Valuing the IK Delivery Option

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Trading Strategies

& Modelling

Conclusions

- IKU2 has negative convexity

- Duration is approx 80% Apr31 & 20% dec32

- Italian Basis looks rich here

- The theta of being short covers the neg convexity but it will require dynamic hedging

- Using option theory we can estimate the prob of delivery of each

- A well constructed basis trade would be a mis-weighted / blend of the potential CTDs hedge according to their own Conversion Factor

Bring me a Higher Love (Rates Curve).. And a bunch of negative convexity

- Italy Issue tapped Btps 2.5% Dec32

- Issue Size now is € 6.5 yds – min size for delivery into IK contracts is 5yds

- The higher coupon puts this bond at a short modified duration than prior 10yrs at the same point in their cycle

- This feature, coupled with the cheapness of the current, on the run 10y makes it vie for Delivery Status more closely

- Ik contracts –Sep & Dec, particularly now have increased indeterminacy of the CTD

If we don't know what the CTD is for sure, what else don't we know

- The Futures contract now inherits negative convexity
- Upside of a short bond / downside of a long bond
- How do we value the option
- And what can it tell us about the duration of the futures contract

In the meantime – we're gonna really struggle with knowing the duration of this future

Basic theory: Expected CTD and Valuing the switch

- The futures is like a margined forward of the CTD(s)
- Now there's some probability of more than one CTD
- Futures = Expected Value of multiple CTDs

The problem is that this is a changing number –

Assuming we have only two bonds vying for CTD status, then as one diminishes its chance of being delivered the other must increase

In basis trading terms, this means that a if one hedges Bond 1 via a basis trade weighted by it's Probability P_1, and Bond 2 weighted by its Probability P_1-1 then we are constantly changing the weightings as the relative prices of Bond 1 & 2 move

That's a beautiful thing if you are long the basis – you are always buying one that has cheapened and selling one that has richened – not so nice of you are long futures and short weighted amounts of the two cash bonds

Negative Convexity

- So it's no surprise that we the IKM2 / IKU2 futures roll has squeezed up to 2.47 from 2.20 in a matter of days

- There are no natural buyers of the back month to stand in it's way and sell weighted cash of either CTD and in return for the negative convexity, get paid via theta, time decay which they earn up to delivery

- This is the classic option traders' short-gamma, dilemma – how much theta is enough?........

Valuing the Delivery Option

- The problem in Valuing the optionality in IKU2 (and beyond) resides in the relative Prices (not necessarily yields) *and* conversion factors
- There are three main components that drive this

1. Delta
2. Curve
3. Isin Risk (specific relative richening or cheapening vs each other)

To compile this into one – we use the Superpositon principle from wave theory – we assume that the three effect are separate and add the effects together. Although there is undoubtedly some interaction between these 3 we can start with this as our base case

Valuation : Market Delta

- Assume the relative yield spreads stay constant – the Futures px is based of the lowest implied price from the two bonds divided by their conversion factor

- We then shift yields up and down 120 bp – and calculate the implied futures price from a worst case for each bond

- As yields fall the Apr31 basis goes to zero and dominates price behaviour of the future

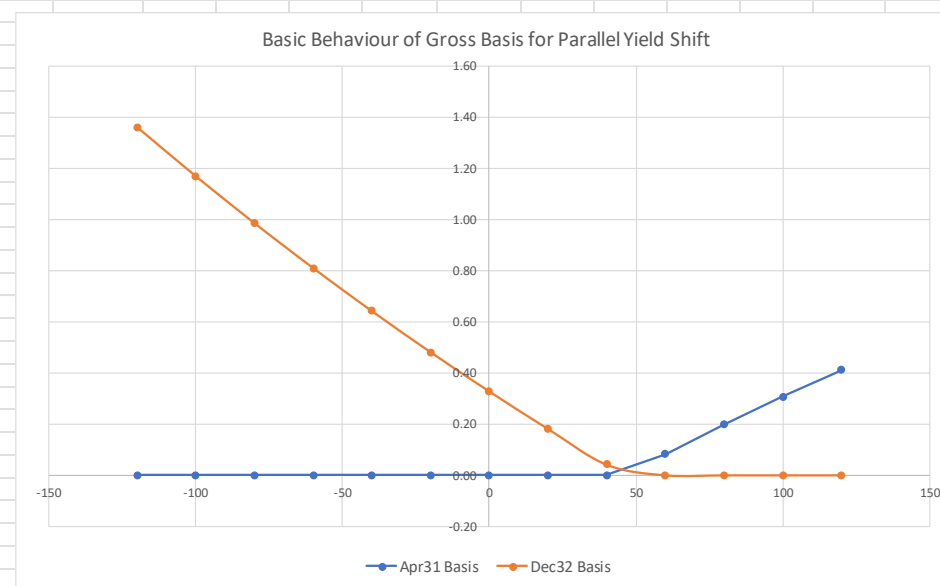- As yields rise another ~40bp the Dec32 takes over as potential CTD

Yield Shifts & Yields

120	100	80	60	40	20	0	-20	-40	-60	-80	-100	-120
4.506	4.306	4.106	3.906	3.706	3.506	**3.306**	3.106	2.906	2.706	2.506	2.306	2.106
4.306	4.106	3.906	3.706	3.506	3.306	**3.106**	2.906	2.706	2.506	2.306	2.106	1.906

Prices YAS_BOND_PX

84.08	85.53	87.02	88.54	90.08	91.67	**93.28**	94.93	96.61	98.33	100.08	101.88	103.71
76.126	77.333	78.562	79.813	81.087	82.385	**83.71**	85.052	86.423	87.820	89.242	90.691	92.167

Implied Futures prices

113.47	115.43	117.44	119.48	121.57	123.71	125.89	128.11	130.38	132.70	135.07	137.49	139.96
114.08	115.89	117.73	119.61	121.52	123.46	125.44	127.46	129.52	131.61	133.74	135.91	138.12

Lower of the Two futures price

113.47	115.43	117.44	119.48	121.52	123.46	125.44	127.46	129.52	131.61	133.74	135.91	138.12

Net Basis = Gross Basis @ delivery

0.00	0.00	0.00	0.00	0.04	0.18	**0.33**	0.48	0.64	0.81	0.99	1.17	1.36
0.41	0.31	0.20	0.08	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Basic Behaviour of Gross Basis for Parallel Yield Shift — Apr31 Basis, Dec32 Basis

		Settle Date	01-Jun-22						Repo =	-0.31							
	DY003		Maturity	Coupon	Risk_Mid	YAS_BOND_PX	YAS_BOND_YLD	YAS_ISPREAD	YAS_ZSP READ	Conversion Factor	RISK_MID	Fwd Px	Fwd Yield	Carry (bp)	Gross	Repo	Net	implied Fut PX
Bond isin																		
IT0005494	BTPS 2.5 12/01/32		01-Dec-32	2.50	8.428	94.052	3.196	160.4	157.4	0.740979	8.4	93.279	3.306	11.0	1.56	-0.31	0.79	125.887
ZO650415	BTPS 0.9 04/01/31		01-Apr-31	0.90	6.908	84.029	2.992	150.29	145.96	0.667280	6.9	83.706	3.106	11.4	0.74	-0.31	0.42	125.444

Futures are a Blend of two bonds

- The 'correct' basis trade for futures would be made of two nasis trades weighted by the probability of delivery

- We can estimate this re-weighting the two bond basis until the option pay out is roughly symmetrical – such that the long basis trade has a payout profile similar to an out of the money call and an out of the money put

- It also tells us roughly what the expected probability of each bond being CTD might be (based on parallel shifts)

Futures blend: 80% Apr31 / 20% Dec32

- We created a 'blended basis' out 80% Arp31 and 20% Dec32

- We think this give equal profile value for a normally distributed yield process centred around current mid

- The duration is best approximated as 80% of that derived from apr31 alone and 20% of that from Dec32

Basis Trade

Nett Basis blend of 75% Apr31 and 25% Dec31

20%	Btps Dec3	0.00	0.00	0.00	0.00	0.00	0.03	0.06	0.09	0.12	0.15	0.18	0.22	0.26
80%	Btps Apr3:	0.36	0.27	0.19	0.10	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
Sum	ded Basis	0.36	0.27	0.19	0.10	0.00	0.03	0.06	0.09	0.12	0.15	0.18	0.22	0.26

Basic Behaviour of Gross Basis for Parallel Yield Shift

(chart: Dec32 Basis)
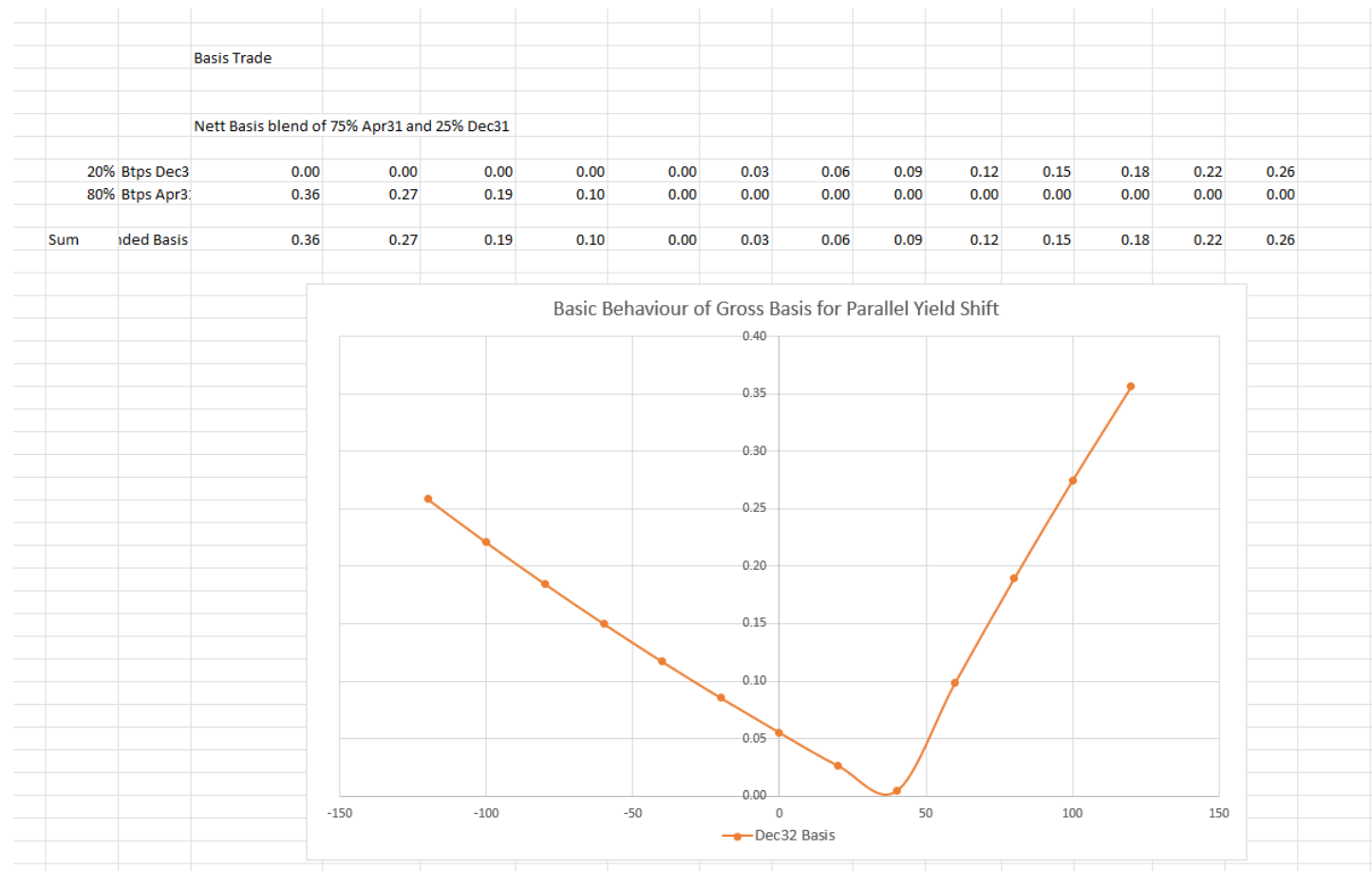
Using option

- if we simply value the basis using options the current CTD basis behaves like a put. Struck ~40bp out of the money put producing 25 cents for a 4 point sell off in the IK futures
- We estimate its value to be
- This does not hedge further curve and ISIN risk

Basic Behaviour of Gross Basis for Apr31

Slope: must generate half a point for every 8 pts move in the future
HR: 6.25%

Put Strike Price: 121
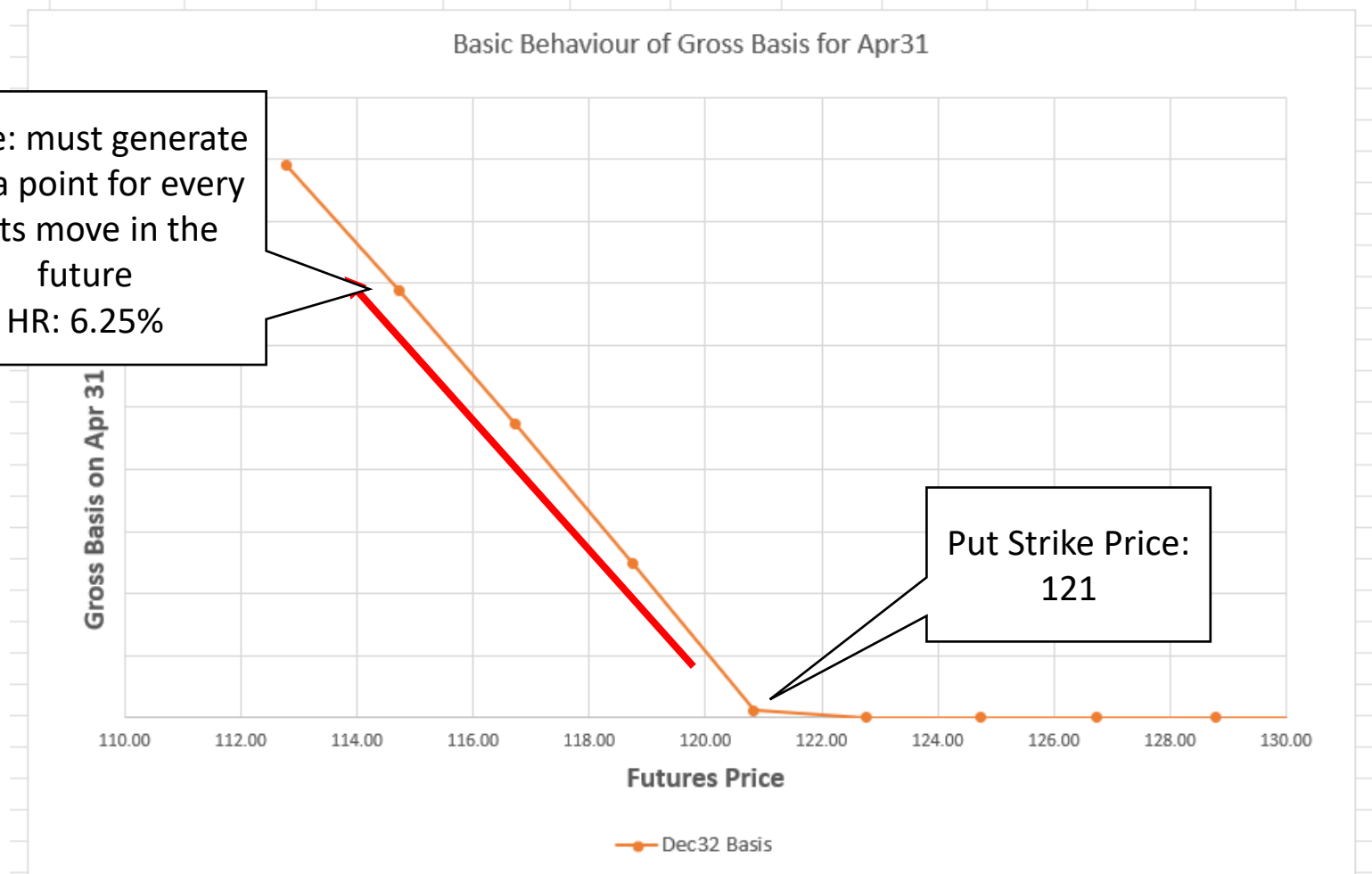
- I estimate this option to cost in the region of 1.25 points to cover the period beyond futures expiry – which would augment the basis by 6.4 cents

Further work:

We have not taken into account

1. Curve twists

2. Further new issues

3. Isin risk – the anomaly of Apr31 going missing

Our analysis seems very low value and suggest we need to do further work to superimpose the value of these other issues

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