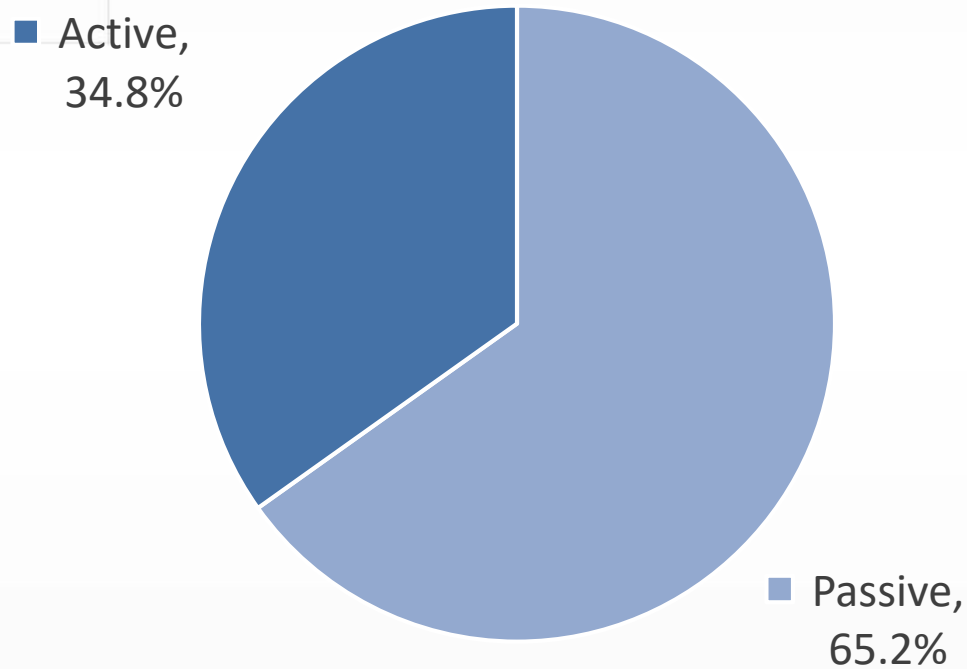- Captures correlation between benchmark and active management

Active Management

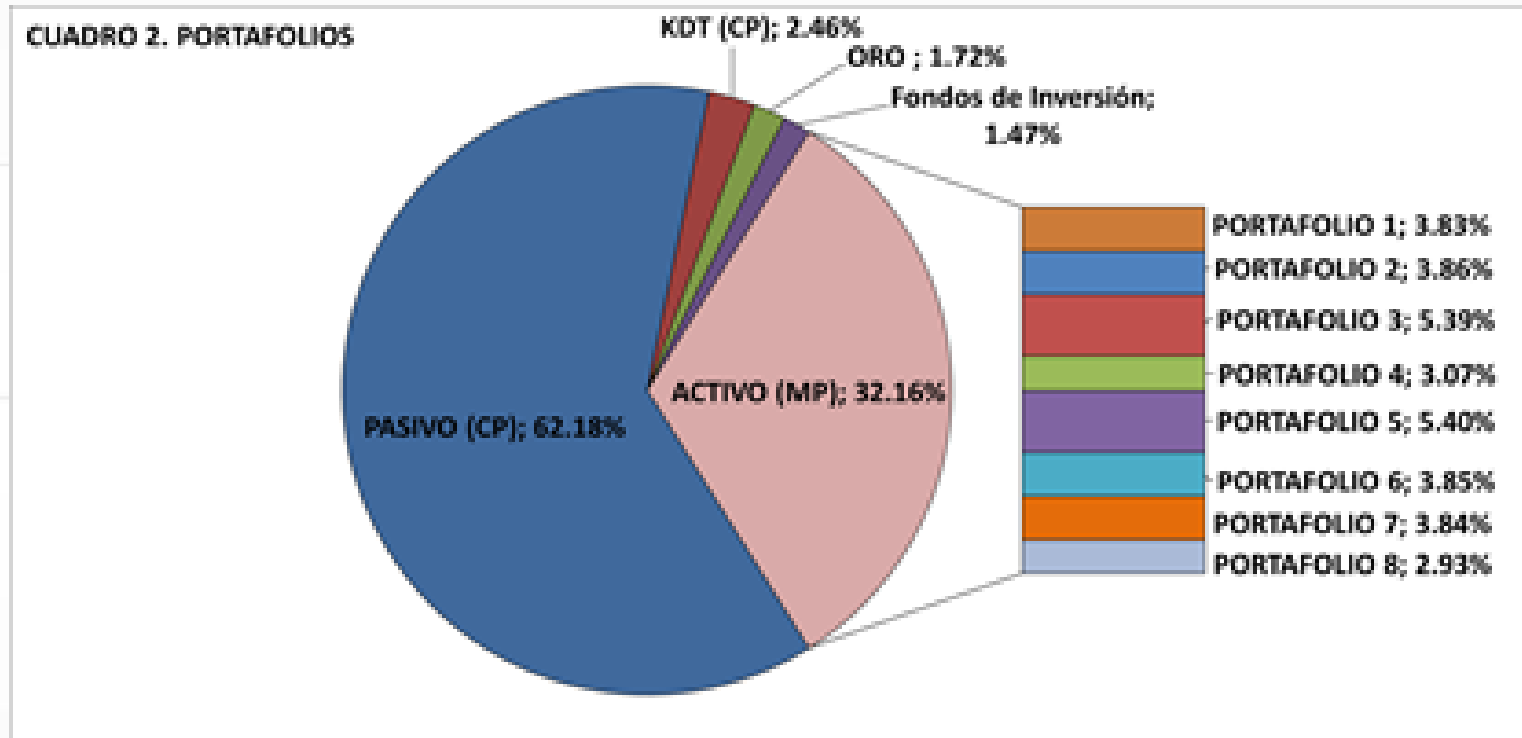Constrained3 IR_{net} as Function of TE_{tot} and n_{mngr}
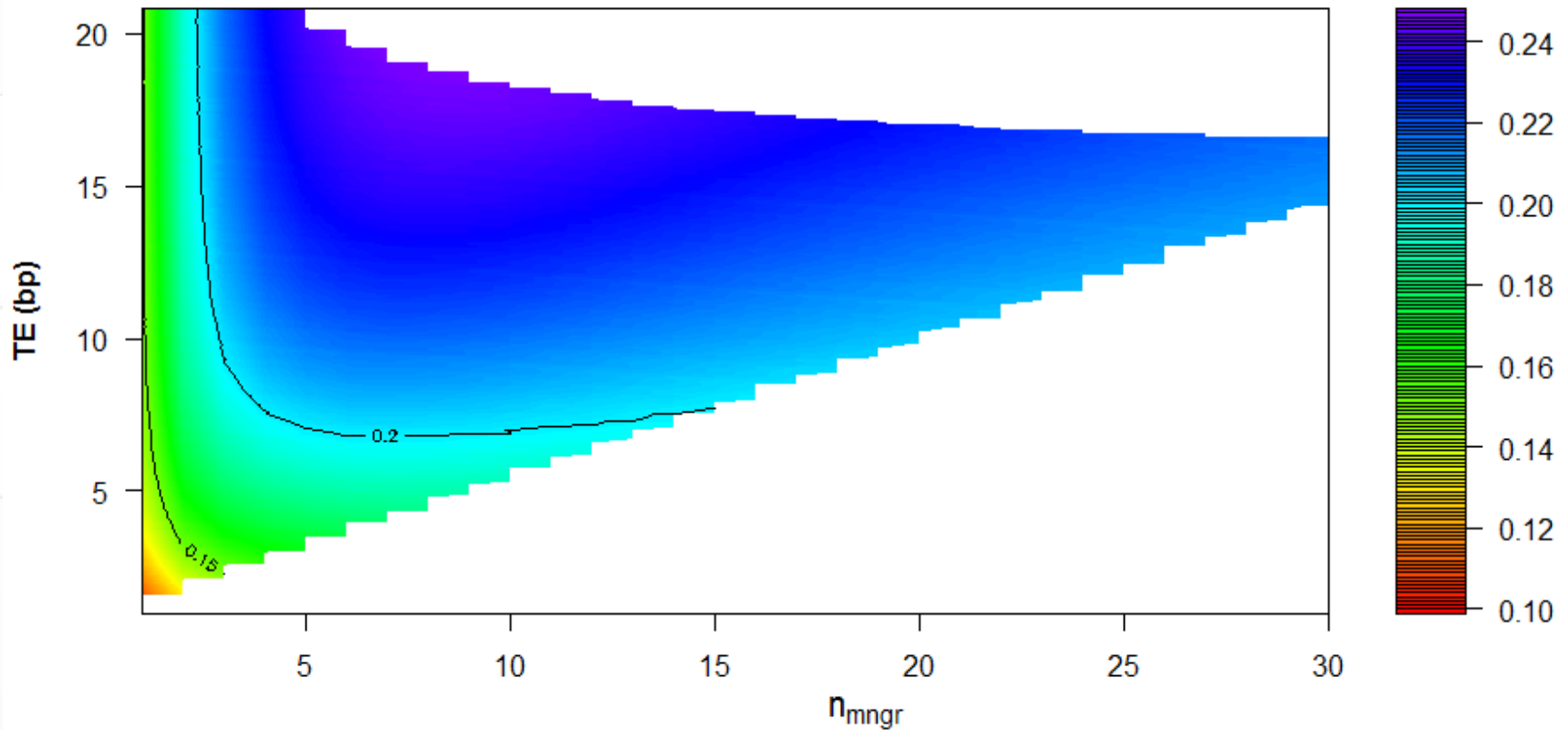
Active Management

Optimal number of managers: 8

Structure of the FR Portfolio

Optimal number of managers: 8

THANK YOU!