



Addressing the Inflation Concerns for Public Pension Plan in China

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Lyon Colloquium



Contents




 **Why Inflation Consideration is Important?**
.....

 **How is Inflation different?**
.....

 **Explicit Consideration of inflation**
.....

 **Application to China Case**
.....

 **Conclusions on China Case**
.....



The role of Inflation in the Four Core Objective of Social Security Program

- Protection against Longevity risk
- Effective Pooling from High Participation. (Inflation Protection is a primary driver in participation decision)

Insurance

- Consumption over time shall be judged by after inflation
- Consumption over time needs to reflect the improvement in Life Quality

Consumption Smoothing

- Income is a function of inflation and other parameters incorporating inflation
- Inflation adjustment works as a tax or subsidy

Income Redistribution

Poverty Reduction

- Reduce Poverty Vulnerability for Elder
- Poverty threshold is a function of inflation

Conclusion: Inflation is a Critical Component across the board. Inflation Challenge in actuarial term, incorporate inflation induced income redistribution with appropriate cost allocation.

The Core Objectives Framework is quoted from Nicholas Barr and Peter Diamond (2010)



Why inflation is important?

- From plan's perspective

- All public pension plans in the world have at least two components which are perceived to significantly incorporating inflation effect. And almost all plans have a component of inflation adjustment arrangement.
- In fact, inflation has produced a complex impact on almost all types of plan parameters other than demographics, such as funding basis, benefit basis, benefit accrual, funding growth, and it also works closely with demographics.
- Inflation influence both DB and DC component of any social security program.
- Inflation will influence almost all levels of critical decisions with plan, such as pre-funding, implied funding commitment, obligation evaluation and funding status of plan, cost allocation and intergenerational equity, affordability and sustainability.
- Explicit consideration of inflation effect will allow a comprehensive check and properly identify the net effect from complex interaction between inflation and other parameters.
- Explicit consideration of inflation effect will achieve a better understanding of inflation adjustment arrangement in the plan structure and facilitate a well function of inflation adjustment arrangement.
- Accumulative Inflation effect is path dependent.



Why inflation is important?

- From participant's perspective

- Preserving the investment value is the baseline purpose for long term investment according to relevant surveys on US investors conducted by CFA Institute over last decade.
- With a long term of investment horizon, such as 30 to 40 years, no one in the economy can be in a meaningfully better information vantage to make investment decision. In other term, the long term investment is seldom driven by information advantage to maximize return.
- Absence of imminent or approaching liquidity concern, value preservation is sought for forced savings component (distinctively different from optional savings which tend to seek risk adjusted maximum return as much as possible for an anticipated larger future consumption capacity in real term than immediate consumption capacity, a justification to abandon otherwise current consumption).
- When several alternatives are available in the economy to fulfill the long term value preservation for these particularly set aside assets, the participant will judge their effectiveness and efficiency (including administration fees imposed). The attractiveness of social security program will decrease if the program cannot provide a best choice and could induce various unintended feedbacks.
- For those population with limited means, they usually don't have easy access to other inflation protection vehicles, which may be stronger than social security program, such as real estate, gold hedge fund.



Why inflation is different?

- **Inflation variable is not really probabilistic.**
 - Most of time, inflation can be externally explained or as an intended consequence of external intervention.
 - Under a normal regime, to the time horizon scale interested, a cycling seems predominating over a random walk in an immediately infinite time length.
 - There are evidences different inflation regimes exists over time, showing a jump and stay pattern rather than random walk.
- **Inflation has complex relationship with multiple parameters.**
 - Almost all parameters in the economy have an Inflation component either concurrently, or in one or more steps lag.
 - Inflation is primarily driven by the price of basic basket, which is a consequence of movement of diverse parameters in the economy.
 - Including the inflation only in return rate is wrong.
 - In general, inflation cannot provide internal offsetting, and net inflation effect shall be considered with diverse external offsetting parameters.
- **Both immediate and accumulative effect of inflation are relevant.**
 - All time average fails to take account properly. (Lognormal Illusion: 65% underestimate, 35% overestimate, frequent sign change)
 - For short term, regime residence is the primary context to consider.
 - For long term, inflation adjustment is the focus to consider.
- **Inflation effect is difficult to be incorporated within traditional accounting framework.**
 - Multiply years and multiply impact attribution makes accrual difficult.
 - Inflation consideration induces more accounting manipulation.



Functionality of Inflation

Assessment Functionality

- A primary benchmark for various parameters in decision process.
- Inflation Protection and/or Offsetting Effectiveness Check on various parameters.
- Interaction of various parameters on a common basis, inflation, can be checked.

Adjustment Functionality

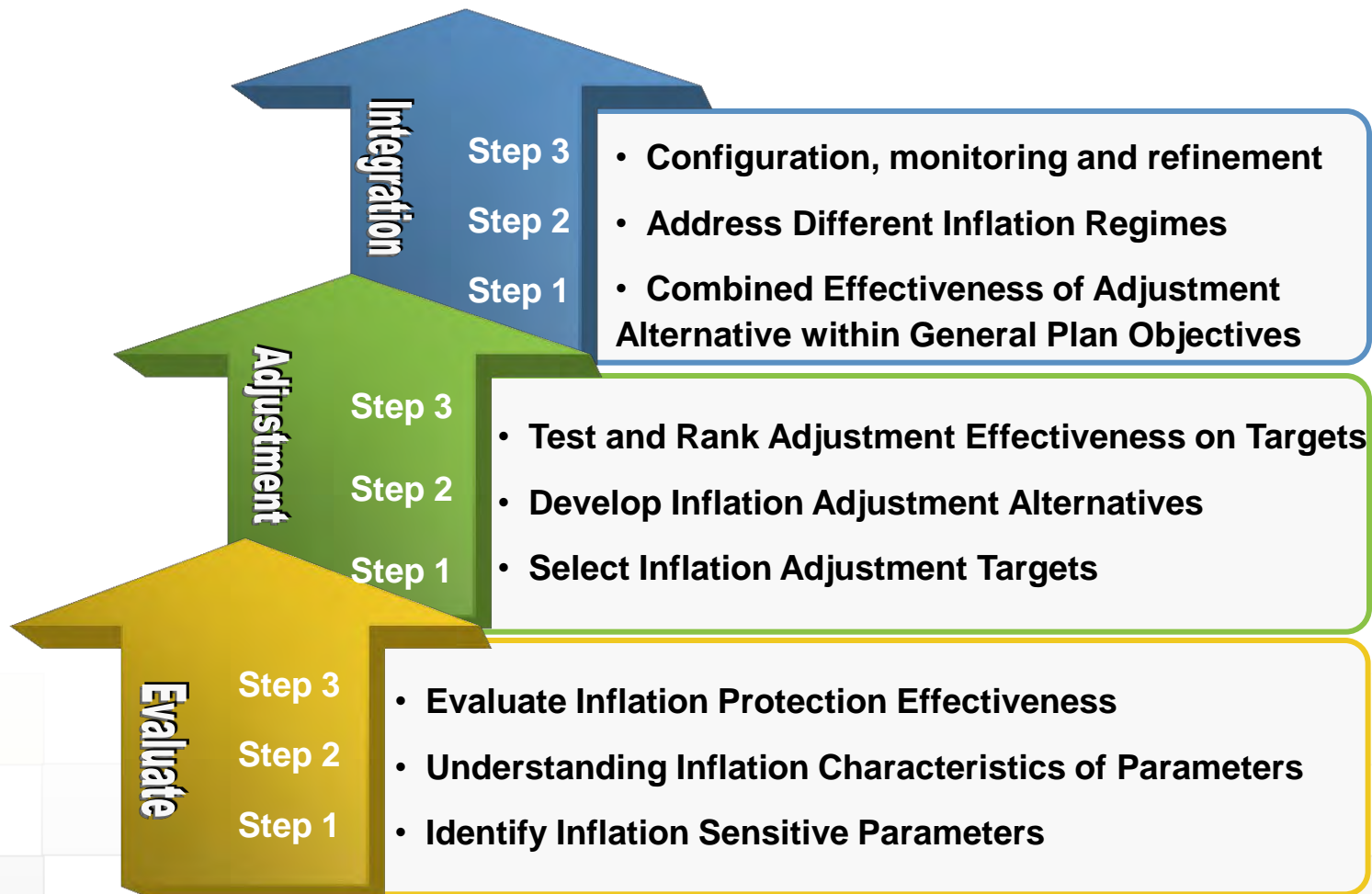
- Inflation adjustment arrangement (IAA) works in arrear with a clear intended target and objective, avoid target missing, and can work even without detailed statistical understanding of realized inflation.
- IAA works on two ways rather one way, more ready to be used, involve less administration cost.
- IAA is flexible and can work on different parameters, and can also function equivalent to a flexible tax and governmental subsidy in an income redistribution process.

Monitoring Functionality

- Inflation usually leads salary growth and consequently individual income tax, and also usually leads business income tax.
- CPI Inflation rate is a concurrent indicator of minimum living standard, medical cost and long term care cost, and a lagging or concurrent indicator of VAT depending on the tax collection regime.
- Catch up need is derived from time lag, partial offsetting and inflation vulnerability in term of exposure is usually increasing. Inflation adjustment facilitate a better comparison and understanding of certain Social Security status over time, facilitate a path neutral consideration and solution.



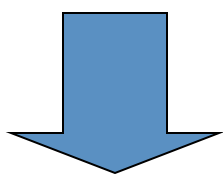
An Inflation Sensitive Accounting Framework





Revised Generic Formula

$$\text{Retirement Benefits} = S \cdot B_t \sum_{i=0,t} P_i + \sum_{i=0,t} [C_i \prod_{j=i+1,t} (1+c_j)] + A \dots \dots \dots (1)$$



Retirement Benefits in real value of time 0

$$= \{S \cdot B_0 \prod_{j=1,t} (1+b_j) \sum_{i=0,t} P_i + \sum_{i=0,t} [c F_0^c \prod_{j=1,i} (1+f_j) \prod_{j=i+1,t} (1+c_j)] + A\} / \prod_{j=1,t} (1+i_j) \dots \dots (4)$$



Revised Generic Formula

- In essence, to allow explicit consideration of inflation impact. Shall be done at the same time of explicit consideration of all inflation sensitive plan parameters.
- A similar revision can be applied to other formulae for funding status check, obligation evaluation, and even year to year cost allocation.
- Allow checks on any inflation amendment arrangement, avoid double accounting of inflation effect as a result of IAA.
- Provide some insights on exposure to inflation, inflation operators through various parameters.
- Basis year is required in practice for any inflation consideration, but the inference is a general one in the looking forward perspective, and selection of other typical or interested basis year for rerun will strengthen understanding on development over time.



Some Inferences from Revised Formulae

- Inflation is irrelevant for a strictly balanced plan.
- In general, inflation serves to reduce as like discount factor.
- For DC component, the plan participant rather the plan sponsor assumes the inflation risk.
- The time horizon before and after any given contribution point in time are subject to different inflation sensitive factors. Suggesting there is a room for an appropriate IAA to provide some streamlining in the anti inflation process. It's particularly true for the most vulnerable population.
- While the inflation exposure is increasing over time, the exposure of inflation offsetting factors is generally increasing up to the retirement, with some exceptions. Effectiveness of inflation protection requires matching of both offsetting movement and offsetting exposure.
- Post retirement inflation will affect both current benefit and remaining benefit to be received. To maintain real value of DB, benefit growth shall catch up with corresponding inflation rate. No inflation protection through inflation offsetting factor is provided for DB component unless there is an appropriate IAA. Inflation adjusted DB has an increasing exposure for individual surviving pensioner, but maybe a decreasing exposure for the plan sponsor due to demographic factor. To maintain real value of current benefit and remaining value of DC component, the existing DC assets grow at a rate not less than corresponding inflation rate is sufficient. DC component has a decreasing inflation exposure.



Development of China Plan



2010

- Brand New Social Insurance Law was enacted. Plan quit by participant was no longer permitted. Focus on Increasing Pooling Level, Streamlining different social insurance coverage, commitment of basis coverage without inflation protection declared.

2005

- The 2005 Scheme was introduced. Include informal employment as mandatory, close IA draining, revised benefit formula.

1997

- The 1997 Scheme was introduced. Include urban workforce and retirement only, establish social pooling and individual account, early retirement.

1992

- A trial plan was initially implemented in Shanghai.



China Plan Observations

- Quick Facts of China Plan

- Benefit from DB similar component supported by social pooling and from DC similar component supported by individual account, which is contributed by and credited with individual participants.
- Benefit basis for DB grows at the same rate of average salary growth up to retirement, credit rate for IA is set by the prevailing one year bank deposit interest rate , DB component runs as PAYGO.
- Involuntary pre fund from current plan surplus and plan transfer. The total inflation vulnerable exposure from social pool and individual account is more than 2 Trillion RMB.
- The investment performance of National Social Security Fund run short of inflation growth in 2004, 2008 and 2011, with an average investment return of 8.27% corresponding to average inflation rate of 2.42% since 2000.

- Low Participation

- Obstacles to participate and receive benefit in future.
- The benefit level is low and remote in light of current high contribution level.
- Low participation intent include not participate at all, delay participation, or report a low income when participating.
- Participation binding is low.



China Plan Observations

- **Social Insurance has no impact on domestic consumption**

- Ping Tian [2011] has summarized in his independent empirical study that the resident's consumption has no significant correlation with pension expenditures from China government from Year 1985 to Year 2006
- At the same time the consumption as a % of GDP has been deteriorating over time.

- **Deteriorating Replacement Ratio**

- See the chart in next page.

- **Lack of Reliability**

- Plan Change. 2005 Scheme has been diminishing the replacement ratio improvement for low income group.

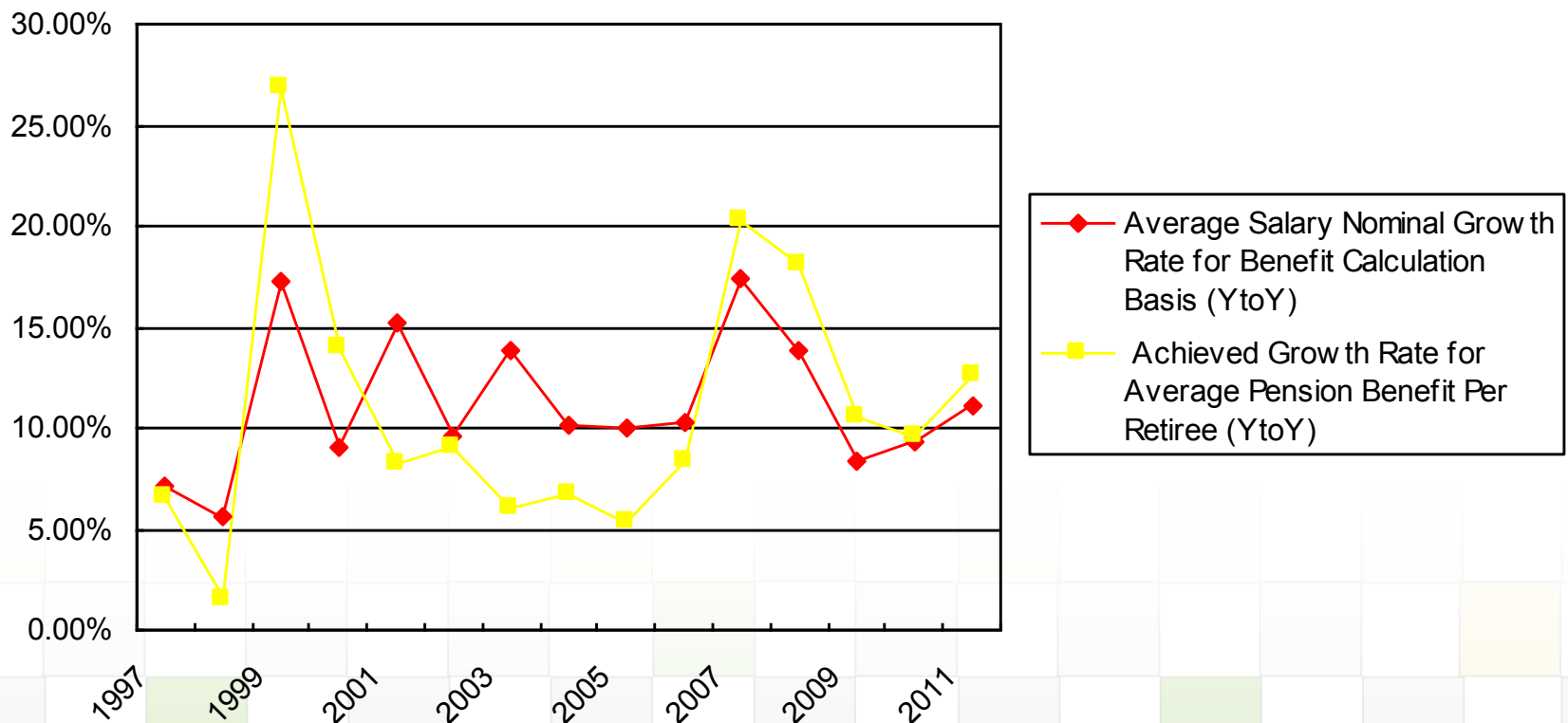
- Under the official scenario (no explicit inflation assumption given), the DB component will contribute 2/3 of retirement benefit, and DC component (through IA accrual at interest rate of 3%) will contribute nearly 1/3 of retirement benefit given current credit rate regime. But the DB component is stronger in term of inflation offsetting than DC component. And DC component will lose it proper function in event of even 1% inflation offsetting gap up to the retirement.

- Inflation protection gap become more severe when there is a fair possibility of retirement postpone.

- Empirical evidence

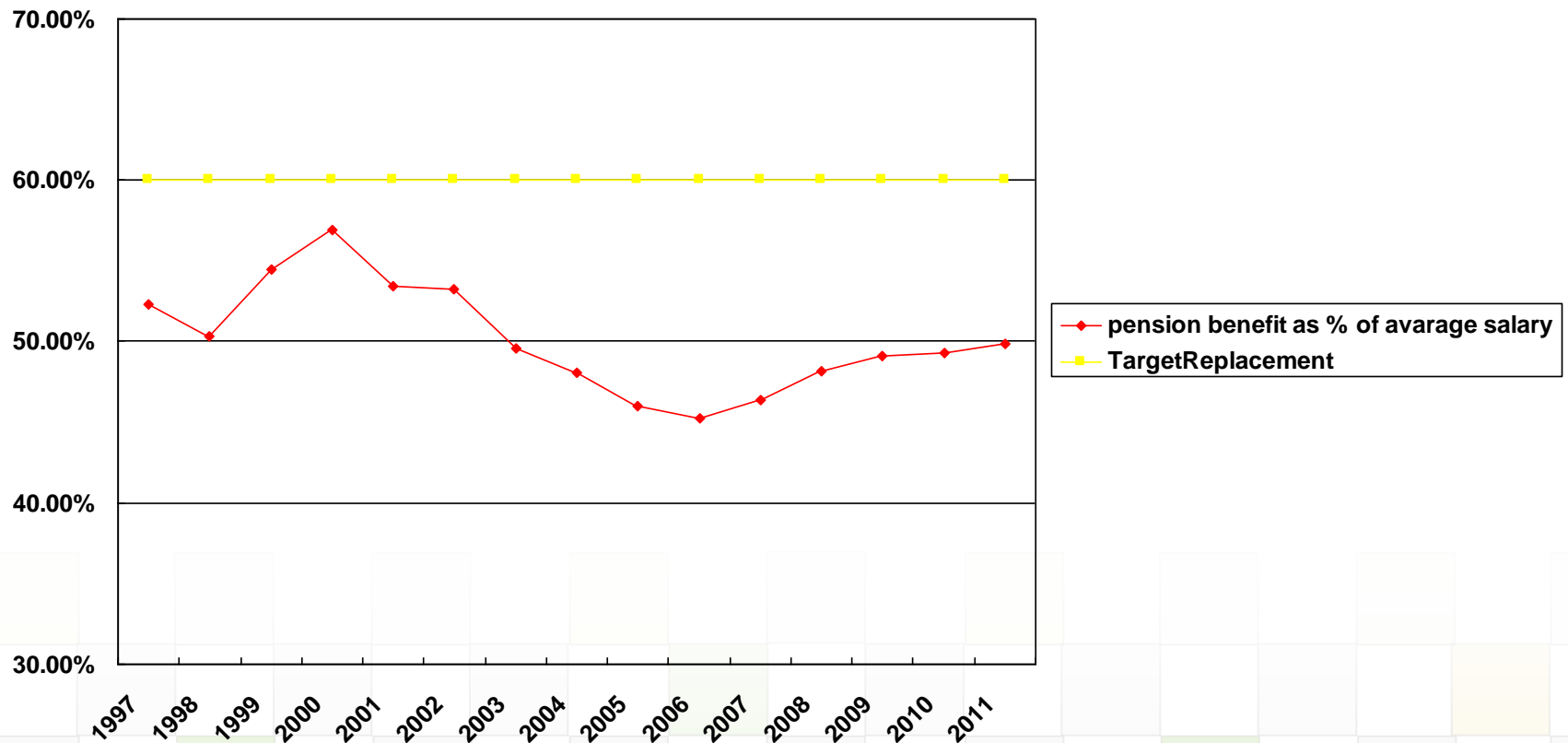
China Plan Observations

Comparison of Realized Increase for Retirement Benefit against The Growth Rate for Benefit Calculation Basis Over Time



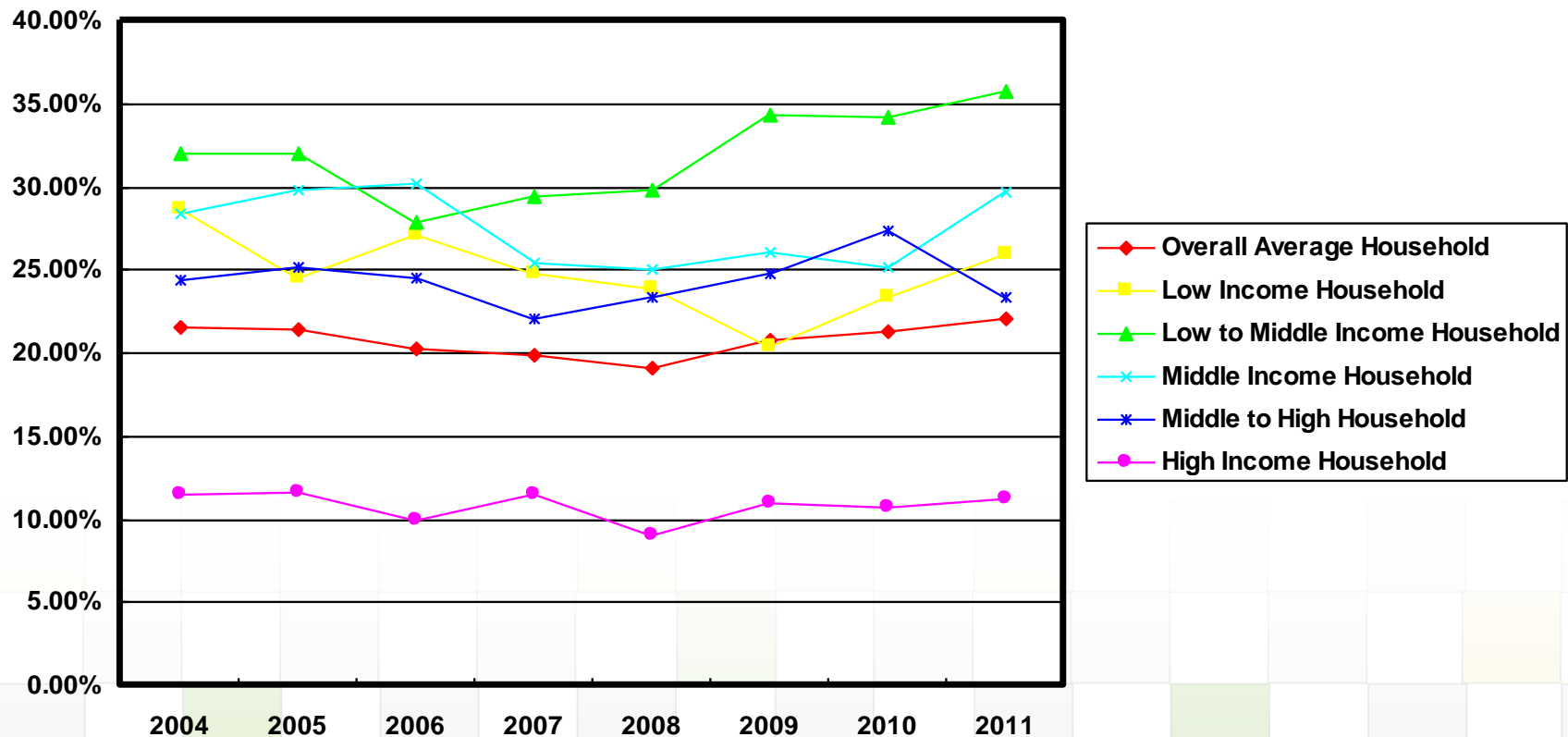
China Plan Observations

Comparison of Realized Replacement Ratio Against Target Replacement Ratio Over Time



China Plan Observations

Pension Received as a % of Disposable Income for Different Income Group Over Time (On a demographic adjusted per capita basis)





Inflation Challenges in China Plan

- **No formal post retirement inflation adjustment**
 - Post retirement inflation adjustment is usually lagging and erratic. 1999 adjustment to reflect 1994-1996 hyperinflation of lowing value of RMB; 2007 adjustment reflect a history record low replacement in 2006 in Shanghai; 2008 to 2010 three years 10% average growth policy required by the State Council. 2011 and 2012 year continued this general guideline, but no guarantee on continuation into future. 2007 adjustment is clearly missing target.
 - With erratic adjustment, the DC component has been losing its function and the value in the eye of existing and future retirees.
- **Poor function of individual account on inflation protection**
 - Current credit rate for individual account provide less effective inflation protection in term of both lagging and running short of inflation rate with a significant possibility.
 - With insufficient credit rate, particularly a widening gap between credit rate and DB benefit basis growth rate along with a deferred retirement age, the individual account runs less chance to achieve its target purpose on replacement ratio either. The IA design at existing condition makes retirement age adjustment, if any, less likely to be accepted.
- **Low Income group become more vulnerable to inflation**
 - Inflation produced disproportionate effect on different income groups under current plan design.
 - The replacement ratio improvement for low income group has been substantially denied by scheme 2005, the remaining improvement, if any, depends substantially upon realized IA accrual which is more vulnerable to inflation risk and less likely to achieve its target.

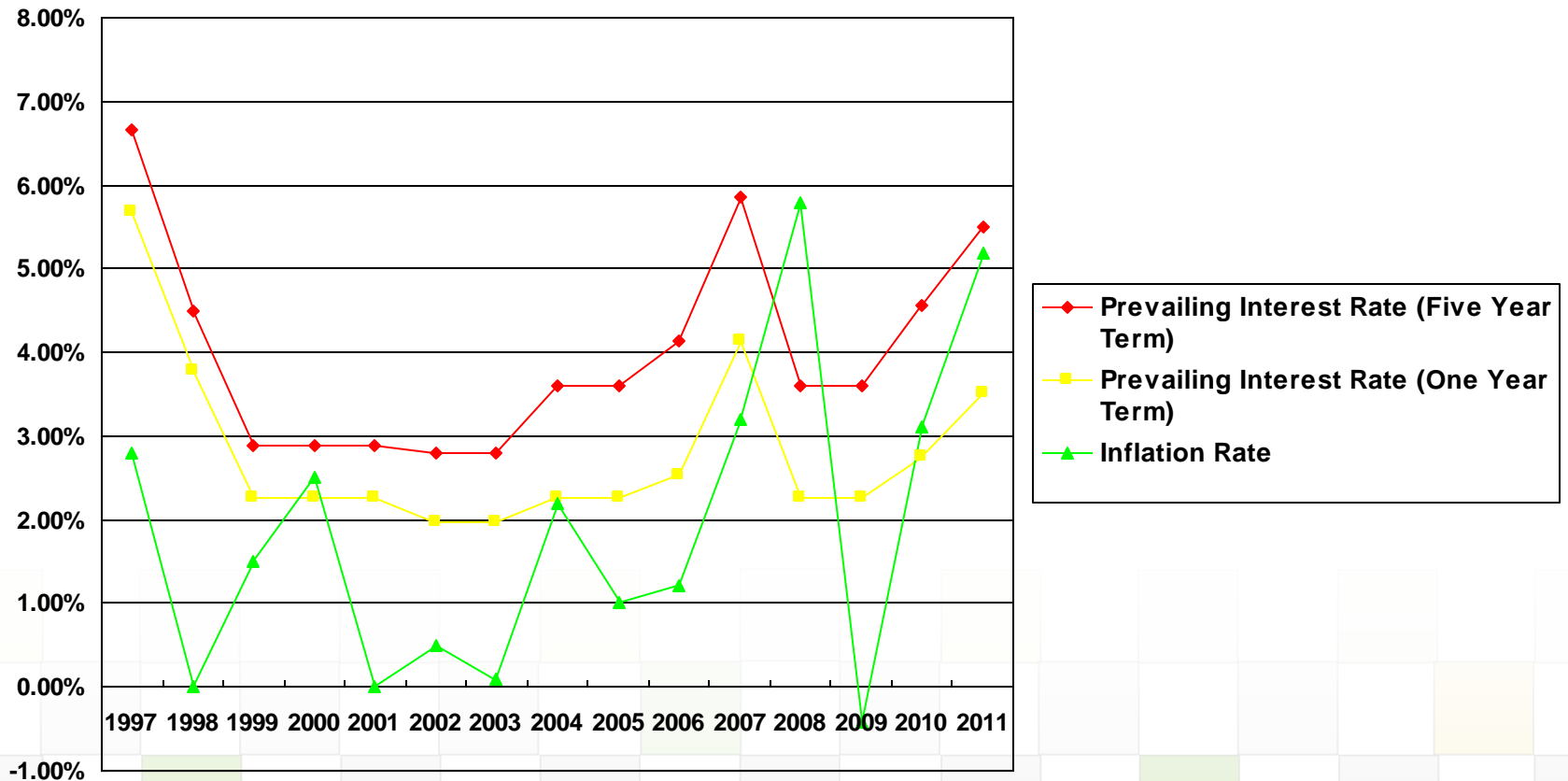


Inflation Challenges in China Plan

- **Interruption in inflation offsetting parameters**
 - Plan transfer present a serious and implied challenge for China Plan.
 - The plan rule on where the participant can receive his retirement benefit is unnecessary complex and the retirement benefit for DB component is finalized at the place where the participant can receive his retirement benefit and based on relevant parameters at that place.
 - The expected DB benefit can not be certain until very late or can be subject to manipulation. Will cause conflict and other unintended feedback from participants and local plan sponsor making and receiving transfer. No clear conclusion can be made currently. It involved too many variables of different types and no model so far can work.
 - It's also a man made obstacle to a uniform National Plan in future.
- **Inflation protection for pre funding assets**
 - Both current plan surplus and received assets from plan transfer present a large assets pooling which calls for a smart investment. The Individual Account balance provide additional challenge.
 - To effectively grow the pre-funding assets to support its corresponding DB commitment, it shall achieve the growth rate on average salary, there is no such investment vehicle in the economy.
 - National Social Security Fund may provide a good alternative, but the historical record showed its high volatility and with a great chance of running short of inflation rate. The realized return for National Social Security Fund has been round 5% relatively consistent over years since its establishment in 2000, but not better than 5 years term bank deposit interest rate in most of the time.
 - The market open for inflation protection investment is far under development.

Inflation Challenges in China Plan

Comparison of IA Credit Rate Alternatives Against Inflation Rate Over Time



Checks on Inflation Protection Effectiveness for China Plan

Sample Statistics

	μ	σ	Skewness	σ/μ	Correl with IR	R^2
ASNGR	0.0459	0.0138	0.4486	0.3006	0.1861	0.0346
GRAPE	0.0443	0.0251	1.0142	0.5662	0.4553	0.2073
PIR	0.0120	0.0043	1.8221	0.3621	0.2931	0.0859
EIR	0.0253	0.2033	-0.4707	8.0323	-0.4124	0.1701
GDPGR	0.0462	0.0077	0.3317	0.1658	-0.0438	0.0019
IR	0.0082	0.0080	0.7349	0.9774	1.0000	1.0000

ASNGR=Average Salary Nominal Growth Rate (Year to Year)

GRAPE=Growth Rate for Average Pension Benefit Per Retiree on nominal basis

PIR=Prevailing Interest Rate

EIR=Equity Investment Return

GDPGR=GDP Growth Rate

IR=Inflation Rate



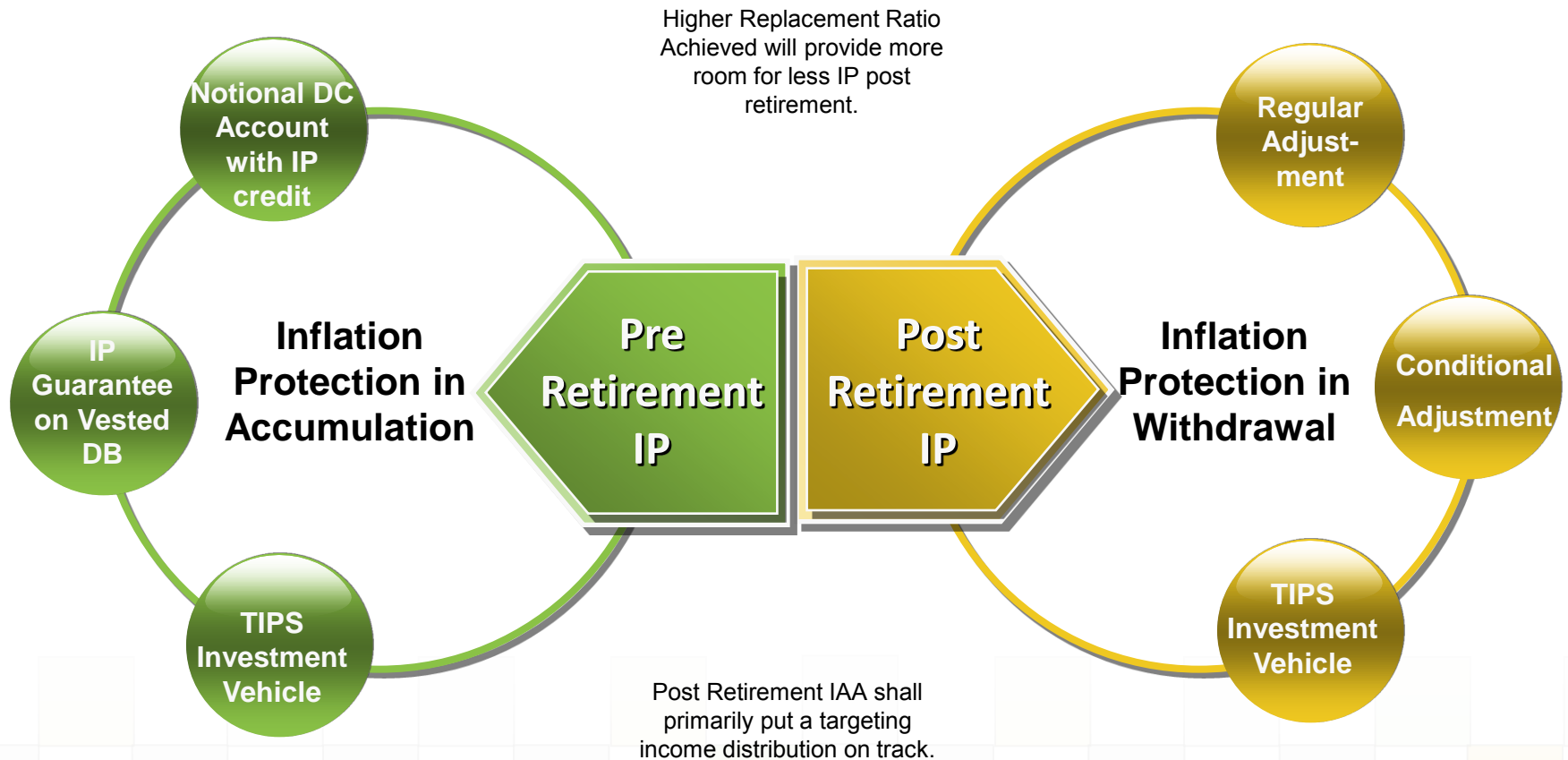
Checks on Inflation Protection Effectiveness for China Plan

Effectiveness Assessment Outcome

	% of Time less than Inflation Rate	Testing on Average Value	Risk from Deviation	Skewness Matching	Ranking
ASNGR	0/15	Yes	Relatively Low	+	2
PIR	4/15	Yes	Relatively Low	+	3
EIR	8/15	Yes	Extremely High	-	4
GDPGR	All observations in the sample period showed a positive real value GDPGR. So 0/15.	Yes	Extremely Low	+	1

Certain Relationship is Known as regime dependent. The observations above reflect an in-the-sample relationship and may not be persistent out-of-sample, and shall purpose to test the inflation protection effectiveness in the sample period only.

International Experience



Basic Two Types: New IP Parameters or IP Adjustment on Existing Parameters. Each Method have advantages and disadvantage.



Conclusions on China Case

General Comments:

Under current plan segmentation condition, diverse sources of parameters suggest strongly the inflation protection is the first priority due to its overwhelming influence, its significance in avoiding situation worsen and a pre condition to a uniform National Plan.

- Enhance the inflation protection on individual account
 - Provide full inflation protection notional credit rate for IA both pre and post retirement , or
 - Credit rate using rolling over average of five year term bank prevailing deposit interest rate at least for pre retirement.
- Adopt separate accrual and accumulative payment principle for workforce in transition
 - To avoid interruption in inflation offsetting factor, the vested retirement benefit for each plan shall grow as if remaining in the same plan. At retirement, the retirement benefit from each plan can be accumulated and paid out.
 - Leave where to retire irrelevant for retirement benefit to be received.
- Establish appropriate post retirement IAA for DB component
 - IAA rules correspond to different inflation regime.
 - No IAA in depress regime. Full IAA in hyperinflation regime.
 - Decreasing IAA under normal inflation regime. Full adjustment is granted to the portion below certain limit, and decrease for the portion above the limit. For those age of 80+, a special attention shall be also paid to inflation in Medical and Care Cost.
- Increase the opportunity in Inflation Protection Investment
 - TIPS Trial. More useful to post retirement DC. Cannot provide in sufficient amount.
 - Municipal Infrastructure bond.
 - Broaden investment universe which has a desirable GDP growth exposure.
 - Broaden investment universe on real estate sector in open market.



Thank You!

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