Dual and Canary Momentum with Rising Yields/Inflation: Hybrid Asset Allocation (HAA)

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Abstract

Our new Hybrid Asset Allocation (HAA) is a follow-up on our Bold Asset Allocation (BAA). Using BAA as our inspiration, we try to compose a much simpler strategy for retail investors. We aim for a balanced but aggressive strategy and much lower cash-fractions than BAA. An important role for this new strategy is reserved for our 'canary' approach for crash protection, but now combined with traditional dual momentum to arrive at our novel 'hybrid' approach. For HAA, we use a new single canary asset, which asset turns 'bad' (has non-positive momentum) when yields and/or inflation are rising. Combined with traditional dual momentum for our offensive universe (where we replace bad TopX assets by our cash asset), we arrive at cash-fractions for HAA of half that of BAA, while return and return/risk is better than our balanced BAA strategy, with a much simpler model.

1. Introduction

As in our previous asset allocation papers (see Keller 2016-2018 for PAA, VAA and DAA), we distinguish between relative and absolute momentum, both based on the concept of a trend in the price of an asset. Assets are represented here by ETFs, like SPY which is based on the S&P 500 stock index. The price trend of an asset is rising when the momentum measure is positive and non-rising (or 'bad') when it is non-positive. Relative momentum allows us to sort the assets in a universe from low to high momentum (with the 'best' assets on top) while absolute momentum enables us to filter out the bad assets. This combination of absolute and relative momentum is often called 'dual momentum'. See eg. Faber (2013) and Antonacci (2014) and the other literature in section 8.

Besides dual momentum, we consider three universes: the offensive one with 'risky' assets (like equities), a defensive one with 'cash' assets (including bonds) and a third protective (or 'canary') universe, where canary assets with 'bad' momentum result in (more) crash protection.[2] More on our 'canary' concept can be found in our Defensive Asset Allocation paper (DAA, Keller 2018).

Although our Bold Asset Allocation (BAA, see Keller 2022) was very well received (because of its great performance), some readers complained that it was rather complex for retail investors, with three (large) universes (offensive, defensive and canary) and two separate momentum filters (a fast filter for the canary universe and a slow one for the other two universes).

Also the very high cash-fractions (CF: average time spent in defensive mode) of more than 50% for BAA was considered risky in times of rising yields and inflation. It also has a rather high turnover. Finally, in view of the complexity of BAA there is the risk of 'overfitting' where the in-sample results might be better than the future (out-of-sample) results.

Our Bold Asset Allocation (BAA) came in two variants: a balanced one (with Top6 out of a 12-asset risky universe) and an aggressive one (with Top1 out of a 4-asset risky universe). Our new Hybrid Asset Allocation (HAA) strategy aims at just one (balanced *and* aggressive) model with a Top4 out of 8-asset risky universe, using a 'hybrid' combination of traditional dual momentum and a new, single canary asset to lower the cash-fractions. We will also reduce both momentum filters to one type and the size of the defensive universe (to two assets), while still maintaining enough global diversification of the 8-asset risky universe. Besides this *HAA-Balanced* version, we will show that our

[1] We thank Jos vd Berkmortel and Bas Nagtzaam for comments. All errors are ours

[2] This is also called 'cross-asset momentum', see also Allocate Smartly, 2022

hybrid approach also works with larger and smaller risky universes, including one with only SPY. We give a summary of our HAA strategy in section 7.

Finally, in our canary choice for HAA we will take into account the recent (2022) stagflation-like regime with low equity growth and rising yields/inflation, including possible recessions by 'inverted-yield-curves' from FED actions like interest hikes and tapering.

2. Crash-protection by absolute and canary momentum

Before explaining our HAA strategy in more detail, we mention the ETFs (assets) used in HAA, for which we have monthly price (and total return) data[3] from Dec 1969 until Dec 2022:

- US Equities: SPY (SP500), IWM (Small Cap), QQQ (Nasdaq), IDW (Large Cap Value)
- Foreign Equities: VEA (Developed Markets), VWO (Emerging), VGK (Europe), EWJ (Japan), SCZ (Developed Markets Small Cap)
- Alternative Assets: VNQ (US Real Estate), REM (US Mortgage Real Estate), DBC (Commodities), GLD (Gold)
- US Bonds: BIL (1-3m T-Bill), IEF (7-10y Treasury), TLT (20y Treasury), LQD (Investment Grade), HYG (High Yield), TIP (Inflation-Protected Treasury), BND (Total Bond Market)

In most of our strategies (see PAA, VAA and DAA in Keller 2016, 2017 and 2018, resp) as well as in BAA (Keller, 2022) we used a fast crash-protection approach based on early canary signals. Even with Protective Asset Allocation (PAA), effectively using part of the risky universe as canary, we arrived at full crash-protection (100% defensive) when the worst 6 assets of the risky 12-asset universe were bad (ie. had non-positive momentum). With VAA and BAA, we even went to full crash-protection when *any one* of the 4 canary assets became bad.

Because of these very fast crash-protection approaches for PAA, VAA and BAA, the average cash-fraction over time was at least 50%. Therefore, using additional crash-protection based on dual momentum, ie. on the (very late) absolute momentum (replacing bad assets in eg. the Top6 by 'cash') was often completely superfluous: the early canary signals already had taken the strategy into 100% defensive (cash) mode.

With our new Hybrid Asset Allocation (HAA), we will 'dim' the canary signal in order to make dual momentum more useful for crash-protection. In fact, for HAA we rely on a 'hybrid' combination of 'traditional' dual momentum and a 'new' canary momentum based on the trend of a single asset (see next section). The result is a very low average cash-fraction.

To arrive at a 'balanced *and* aggressive' strategy for HAA, we will use an equal-weight Top4 selection which can be viewed as both balanced and aggressive, being the compromise of the BAA balanced Top6 (out of 12 risky assets) and aggressive Top1 (out of 4 risky assets). In general, the smaller the number of assets in the TopX selection, the more aggressive and the less balanced the strategy will be. We consider a Top4 to be a good compromise between a balanced and an aggressive allocation.

Given our Top4 choice, we choose for an 8-asset instead of a 12-asset offensive universe, since smaller universes will improve the effectiveness of absolute momentum based crash protection. The reason is that with a 12-asset risky universe we need more than 8 bad assets (two-third) before some Top4 assets are replaced by cash, while this is only more than 4 bad assets (half) in case of the

[3] For the early years we used index data which we adjusted for fees etc by ETF calibration (see Keller, 2016).

8-asset universe. Choosing the Top half of the risky universe (T=N/2) often provides the best balance.

So, the Top4 of the risky assets should come out of an 8-asset offensive (risky) universe. And to have some (global) diversification for this balanced HAA-8, we will use 4 types of asset *classes* (US and Foreign equity, Alts and Bonds) with two assets (ETFs) per class for broad diversification in our 8-asset offensive (risky) universe. This also gives us some simple *diversification* with never more than two assets per asset class in our Top4[4], which is based solely on 'best' momentum. Each asset class in our balanced 8-asset HAA universe is populated with the two most typical and diversifying ETFs from the list of available ETFs above: US Equities (SPY, IWM), Foreign Equities (VEA, VWO), Alternative Assets (VNQ, DBC) and US Treasury Bonds (IEF, TLT).[5]

Given the Top4 selection, we will demonstrate the effect of the size of the risky universe on absolute momentum by comparing this 8-asset risky universe against one with 12 risky assets. The 12-asset universe is a superset of our HAA 8-asset Offensive universe (SelO in figs 1 and 2), see also section 5. In fig 1 and 2 we look at the average Cash-Fraction (CF) over the 50+ year Full-Sample (FS) of both universes, where we use only dual momentum for crash protection with the chosen Top4 (TO=4), so without our canary approach.

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-5.1%	6.3%	7.5%	0.0%	-1.43	-0.85	44.2%	-14.5%
R10	Dec 12	Dec 22	8.7%	15.7%	10.0%	4.7%	1.29	0.81	6.6%	7.8%
R20	Dec 02	Dec 22	11.0%	16.3%	11.2%	5.7%	1.64	0.88	3.9%	7.4%
P32	Dec 70	Dec 02	17.4%	25.7%	14.1%	0.0%	1.57	0.76	1.7%	10.4%
FS	Dec 70	Dec 22	15.0%	25.7%	13.1%	0.0%	1.59	0.80	2.6%	9.3%
SelO=	**SPY, QQQ, IWM, VGK, EWJ, VWO, VNQ, DBC, GLD, IEF, TLT, LQD**								D6040=	29.3%
SelD=	**BIL**								TOver=	291%
									TrM=	8.6
NO=12, TO=4, ND=1, TD=1, L=1, TC=0.1%										

Fig 1 Crash-protection (see CF/FS) by absolute momentum in the Top4 of a 12-asset risky universe

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-2.7%	5.2%	6.7%	0.0%	-1.21	-0.57	55.8%	-14.5%
R10	Dec 12	Dec 22	8.0%	11.9%	9.2%	5.5%	1.42	0.80	10.7%	7.8%
R20	Dec 02	Dec 22	11.8%	11.9%	10.1%	8.1%	2.41	1.06	8.0%	7.4%
P32	Dec 70	Dec 02	14.6%	27.9%	11.4%	0.0%	1.33	0.69	4.8%	10.4%
FS	Dec 70	Dec 22	13.6%	27.9%	10.9%	0.0%	1.67	0.83	6.0%	9.3%
SelO=	**SPY, IWM, VWO, VEA, VNQ, DBC, IEF, TLT**								D6040=	29.3%
SelD=	**BIL**								TOver=	228%
									TrM=	7.2
NO=8, TO=4, ND=1, TD=1, L=1, TC=0.1%										

Fig 2 Crash-protection (see CF/FS) by absolute momentum in the Top4 of an 8-asset risky universe

Here, we will use the same L=1 momentum filter (13612U) as in section 4, where the 'hybrid' approach will be introduced further, and with only BIL as Defensive asset (ND=1, TD=1) for simplicity

[4] While for a Top4 selection out of a 4x3=12 asset risky universe this limit is 75% (instead of 50% for HAA-8)
[5] Eg. we choose IEF and TLT as the most typical and most diversifying bonds (lowest correlation wrt. SPY).

(the results for CF do not change for other cash choices). Besides the Full Sample (FS: Dec 1970 - 2022) we also distinguish the Recent 1, 10 and 20 years (periods R1, R10, R20), and the Past 32 years (period P32: Dec 70 – Dec 2002), see figs 1, etc.

As is clear from fig 1 and 2, the average full-sample cash-fraction CF/FS (and therefore the average rate of crash-protection) is more than double (6% vs 2.6%) in the 8-asset risky case (NO=8) than in the larger 12-asset universe (NO=12). Also risk in terms of (annual) volatility V is better for all 5 periods for the 8-assetc risky universe (as are the return/risk statistics UPI and SR for recent years). We will discuss all the other statistics in these 'heavy' tables in more detail in the next sections.

In conclusion, for HAA to arrive at a balanced *and* aggressive strategy, we opt for a Top4 selection of best assets out of an 8-asset risky universe.

3. Rising yields/inflation and the canary universe

For BAA, we used a global 4-asset *canary* universe (SPY, VWO, VEA, BND) with very fast crash-protection (B=1): only when *all* four canary assets show positive momentum we selected the best risky assets, otherwise (when one or more canary assets were 'bad') we go 100% to 'cash'.

As a result the BAA cash-fraction over the full sample was nearly 60%, so the BAA model spent most of its past in the defensive mode, with high rate-sensitive assets like long duration government bonds. With decreasing yields (and rising prices) from 1980, that worked well for say 40 years (see fig 3), but that changed when the decline in rates stopped in recent years, in particular in 2022 when the FED started hiking rates quickly (fig 3) in order to fight the sharply increasing inflation. This to slow the economy and therefore to dampen the inflation.

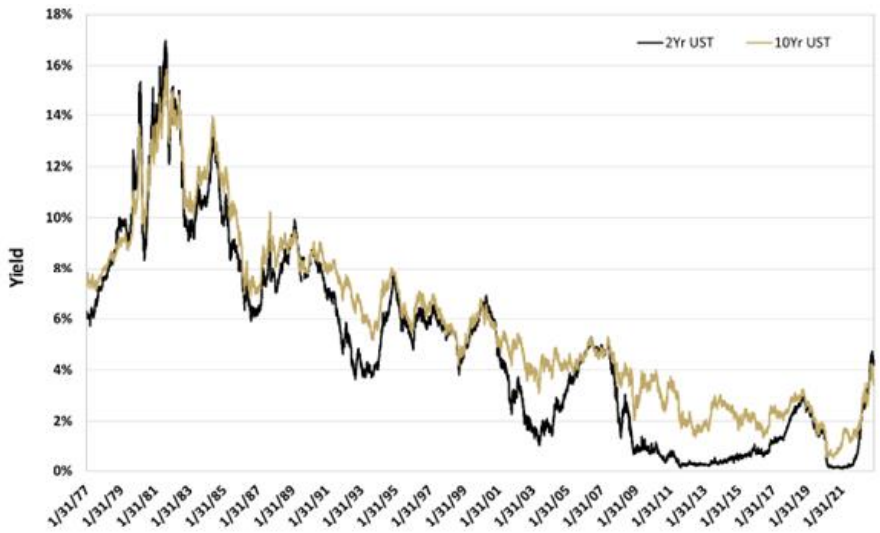

Fig 3 Yields of 2y & 10yr US Treasuries from Dec 1976 to Dec 2022 (Simplify, 2022).

When the FED hikes interest rates, it is mainly the short-term (0-2 years) yields which are affected. This gives the risk of *inverted* yield curves where long-term yields becomes lower than short term yields after FED hikes. Often these inverted yield curves are indicators for later recession (see fig 4).

The traditional view on crash-protection is often based on 'bad' (ie. non-positive) momentum of risky assets, like bad momentum for SPY, VEA or VWO. For BAA (and VAA/DAA) we also used (in

addition to these three risky canary assets) bad momentum of the bond market (BND) as crash-protection signal, since an increasing yield results in a decreasing price for bonds.

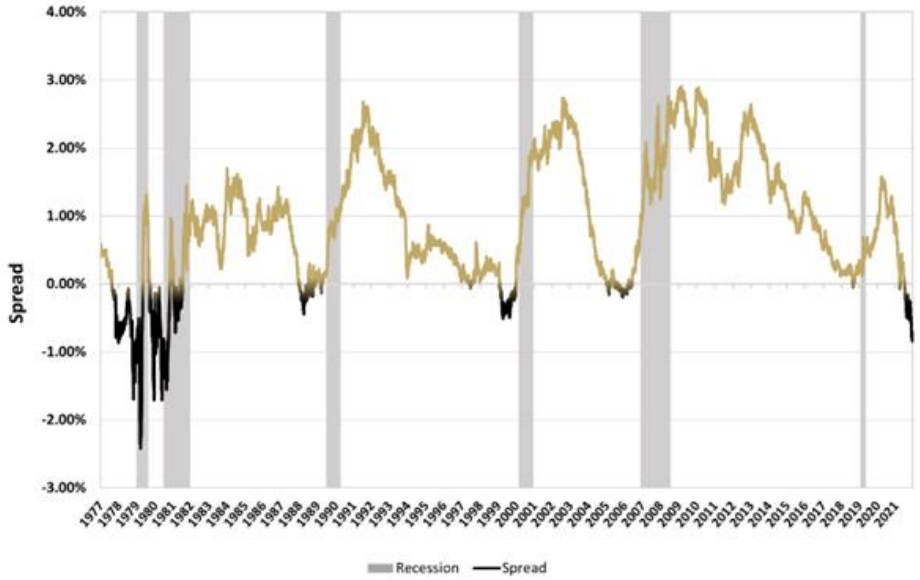

Fig 4 Spread between 2y & 10y US Treasury Yields from Dec 1976 to Dec 2022 (Simplify, 2022)

For HAA, we will extend the early crash warning effect to include (beside rising yields) also rising (expected) inflation as canary (and FED rate hike) signal by using *TIP* (the inflation-protected U.S. Treasury bond) as canary asset. Notice that the price of this ETF will go down (become 'bad') with rising yields and/or rising (expected) inflation. And since we strived for simplicity for HAA, we will use *only* TIP as canary, so the protection universe of HAA has just a *single* canary asset (NP=1).

In fig 5 we show TIPs momentum, with non-positive values (at or below the red line) in 1973, 1980-1981, 1984, 1987-1988, 1994-1995, 1997, 2006, 2008, 2009, 2013-2015, 2017-2018, and 2022, for a total of 84 months (13.4%, see also fig 15) over the full sample of 624 months (52 years). In the next section we will show the performance of HAA incorporating the single canary ETF TIP combined with dual momentum of the risky universe assets.

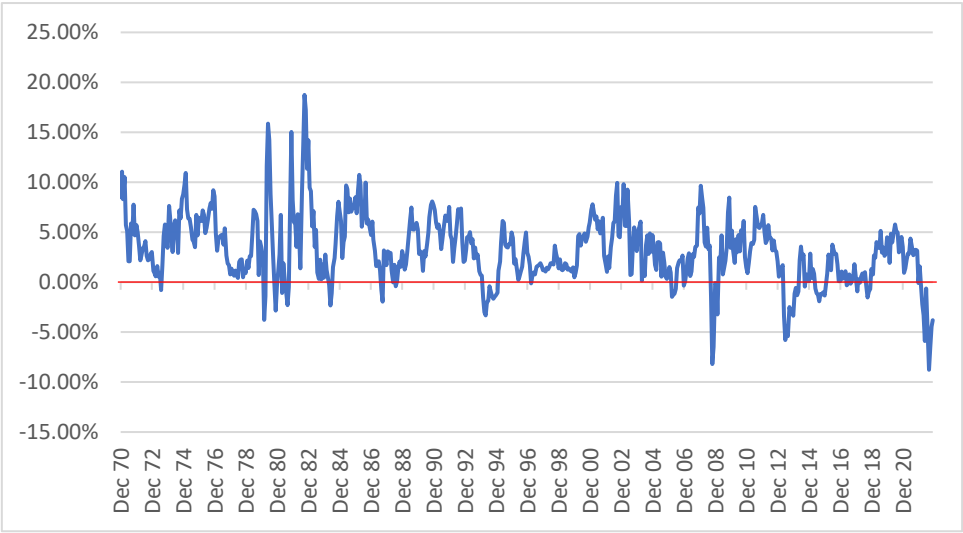

Fig 5 The 13612U-momentum of TIP

4. Putting the building blocks together: the balanced Hybrid Asset Allocation

As said, our *hybrid* strategy combines 'traditional' dual momentum crash protection with our 'new' canary approach. As discussed, we have already decided on a risky (offensive) universe with Top4 out of a global 8-asset universe, crash protection by means of dual momentum (replacing bad risky assets by cash in the Top4) and a canary (or protection) universe with only one asset, TIP (NP=1). To arrive at our final Hybrid Asset Allocation, we only need to decide on the momentum measure(s) used and the composition of the defensive universe. We start with the latter.

In BAA we used a very large defensive (cash) universe with a defensive Top3 selection (plus absolute momentum replacing defensive assets by BIL when they had a lower momentum than BIL). In view of our desire for a simple design (and also because we look for simple replacements for bad risky assets in the Top4), we will chose a defensive universe with only two assets BIL and IEF of which the best (in terms of momentum) is chosen as 'cash' to achieve c(r)ash-protection (ND=2, TD=1).

Now for the momentum measure(s). For BAA we used the *slow* SMA(12) filter (denoted as L=12 in the figs) for both the offensive (risky) *and* the defensive (cash) universe and the very *fast* 13612W filter (denoted as LP=0) for the protection (canary) universe. [6]

Since we strive for simplicity, we will only use the *unweighted* 13612U momentum (average total return over the past 1, 3, 6, 12 months, denoted as L=1) for each of the offensive, the defensive, *and* the protection universes. This filter is less fast than the 13612W, but faster than the SMA(12) filter used in BAA, therefore in our pursuit for simplicity we consider 13612U a good compromise. It is also the momentum filter used for GAA (Faber, 2013), EAA/CAA (Keller, 2015) and GPM (Keuning, 2016).

Using the 8-asset Offensive (risky) universe (NO=8), with a balanced Top4 selection (TO=4) and BIL/IEF as Defensive (cash) universe with Top1 (ND=2, TD=1), a protective (canary) universe with only TIP (NP=1) and a 13612U trend filter (L=1) for momentum on *all* three universes, we arrive at fig 6, which we will call the HAA-8 or **HAA-Balanced** strategy (with Global8 and Top4 or G8/T4).

In this (and similar) tables for the respective periods, R stands for the yearly compounded return (CAGR), D is the maximum (monthly) drawdown, V is annual volatility, UPI is the Ulcer Performance Index (see Martin, 1987) and SR stands for the well-known Sharpe Ratio.

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	2.7%	2.8%	5.5%	2.5%	1.41	0.27	86.5%	-14.5%
R10	Dec 12	Dec 22	8.5%	6.4%	7.7%	7.2%	3.40	1.02	36.8%	7.8%
R20	Dec 02	Dec 22	12.1%	9.7%	9.4%	9.2%	3.83	1.17	24.4%	7.4%
P32	Dec 70	Dec 02	18.2%	9.2%	9.3%	14.0%	6.05	1.23	11.9%	10.4%
FS	Dec 70	Dec 22	15.9%	9.7%	9.4%	12.0%	4.88	1.21	16.7%	9.3%
SelO=	**SPY, IWM, VWO, VEA, VNQ, DBC, IEF, TLT**								D6040=	29.3%
SelD=	**BIL, IEF**								TOver=	275%
SelP=	**TIP**								TrM=	7.0
NO=8, TO=4, ND=2, TD=1, NP=1, L=1, TC=0.1%										

Fig 6 HAA-Balanced (G8/T4)

[6] The 13612W filter (denoted L=0) used in BAA is the average *annualized* total returns, so with Weights 12, 4, 2 and 1 for 1, 3, 6, and 12 months, resp. The 13612U filter (denoted L=1) used in HAA is simply the (Unweighted) average total returns over the last 1, 3, 6 and 12 months. SMA(12) averages prices with max lag 12 months.

Besides UPI and SR, we will use our own return/risk measure K25, which attenuates R by D such that K25= 0% when D=25%.[7] TOver and TrM stands for yearly turnover and the average number of 'Trading Months' per year on FS, resp., while we assume a one-way transaction costs of 0.1% (=TC). We also show R and D for the 60/40 (SPY/IEF) benchmark (see R/D6040 and also fig 16).

We already discussed CF as the average Cash-Fraction over a period, ie. the fraction the strategy is in defensive ('cash') mode. Notice that bad canary TIP in one month always results in 100% cash, while absolute momentum (replace bad Top4 asset by cash) often results in 'fractional' cash per month (eg CF=25% when 1 out Top4 is bad), unless all Top4 assets are bad.

Fig 7 shows the (log) equity and drawdown graphs for HAA-Balanced compared to the 60/40 (SPY/IEF) benchmark. The equity line is rising in recent years where the benchmark takes a hit. Notice that the relative HAA/6040 price (yellow line) is nearly flat or rising most of the time, indicating that the return of HAA-Balanced is at least as good as that of the 6040 benchmark for most multi-year periods. The drawdown graph shows a max D for HAA-Balanced less than 10% over the full sample.

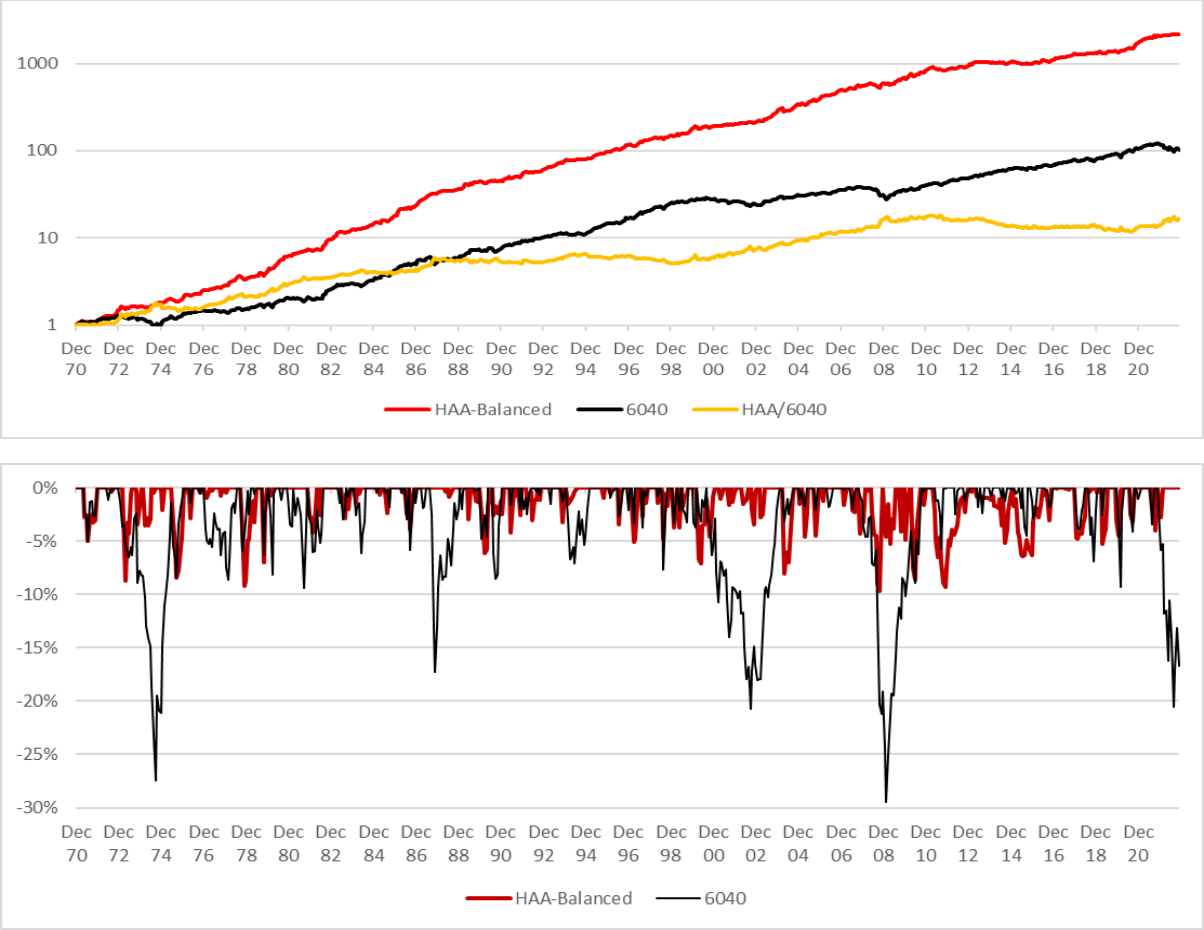

Fig 7 Equity and Drawdown line of HAA-Balanced (vs 60/40)

When we compare HAA-Balanced (fig 6) with BAA-Balanced (fig 8) it is clear that HAA is less complex than BAA-Balanced (with smaller universes, single momentum L=LP, and lower CF). For nearly all

[7] The formula is K25= R (1– 2D/(1-2D)) for R>=0 and D<=25%, else K25=0% (see also Keller, 2017 and TrendXplorer, 2018). Example: with R=20% and D=10%, K25=15%

periods, HAA turns out to be better in terms of return R (so more aggressive) and return/risk (see K25, UPI and SR). Notice the low CF=16.7% and turnover TOver=275% on FS for HAA (fig 6) compared to 57.4% and 472%, resp., with BAA-Balanced (fig 8).

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	0.6%	7.7%	6.4%	0.5%	-0.15	-0.09	92.3%	-14.5%
R10	Dec 12	Dec 22	7.1%	7.7%	6.6%	5.8%	2.32	0.98	62.0%	7.8%
R20	Dec 02	Dec 22	11.5%	8.7%	8.7%	9.1%	3.88	1.20	53.5%	7.4%
P32	Dec 70	Dec 02	16.1%	8.3%	8.3%	12.9%	5.42	1.13	60.0%	10.4%
FS	Dec 70	Dec 22	14.4%	8.7%	8.5%	11.4%	4.58	1.16	57.4%	9.3%
SelO=	**SPY, QQQ, IWM, VGK, EWJ, VWO, VNQ, DBC, GLD, TLT, HYG, LQD**								D6040=	29.3%
SelD=	**DBC, BIL, IEF, TLT, LQD, BND, TIP**								TOver=	472%
SelP=	**SPY, VWO, VEA, BND**								TrM=	8.2
NO=12, TO=6, ND=7, TD=3, NP=4, B=1, L=12, LP=0, TC=0.1%										

Fig 8 BAA-Balanced (G12/T6)

Since 'Hybrid' in HAA refers to 'traditional' absolute momentum combined with 'new' canary momentum, it is interesting to see the balance between these two cash-protection mechanisms in HAA. Since cash-protection by *only* absolute momentum results in CF=6% on FS (see fig 2) and by *only* canary TIP in CF=13.4% (see fig 15) for a total of 19.4%, there is 2.7% (= 19.4-16.7%, see fig 6) overlap where the combination of *both* absolute momentum *and* canary momentum are active as cash-protection.

In other words, nearly half of the absolute momentum crash-protection signals (from the bad assets in the Top4) are also 'predicted' by our single canary asset TIP. And even with our optimal Top4 (out of 8 assets) selection for absolute momentum crash-protection (measured here by CF, see figs 1 and 2), the effect of the canary protection alone equals 10.7% in HAA (13.4% minus 2.7% overlap), much more than the 3.3% (6.0% in fig 2 minus 2.7% overlap) of absolute momentum alone. [8]

Notice that this balance might be different for other choices of TopX and risky universe compositions: see section 5 and in particular section 6 (the case of only SPY as a single risky asset). Remember that without absolute momentum the canary TIP effect is *always* 13.4% on FS, given the trend filter L=1, but independent of the choice of the offensive and defensive universe (see fig 5).

5. The robustness of HAA

Although the main result for our Hybrid Asset Allocation is the HAA-Balanced (G8/T4) strategy shown in fig 6 above, we will check its robustness in this section and see how HAA performs with other risky universes. To maximize the effect of absolute momentum, we will select a TopX with half the size of the Offensive (risky) universe (X=NO/2, see also section 2).

For diversification reasons, all universes will have 4 asset *classes* (US equities, Foreign equities, Alternative assets and Bonds) like HAA-8, therefore we consider four risky universes with 16 (4x4), 12 (4x3), 8 (4x2) and 4 (4x1) risky assets, see figs 9, 10, 6 (HAA-8) and 11, resp.

[8] Actually, even *without* the additional crash protection and with *only* canary TIP, the results for HAA-8 are slightly better for the early 30 years. But this might be just luck, since this does not hold for most of the other risky universes tested (see figs 9-12, and 15), so we stick to the hybrid strategy for more robustness.

We will start with our 'super' universe of NO=16 (global) risky ETFs (see dataset in section 2), and select smaller universes based on the most typical and most diversifying ETFs per asset class (see section 2). We will also examine a special case (SPY only) in the next section.

In terms of robustness of HAA, we think the results speak for themselves, with (on FS) return R larger than 14% and max drawdown D less than 14% for all four HAA universe tested (HAA-16, 12, 8 and 4). Also, the degree of crash-protection (CF/FS range 16.1-17.6%) and annual turnover (TOver range 267-281%) for all these four universes are very similar. So, we conclude that our results for HAA-8 are similar for these four different risky universes (with four global asset classes).

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-0.7%	4.9%	5.8%	0.0%	-0.76	-0.33	87.5%	-14.5%
R10	Dec 12	Dec 22	6.8%	13.1%	7.8%	4.4%	1.94	0.80	36.6%	7.8%
R20	Dec 02	Dec 22	9.9%	13.1%	9.0%	6.4%	2.50	0.98	24.6%	7.4%
P32	Dec 70	Dec 02	18.4%	10.0%	9.3%	13.8%	5.06	1.26	12.2%	10.4%
FS	Dec 70	Dec 22	15.1%	13.1%	9.2%	9.8%	3.73	1.15	17.0%	9.3%
SelO=	**SPY, QQQ, IWM, IWD, VGK, EWJ, VWO, SCZ, VNQ, REM, DBC, GLD, IEF, TLT, HYG, LQD**								D6040=	29.3%
SelD=	**BIL, IEF**								TOver=	281%
SelP=	**TIP**								TrM=	9.5
NO=16, TO=8, ND=2, TD=1, NP=1, L=1, TC=0.1%										

Fig 9 HAA-16

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-0.4%	5.0%	6.1%	0.0%	-0.69	-0.26	87.2%	-14.5%
R10	Dec 12	Dec 22	8.2%	5.0%	7.2%	7.3%	3.84	1.05	36.0%	7.8%
R20	Dec 02	Dec 22	11.1%	8.3%	8.8%	8.9%	3.96	1.13	23.6%	7.4%
P32	Dec 70	Dec 02	19.0%	10.7%	9.9%	13.8%	4.83	1.24	11.3%	10.4%
FS	Dec 70	Dec 22	15.9%	10.7%	9.6%	11.6%	4.50	1.19	16.1%	9.3%
SelO=	**SPY, QQQ, IWM, VGK, EWJ, VWO, VNQ, DBC, GLD, IEF, TLT, LQD**								D6040=	29.3%
SelD=	**BIL, IEF**								TOver=	275%
SelP=	**TIP**								TrM=	8.4
NO=12, TO=6, ND=2, TD=1, NP=1, L=1, TC=0.1%										

Fig 10 HAA-12

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-1.2%	7.3%	8.9%	0.0%	-0.69	-0.27	84.6%	-14.5%
R10	Dec 12	Dec 22	7.4%	9.2%	8.5%	5.8%	1.90	0.81	36.4%	7.8%
R20	Dec 02	Dec 22	10.4%	12.1%	9.8%	7.1%	2.27	0.94	25.5%	7.4%
P32	Dec 70	Dec 02	17.1%	13.7%	9.9%	10.7%	3.87	1.06	12.6%	10.4%
FS	Dec 70	Dec 22	14.5%	13.7%	9.9%	9.1%	3.04	1.02	17.6%	9.3%
SelO=	**SPY, VEA, VNQ, IEF**								D6040=	29.3%
SelD=	**BIL, IEF**								TOver=	267%
SelP=	**TIP**								TrM=	4.3
NO=4, TO=2, ND=2, TD=1, NP=1, L=1, TC=0.1%										

Fig 11 HAA-4

6. HAA-Simple

And finally, in fig 12 we will look at a very special HAA case with only *one* risky asset SPY (NO=TO=1).[9] Notice the highest cash fraction of all HAA strategies here (CF/FS=29.8%), since Top1 equals 100% of the risky universe (see section 2). So absolute momentum (of SPY) now adds 29.8 - 13.4% (see also fig 15) = 16.4% to the canary crash-protection by TIP, much more than with eg. HAA-8.

We will call this special version with only SPY the **HAA-Simple** (or HAA-1) strategy. Note that even this simple version of HAA (with only SPY as risky) has returns R and drawdowns D substantial better than the 60/40 benchmark (see fig 16) for *all* periods (including R/FS= 12.8% vs. 9.3% for 60/40) and impressive return/risk statistics, in particular for the most recent 10 years (see UPI/R10 = 5.60).

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-0.8%	5.7%	6.8%	0.0%	-0.73	-0.30	84.6%	-14.5%
R10	Dec 12	Dec 22	12.5%	8.2%	9.2%	10.0%	5.60	1.30	38.0%	7.8%
R20	Dec 02	Dec 22	10.8%	16.6%	9.4%	5.4%	2.73	1.03	32.4%	7.4%
P32	Dec 70	Dec 02	14.1%	16.4%	11.7%	7.2%	1.66	0.63	28.3%	10.4%
FS	Dec 70	Dec 22	12.8%	16.6%	10.9%	6.5%	2.02	0.76	29.8%	9.3%
SelO=	**SPY**								D6040=	29.3%
SelD=	**BIL, IEF**								TOver=	184%
SelP=	**TIP**								TrM=	1.8
NO=1, TO=1, ND=2, TD=1, NP=1, L=1, TC=0.1%										

Fig 12 HAA-Simple (SPY only)

In Fig 13 we show the (log) equity and drawdown graphs for HAA-Simple compared to the 60/40 benchmark. Notice that the equity line has an upswing in recent years where the benchmark takes a hit. The relative HAA/6040 price (yellow line) is nearly flat or rising most of the time, indicating that the return of HAA-Simple is at least as good as that of the 6040 benchmark for most multi-year periods, while it shows some tops (eg. in 1988 and 2009) corresponding with benchmark bottoms.

The drawdown graph shows a max drawdown D of 16.6% over the full sample for HAA-Simply (the benchmark had D/FS= 29.3%), while HAA-Balanced had an even smaller D/FS= 9.7%. However, annual turnover over FS and especially the average number of Trading Months per year for HAA-Simple (TrM/FS= 1.8) are *much* less than for HAA-Balanced (with TrM/FS= 7.0).

So, we conclude that the 'hybrid' combination of dual and canary momentum for crash protection also appears to work even for HAA-Simple with only SPY as risky asset (see fig 12), as it did for various other choices of larger risky universes (see section 5).[10] And in view of the low average two trading months a year (TrM/FS= 1.8), HAA-Simple might also be of special interest for *lazy* retail investors.

[9] We also considered the HAA-2 strategy with risky SPY and IEF (NO=2) with Top1 (TO=1) as a tactical alternative for 60/40. This model (with R/D= 11.6/15.5% on FS) turns out slightly less offensive as the SPY-only strategy and with a ca 40% higher turnover and trading.

[10] However, the choice of SPY is somewhat special, since HAA-1 with other eg. Nasdaq QQQ instead of SPY had much larger drawdowns (D/FS=27.7%), but also much greater returns (D/FS=15.3%) than HAA-Simple.

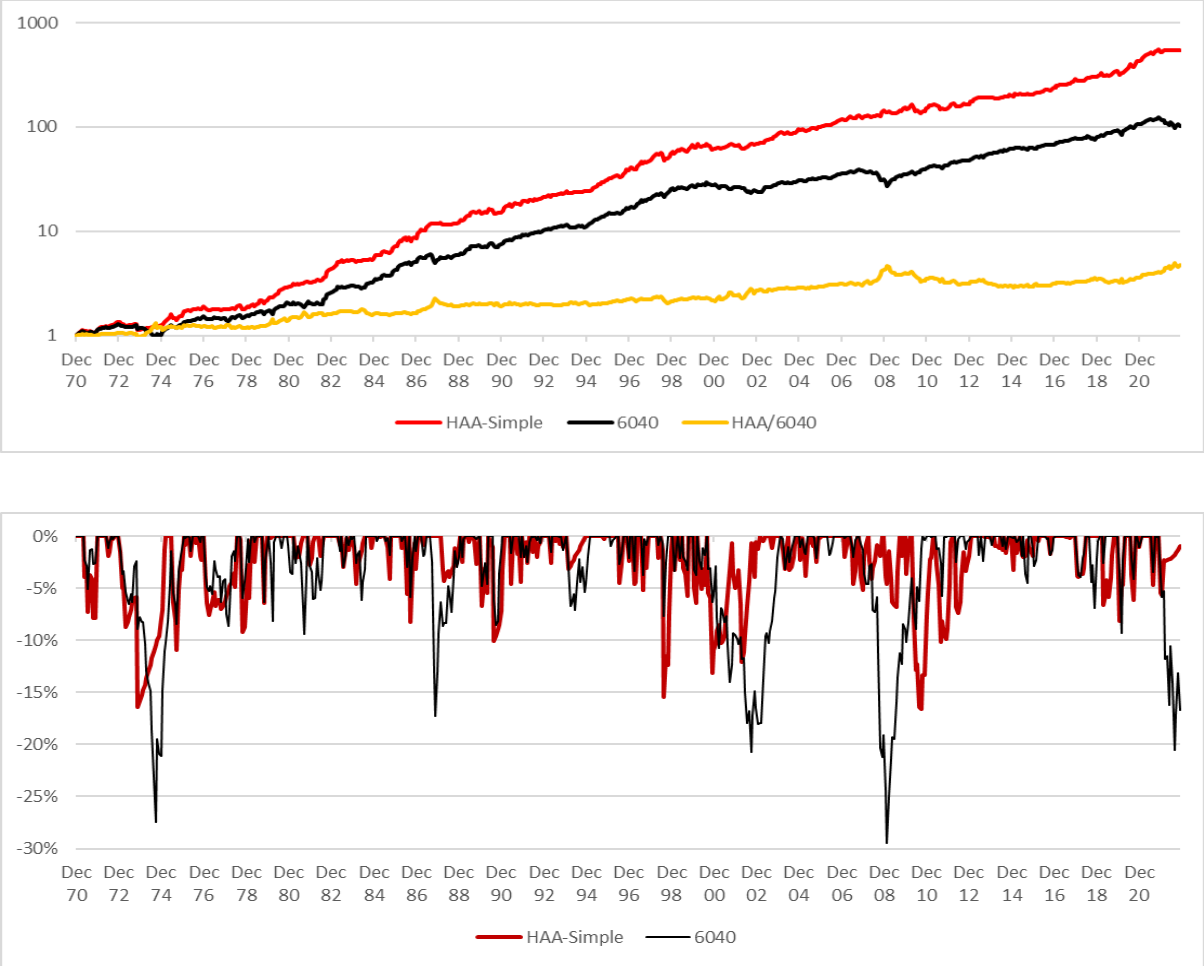

Fig 13 Equity and Drawdown line of HAA-Balanced (vs 60/40)

Finally, as an encore, notice that the absolute momentum part of HAA-Simple is very similar to the traditional SMA10 strategy momentum but now with the 13612U momentum.[11] Therefore it is interesting to look at the contributions with regards to crash protection of the absolute momentum and the TIP canary separately in more detail (as we did for HAA-8).

First, in fig 14 we look at the SPY-only strategy with *no* TIP canary, so *only* absolute momentum (based on 13612U momentum) for crash-protection. We see that crash-protection is substantial (CF=21% on FS) but not enough to keep max drawdown low on the full sample: D/FS=25.2% (with D6040/FS= 29.3%). Except for period R1y, return/risk is not *too* bad while return R is clearly better for all periods than 60/40.

Second, in fig 15 we look at the same SPY strategy with *only* the TIP canary as crash-protection, so *without* absolute momentum. Although all returns are (much) better than 60/40 (see fig 15), max drawdown D on FS now equals a quite painful 44.7% (in Sep 2008). In fig 15 we also see that eg CF = 13.4% on FS (with only TIP canary), corresponding with the non-positive (13612U) momentum occurrences of TIP in fig 5. These CF figures (see all periods in fig 15) holds for *all* our HAA variations (risky universes) when absolute TopX momentum is not taken into account for crash protection, so *only* canary based crash protection (with L=1 momentum).

[11] The result for HAA-1 with 13612U replaced by SMA10 shows R/D= 11.6/17.3% and CF= 34.7% on FS.

Notice that for HAA-Simple there is a 4.4% *overlap* where TIP crash-protection coincides with absolute momentum (see CF= 13.4% in fig 15 plus 20.8% in fig 13 equals CF= 34.2%, while HAA-Simple has CF= 29.8% in fig 12).

In conclusion, absolute momentum (of SPY) alone now adds (29.8% fig 12 - 13.4% fig 15 - 4.4% overlap =) 12.0% to the canary crash-protection by TIP, much more than the 3.3% of HAA-8 (see section 4). This is the result of a (small) risky universe with TO=NO (see also section 2).

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-10.4%	13.2%	11.4%	0.0%	-1.05	-1.01	69.2%	-14.5%
R10	Dec 12	Dec 22	10.9%	13.7%	11.4%	6.8%	1.77	0.91	14.0%	7.8%
R20	Dec 02	Dec 22	10.0%	16.6%	10.6%	5.0%	1.69	0.84	18.3%	7.4%
P32	Dec 70	Dec 02	12.1%	25.2%	13.1%	0.0%	0.75	0.42	22.6%	10.4%
FS	Dec 70	Dec 22	11.3%	25.2%	12.2%	0.0%	1.03	0.56	20.8%	9.3%
SelO=	**SPY**								D6040=	29.3%
SelD=	**BIL, IEF**								Tover=	140%
									TrM=	1.4
NO=1, TO=1, ND=2, TD=1, NP=0, L=1, TC=0.1%										

Fig 14 HAA-Simple, without TIP canary

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-0.8%	5.7%	6.8%	0.0%	-0.73	-0.30	84.6%	-14.5%
R10	Dec 12	Dec 22	13.3%	19.4%	11.0%	4.9%	4.70	1.16	34.7%	7.8%
R20	Dec 02	Dec 22	12.7%	42.3%	11.9%	0.0%	1.04	0.97	22.0%	7.4%
P32	Dec 70	Dec 02	12.4%	44.7%	14.5%	0.0%	0.60	0.40	8.1%	10.4%
FS	Dec 70	Dec 22	12.6%	44.7%	13.5%	0.0%	0.80	0.60	13.4%	9.3%
SelO=	**SPY**								D6040=	29.3%
SelD=	**BIL, IEF**								Tover=	100%
SelP=	**TIP**								TrM=	1.0
NO=1, TO=1, ND=2, TD=1, NP=1, L=1, TC=0.1%										**AM0**

Fig 15 HAA-Simple, without absolute momentum

Period	Start	Stop	R	D	V	K25	UPI	SR	CF	R6040
R1	Dec 21	Dec 22	-14.5%	20.5%	16.4%	**0.0%**	-1.24	-0.95	0.0%	-14.5%
R10	Dec 12	Dec 22	7.8%	20.5%	9.1%	**2.4%**	1.60	0.79	0.0%	7.8%
R20	Dec 02	Dec 22	7.4%	29.5%	8.8%	**0.0%**	0.94	0.71	0.0%	7.4%
P32	Dec 70	Dec 02	10.4%	27.4%	10.4%	**0.0%**	0.69	0.36	0.0%	10.4%
FS	Dec 70	Dec 22	9.3%	29.5%	9.8%	**0.0%**	0.80	0.49	0.0%	9.3%
SPY/IEF (60/40)									Tover=	0%
									TrM/y=	0.0

Fig 16 The 60/40 benchmark

7. Summary and conclusions

By the 'hybrid' combination of *traditional* dual momentum with a *new* canary asset TIP for crash protection, we are able to arrive at a very simple strategy called 'Hybrid Asset Allocation' (HAA), which is much simpler than our complex BAA (Bold Asset Allocation) model.

The recipe for this new HAA strategy is simple: on the close of the last trading day of each month t:

1. Calculate the momentum of each asset in the (risky) offensive, defensive (BIL/IEF) and canary (TIP) universe, where momentum is the average total return over the past 1, 3, 6, and 12 months.

2. Select only the best defensive 'cash' asset (BIL or IEF) when TIP is bad, or else allocate 1/TopX of the portfolio to each of the best TopX half of the risky assets (equally weighted), while replacing each of those TopX assets by the best 'cash' asset when 'bad' (ie. has non-positive momentum).

3. Hold all positions until the final trading day of the following month. Rebalance the entire portfolio monthly, regardless of whether there is a change in position.

We selected the *HAA-Balanced* strategy with a Top4 out of 8 Global risky assets (SPY, IWM, VEA, VWO, VNQ, DBC, IEF, TLT) and the *HAA-Simple* strategy with only *one* US risky (SPY) as risky asset.

In fig 17, we compare the HAA-Balanced strategy with BAA-Balanced and HAA-Simple with 60/40 for 3 periods (**bold** is best). We conclude that in terms of risk (and return/risk) our new HAA-Balanced is a more offensive alternative for the much more complex BAA-Balanced, while HAA-Simple (with only SPY as risky) might be a simple tactical alternative for lazy 60/40 investors. Both HAA strategies also spend nearly half the time of BAA in defensive mode (see CF), which might be useful in times of rising yields. As a result, HAA also has a much lower turnover than BAA.

	R	D	V	K25	UPI	SR	CF
R10y (Dec 2012 - Dec 2022)							
HAA-Balanced (G8/T4)	**8.5%**	**6.4%**	7.7%	**7.2%**	**3.40**	**1.02**	**37%**
BAA-Balanced (G12/T6)	7.1%	7.7%	**6.6%**	5.8%	2.32	0.98	62%
HAA-Simple (U1/T1)	**12.5%**	**8.2%**	9.2%	**10.0%**	**5.60**	**1.30**	38%
60/40 (SPY/IEF)	7.8%	20.5%	**9.1%**	2.4%	1.60	0.79	**0%**
R20y (Dec 2002 - Dec 2022)							
HAA-Balanced (G8/T4)	**12.2%**	9.7%	9.4%	**9.2%**	3.83	1.17	**24%**
BAA-Balanced (G12/T6)	11.5%	**8.7%**	**8.7%**	9.1%	**3.88**	**1.20**	54%
HAA-Simple (U1/T1)	**10.8%**	**16.6%**	9.4%	**5.4%**	**2.73**	**1.03**	32%
60/40 (SPY/IEF)	7.4%	29.5%	**8.8%**	0.0%	0.94	0.71	**0%**
FS (Dec 1970 - Dec 2022)							
HAA-Balanced (G8/T4)	**15.9%**	9.7%	9.4%	**12.0%**	**4.88**	**1.21**	**17%**
BAA-Balanced (G12/T6)	14.4%	**8.7%**	**8.5%**	11.4%	4.58	1.16	57%
HAA-Simple (U1/T1)	**12.8%**	**16.6%**	10.9%	**6.5%**	**2.02**	**0.76**	30%
60/40 (SPY/IEF)	9.3%	29.5%	**9.8%**	0.0%	0.80	0.49	**0%**

Fig 17 Comparison of HAA-Balanced with BAA-Balanced, and HAA-Simple with 60/40 (SPY/IEF)

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